



US Army Corps
Of Engineers
Savannah District

Hunter Army Airfield, Georgia

Solicitation Number

W912HN-26-B-A003

SOF Military Working Dog Kennel

Volume 1 of 3: Specifications Divisions 01 – 08

PN69262

January 2026

**U.S. ARMY ENGINEER DISTRICT, SAVANNAH
CORPS OF ENGINEERS
100 WEST OGLETHORPE AVENUE
SAVANNAH, GEORGIA 31401-3640**

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SOF Military Working Dog Kennel
Fort Stewart-Hunter Airfield, Georgia

January 2026

SPECIFICATION CERTIFICATION PAGE

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FIRE PROTECTION



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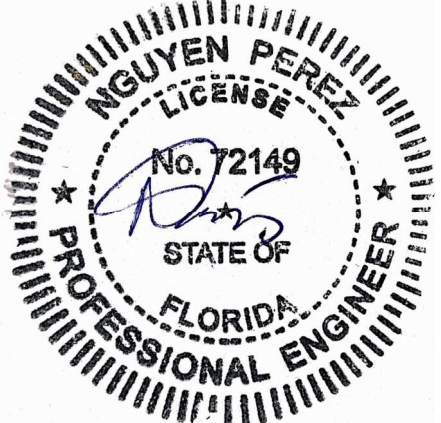
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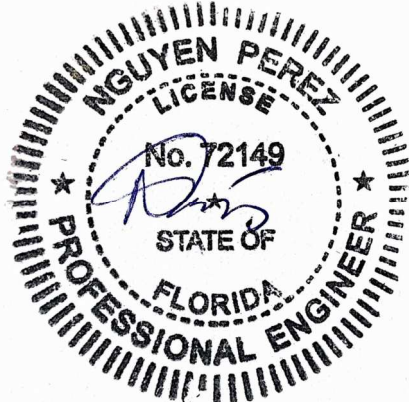


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ELECTRONICS AND COMMUNICATIONS



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SECTION 01 11 00

SUMMARY OF WORK

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Salvage Plan; G

1.2 WORK COVERED BY CONTRACT DOCUMENTS

1.2.1 Project Description

The work includes construction of permanent facilities for the US Army Corps of Engineers, Savannah District. The primary scope of work includes a new military working dog (MWD) Kennel. The MWD Kennel will include kennel administration offices, veterinary exam and surgical suite, TA-50 locker area, latrines with showers, tack room, food preparation and storage areas, indoor and outdoor kennels, and building utility support areas. Fire detection and suppression, energy management control, unclassified and classified communications networks, intrusion detection, surveillance, and access control systems will be provided. Supporting facilities include all related site-work and utilities (electrical, water, gas, sanitary sewer, and information systems distribution), lighting, parking, curb and gutter, sidewalks, storm drainage, landscaping, antiterrorism/force protection measures (AT/FP), obedience course with apparatuses, exercise and break areas, mobility equipment storage, and other site improvements. Special construction includes sustainable construction features complying with Leadership in Energy and Environmental Design LEED "Silver".

1.2.2 Location

The MWD Kennel Project is located on a 3-acre site located within the controlled perimeter of Hunter Army Airfield in Savannah, Georgia. The site is bound by Perimeter Road and WM F Lynes Parkway to the North and Stephen Douglas Street to the West. The existing kennel building (Bldg. 1030) and obedience yard bounds the site to the East. Springfield Canal bounds the site to the South.

1.3 OCCUPANCY OF PREMISES

Surrounding building(s) will be occupied during performance of work under this Contract.

Before work is started, arrange with the Contracting Officer a sequence of procedure, means of access, space for storage of materials and equipment, and use of approaches, corridors, and stairways. The Government will require 45 days to move out of the old kennels after the new kennels are

accepted.

1.4 EXISTING WORK

In addition to FAR 52.236-9 Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements:

- a. Remove or alter existing work in such a manner as to prevent injury or damage to any portions of the existing work which remain.
- b. Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as approved by the Contracting Officer. At the completion of operations, existing work must be in a condition equal to or better than that which existed before new work started.

1.5 LOCATION OF UNDERGROUND UTILITIES

Obtain digging permits prior to start of excavation, and comply with Installation requirements for locating and marking underground utilities. Contact local utility locating service a minimum of 48 hours prior to excavating, to mark utilities, and within sufficient time required if work occurs on a Monday or after a Holiday. Verify existing utility locations indicated on contract drawings, within area of work.

Identify and mark all other utilities not managed and located by the local utility companies. Scan the construction site with Ground Penetrating Radar (GPR), electromagnetic, or sonic equipment, and mark the surface of the ground or paved surface where existing underground utilities are discovered. Verify the elevations of existing piping, utilities, and any type of underground or encased obstruction not indicated, or specified to be removed, that is indicated or discovered during scanning, in locations to be traversed by piping, ducts, and other work to be conducted or installed. Verify elevations before installing new work closer than nearest manhole or other structure at which an adjustment in grade can be made.

1.5.1 Notification Prior to Excavation

Notify the Contracting Officer at least 15 days prior to starting excavation work.

1.6 SALVAGE MATERIAL AND EQUIPMENT

Items designated by the Contracting Officer to be salvaged remain the property of the Government. Segregate, itemize, deliver and off-load the salvaged property at the Government designated site.

Provide a salvage plan, listing material and equipment to be salvaged, and their storage location. Maintain property control records for material or equipment designated as salvage. Provide a system for property control in the salvage plan. Store and protect salvaged materials and equipment until disposition by the Contracting Officer.

SOF Military Working Dog Kennel
Hunter Army Airfield, Georgia

PN 69262

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

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SECTION 01 14 00

WORK RESTRICTIONS

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

List of Contact Personnel

1.2 SPECIAL SCHEDULING REQUIREMENTS

- a. The surrounding facilities will remain in operation during the entire construction period. The Contractor must conduct his operations so as to cause the least possible interference with normal operations of the activity.
- b. Permission to interrupt any Activity roads, railroads, or utility service must be requested in writing a minimum of 15 calendar days prior to the desired date of interruption.

1.3 CONTRACTOR ACCESS AND USE OF PREMISES

1.3.1 Activity Regulations

Ensure that Contractor personnel employed on the Activity become familiar with and obey Activity regulations including safety, fire, traffic and security regulations. Keep within the limits of the work and avenues of ingress and egress. Wear appropriate personal protective equipment (PPE) in designated areas. Do not enter any restricted areas unless required to do so and until cleared for such entry. Ensure all Contractor equipment, include delivery vehicles, are clearly identified with their company name.

1.3.1.1 Subcontractors and Personnel Contacts

Provide a list of contact personnel of the Contractor and subcontractors including addresses and telephone numbers for use in the event of an emergency. As changes occur and additional information becomes available, correct and change the information contained in previous lists.

1.3.1.2 No Smoking Policy

Smoking is prohibited within and outside of all buildings on installation, except in designated smoking areas. This applies to existing buildings, buildings under construction and buildings under renovation. Discarding tobacco materials other than into designated tobacco receptacles is considered littering and is subject to fines. The Contracting Officer will identify designated smoking areas.

1.3.2 Working Hours

Regular working hours will consist of an 8 1/2 hour period, between 8:00 a.m. and 4:30 p.m., Monday through Friday, excluding Government holidays.

1.3.3 Work Outside Regular Hours

Work outside regular working hours requires Contracting Officer approval. Make application 15 calendar days prior to such work to allow arrangements to be made by the Government for inspecting the work in progress, giving the specific dates, hours, location, type of work to be performed, contract number and project title. Based on the justification provided, the Contracting Officer may approve work outside regular hours. During periods of darkness, the different parts of the work must be lighted in a manner approved by the Contracting Officer. Make utility cutovers after normal working hours or on Saturdays, Sundays, and Government holidays unless directed otherwise.

1.3.4 Occupied and Existing Buildings

The Contractor shall be working around existing buildings which are occupied. Do not enter the buildings without prior approval of the Contracting Officer.

1.3.5 Utility Cutovers and Interruptions

- a. Make utility cutovers and interruptions after normal working hours or on Saturdays, Sundays, and Government holidays. Conform to procedures required in paragraph WORK OUTSIDE REGULAR HOURS.
- b. Ensure that new utility lines are complete, except for the connection, before interrupting existing service.
- c. Interruption to water, sanitary sewer, storm sewer, telephone service, electric service, air conditioning, heating, fire alarm, compressed air, and natural gas are considered utility cutovers pursuant to the paragraph WORK OUTSIDE REGULAR HOURS.

1.4 SECURITY REQUIREMENTS

Contract Clause FAR 52.204-2 Security Requirements and Alternate II apply.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2024) Safety -- Safety and Occupational Health (SOH) Requirements

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

View Location Map

Progress and Completion Pictures

1.3 VIEW LOCATION MAP

Submit, prior to or with the first digital photograph submittals, a sketch or drawing indicating the required photographic locations. Update as required if the locations are moved.

1.4 PROGRESS AND COMPLETION PICTURES

Photographically document site conditions prior to start of construction operations. Provide monthly, and within one month of the completion of work, digital photographs, 1600x1200x24 bit true color minimum resolution in JPEG file format showing the sequence and progress of work. Take a minimum of 20 digital photographs each week throughout the entire project from a minimum of ten different viewpoints selected by the Contractor unless otherwise directed by the Contracting Officer. Submit with the monthly invoice two sets of digital photographs, each set on a separate compact disc (CD) or data versatile disc (DVD), cumulative of all photos to date. Indicate photographs demonstrating environmental procedures. Provide photographs for each month in a separate monthly directory and name each file to indicate its location on the view location sketch. Also provide the view location sketch on the CD or DVD as a digital file. Include a date designator in file names. Photographs provided are for unrestricted use by the Government.

1.5 MINIMUM INSURANCE REQUIREMENTS

Provide the minimum insurance coverage required by FAR 28.307-2 Liability,

during the entire period of performance under this contract. Provide other insurance coverage as required by State law.

1.6 SUPERVISION

1.6.1 Superintendent Qualifications

Provide project superintendent with a minimum of 10 years experience in construction with at least 5 of those years as a superintendent on projects similar in size and complexity. The individual must be familiar with the requirements of EM 385-1-1 and have experience in the areas of hazard identification and safety compliance. The individual must be capable of interpreting a critical path schedule and construction drawings. The qualification requirements for the alternate superintendent are the same as for the project superintendent. The Contracting Officer may request proof of the superintendent's qualifications at any point in the project if the performance of the superintendent is in question.

1.6.2 Minimum Communication Requirements

Have at least one qualified superintendent, or competent alternate, capable of reading, writing, and conversing fluently in the English language, on the job site at all times during the performance of Contract work. In addition, if a Quality Control (QC) representative is required on the Contract, then that individual must also have fluent English communication skills.

1.6.3 Duties

The project superintendent is primarily responsible for managing subcontractors and coordinating day-to-day production and schedule adherence on the project. The superintendent is required to attend partnering meetings, and quality control meetings. The superintendent or qualified alternative must be on-site at all times during the performance of this contract until the work is completed and accepted.

1.6.4 Non-Compliance Actions

The Project Superintendent is subject to removal by the Contracting Officer for non-compliance with requirements specified in the contract and for failure to manage the project to ensure timely completion. Furthermore, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders is acceptable as the subject of claim for extension of time for excess costs or damages by the Contractor.

1.7 PRECONSTRUCTION MEETING CONFERENCE

Immediately after award, prior to commencing any work at the site, coordinate with the Contracting Officer a time and place to meet for the Preconstruction Conference. The conference must take place within 35 calendar days after award of the contract, but prior to commencement of any work at the site. The purpose of this conference is to discuss and develop a mutual understanding of the administrative requirements of the Contract including but not limited to: Daily reporting, invoicing, value engineering, safety, base-access, outage requests, hot work permits, schedule requirements, quality control, schedule of prices or earned value report, shop drawings, submittals, cybersecurity, prosecution of the work,

Government acceptance, final inspections and contract close-out.
Contractor must present and discuss their basic approach to scheduling the construction work and any required phasing.

1.7.1 Attendees

Contractor attendees must include the Project Manager, Superintendent, Site Safety and Health Officer (SSHO), Quality Control Manager and major subcontractors.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

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SECTION 01 32 01.00 10

PROJECT SCHEDULE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AACE INTERNATIONAL (AACE)

AACE 29R-03 (2011) Forensic Schedule Analysis

AACE 52R-06 (2006) Time Impact Analysis - As Applied
in Construction

U.S. ARMY CORPS OF ENGINEERS (USACE)

ER 1-1-11 (2017) Administration -- Project Schedules

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Project Scheduler Qualifications; G

Preliminary Project Schedule; G

Initial Project Schedule; G

Periodic Schedule Update; G

1.3 PROJECT SCHEDULER QUALIFICATIONS

Designate an authorized representative to be responsible for the preparation of the schedule and all required updating and production of reports. The authorized representative must have a minimum of 2-years experience scheduling construction projects similar in size and nature to this project with scheduling software that meets the requirements of this specification. Representative must have a comprehensive knowledge of CPM scheduling principles and application.

PART 2 PRODUCTS

2.1 SOFTWARE

The scheduling software utilized to produce and update the schedules required herein must be capable of meeting all requirements of this

specification.

2.1.1 Government Default Software

The Government intends to use Primavera P6.

2.1.2 Contractor Software

Scheduling software used by the contractor must be commercially available from the software vendor for purchase with vendor software support agreements available. The software routine used to create the required sdef file must be created and supported by the software manufacturer.

2.1.2.1 Primavera

If Primavera P6 is selected for use, provide the "xer" export file in a version of P6 importable by the Government system.

2.1.2.2 Other Than Primavera

If the contractor chooses software other than Primavera P6, that is compliant with this specification, provide for the Government's use two licenses, two computers, and training for two Government employees in the use of the software. These computers will be stand-alone and not connected to Government network. Computers and licenses will be returned at project completion.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

Prepare for approval a Project Schedule, as specified herein, pursuant to FAR Clause 52.236-15 Schedules for Construction Contracts. Show in the schedule the proposed sequence to perform the work and dates contemplated for starting and completing all schedule activities. The scheduling of the entire project is required. The scheduling of construction is the responsibility of the Contractor. Contractor management personnel must actively participate in its development. Subcontractors and suppliers working on the project must also contribute in developing and maintaining an accurate Project Schedule. Provide a schedule that is a forward planning as well as a project monitoring tool. Use the Critical Path Method (CPM) of network calculation to generate all Project Schedules. Prepare each Project Schedule using the Precedence Diagram Method (PDM).

3.2 BASIS FOR PAYMENT AND COST LOADING

The schedule is the basis for determining contract earnings during each update period and therefore the amount of each progress payment. The aggregate value of all activities coded to a contract CLIN must equal the value of the CLIN.

3.2.1 Activity Cost Loading

Activity cost loading must be reasonable and without front-end loading. Provide additional documentation to demonstrate reasonableness if requested by the Contracting Officer.

3.2.2 Withholdings / Payment Rejection

Failure to meet the requirements of this specification may result in the disapproval of the preliminary, initial or periodic schedule updates and subsequent rejection of payment requests until compliance is met.

In the event that the Contracting Officer directs schedule revisions and those revisions have not been included in subsequent Project Schedule revisions or updates, the Contracting Officer may withhold 10 percent of pay request amount from each payment period until such revisions to the project schedule have been made.

3.3 PROJECT SCHEDULE DETAILED REQUIREMENTS

3.3.1 Level of Detail Required

Develop the Project Schedule to the appropriate level of detail to address major milestones and to allow for satisfactory project planning and execution. Failure to develop the Project Schedule to an appropriate level of detail will result in its disapproval. The Contracting Officer will consider, but is not limited to, the following characteristics and requirements to determine appropriate level of detail:

3.3.2 Activity Durations

Reasonable activity durations are those that allow the progress of ongoing activities to be accurately determined between update periods. Less than 2 percent of all non-procurement activities may have Original Durations (OD) greater than 20 work days or 30 calendar days.

3.3.3 Procurement Activities

Include activities associated with the critical submittals and their approvals, procurement, fabrication, and delivery of long lead materials, equipment, fabricated assemblies, and supplies. Long lead procurement activities are those with an anticipated procurement sequence of over 90 calendar days.

3.3.4 Mandatory Tasks

Include the following activities/tasks in the initial project schedule and all updates.

- a. Submission, review and acceptance of SD-01 Preconstruction Submittals (individual activity for each).
- b. Submission of mechanical/electrical/information systems layout drawings.
- c. Long procurement activities
- d. Submission and approval of O & M manuals.
- e. Submission and approval of as-built drawings.
- f. Submission and approval of DD1354 data and installed equipment lists.
- g. Submission and approval of testing and air balance (TAB).

- h. Submission of TAB specialist design review report.
- i. Submission and approval of fire protection specialist.
- j. Submission and approval of Building Commissioning Plan, test data, and reports: Develop the schedule logic associated with testing and commissioning of mechanical systems to a level of detail consistent with the contract commissioning requirements. All tasks associated with all building testing and commissioning will be completed prior to submission of building commissioning report and subsequent contract completion.
- k. Air and water balancing.
- l. Building commissioning - Functional Performance Testing.
- m. Controls testing plan submission.
- n. Controls testing.
- o. Performance Verification testing.
- p. Other systems testing, if required.
- q. Contractor's pre-final inspection.
- r. Correction of punch list from Contractor's pre-final inspection.
- s. Government's pre-final inspection.
- t. Correction of punch list from Government's pre-final inspection.
- u. Final inspection.

3.3.5 Government Activities

Show Government and other agency activities that could impact progress. These activities include, but are not limited to: Environmental permit approvals by State regulators, inspections, utility tie-in, Government Furnished Equipment (GFE) and Notice to Proceed (NTP) for phasing requirements.

3.3.6 Standard Activity Coding Dictionary

Use the activity coding structure defined in the Standard Data Exchange Format (SDEF) in ER 1-1-11. This exact structure is mandatory. Develop and assign all Activity Codes to activities as detailed herein. A template SDEF compatible schedule backup file is available on the QCS web site: <http://rms.usace.army.mil>.

The SDEF format is as follows:

Field	Activity Code	Length	Description
1	WRKP	3	Workers per day

Field	Activity Code	Length	Description
2	RESP	4	Responsible party
3	AREA	4	Area of work
4	MODF	6	Modification Number
5	BIDI	6	Bid Item (CLIN)
6	PHAS	2	Phase of work
7	CATW	1	Category of work
8	FOW	20	Feature of work*
*Some systems require that FEATURE OF WORK values be placed in several activity code fields. The notation shown is for Primavera P6. Refer to the specific software guidelines with respect to the FEATURE OF WORK field requirements.			

3.3.6.1 Workers Per Day (WRKP)

Assign Workers per Day for all field construction or direct work activities, if directed by the Contracting Officer. Workers per day is based on the average number of workers expected each day to perform a task for the duration of that activity.

3.3.6.2 Responsible Party Coding (RESP)

Assign responsibility code for all activities to the Prime Contractor, Subcontractor(s) or Government agency(ies) responsible for performing the activity.

- a. Activities coded with a Government Responsibility code include, but are not limited to: Government approvals, Government design reviews, environmental permit approvals by State regulators, Government Furnished Property/Equipment (GFP) and Notice to Proceed (NTP) for phasing requirements.
- b. Activities cannot have more than one Responsibility Code. Examples of acceptable activity code values are: DOR (for the designer of record); ELEC (for the electrical subcontractor); MECH (for the mechanical subcontractor); and GOVT (for USACE).

3.3.6.3 Area of Work Coding (AREA)

Assign Work Area code to activities based upon the work area in which the activity occurs. Define work areas based on resource constraints or space constraints that would preclude a resource, such as a particular trade or craft work crew from working in more than one work area at a time due to restraints on resources or space. Examples of Work Area Coding include different areas within a floor of a building, different floors within a building, and different buildings within a complex of buildings. Activities cannot have more than one Work Area Code.

Not all activities are required to be Work Area coded. A lack of Work

Area coding indicates the activity is not resource or space constrained.

3.3.6.4 Modification Number (MODF)

Assign a Modification Number Code to any activity or sequence of activities added to the schedule as a result of a Contract Modification, when approved by Contracting Officer. Key all Code values to the Government's modification numbering system. An activity can have only one Modification Number Code.

3.3.6.5 Bid Item Coding (BIDI)

Assign a Bid Item Code to all activities using the Contract Line Item Schedule (CLIN) to which the activity belongs, even when an activity is not cost loaded. An activity can have only one BIDI Code.

3.3.6.6 Phase of Work Coding (PHAS)

Assign Phase of Work Code to all activities. Examples of phase of work are procurement phase and construction phase. Each activity can have only one Phase of Work code.

- a. Code proposed fast track design and construction phases proposed to allow filtering and organizing the schedule by fast track design and construction packages.
- b. If the contract specifies phasing with separately defined performance periods, identify a Phase Code to allow filtering and organizing the schedule accordingly.

3.3.6.7 Category of Work Coding (CATW)

Assign a Category of Work Code to all activities. Category of Work Codes include, but are not limited to construction submittal, procurement, fabrication, weather sensitive installation, non-weather sensitive installation, start-up, and testing activities. Each activity can have no more than one Category of Work Code.

3.3.6.8 Feature of Work Coding (FOW)

Assign a Feature of Work Code to appropriate activities based on the Definable Feature of Work to which the activity belongs based on the approved QC plan.

Definable Feature of Work is defined in Section 01 45 00.00 10 QUALITY CONTROL. An activity can have only one Feature of Work Code.

3.3.7 Contract Milestones and Constraints

Milestone activities are to be used for significant project events including, but not limited to, project phasing, project start and end activities, or interim completion dates. The use of artificial float constraints such as "zero free float" or "zero total float" are prohibited.

Mandatory constraints that ignore or effect network logic are prohibited. No constrained dates are allowed in the schedule other than those specified herein. Submit additional constraints to the Contracting Officer for approval on a case by case basis.

3.3.7.1 Project Start Date Milestone and Constraint

The first activity in the project schedule must be a start milestone titled "NTP Acknowledged," which must have a "Start On" constraint date equal to the date that the NTP is acknowledged.

3.3.7.2 End Project Finish Milestone and Constraint

The last activity in the schedule must be a finish milestone titled "End Project."

Constrain the project schedule to the Contract Completion Date in such a way that if the schedule calculates an early finish, then the float calculation for "End Project" milestone reflects positive float on the longest path. If the project schedule calculates a late finish, then the "End Project" milestone float calculation reflects negative float on the longest path. The Government is under no obligation to accelerate Government activities to support a Contractor's early completion.

3.3.7.3 Interim Completion Dates and Constraints

Constrain contractually specified interim completion dates to show negative float when the calculated late finish date of the last activity in that phase is later than the specified interim completion date.

3.3.7.3.1 Start Phase

Use a start milestone as the first activity for a project phase. Call the start milestone "Start Phase X" where "X" refers to the phase of work.

3.3.7.3.2 End Phase

Use a finish milestone as the last activity for a project phase. Call the finish milestone "End Phase X" where "X" refers to the phase of work.

3.3.8 Calendars

Schedule activities on a Calendar to which the activity logically belongs. Develop calendars to accommodate any contract defined work period such as a 7-day calendar for Government Acceptance activities, concrete cure times, etc. Develop the default Calendar to match the physical work plan with non-work periods identified including weekends and holidays. Develop sSeasonal Calendar(s) and assign to seasonally affected activities as applicable.

If an activity is weather sensitive it should be assigned to a calendar showing non-work days on a monthly basis, with the non-work days selected at random across the weeks of the calendar, using the anticipated adverse weather delay work days provided in the Special Contract Clauses. Assign non-work days over a seven-day week as weather records are compiled on seven-day weeks, which may cause some of the weather related non-work days to fall on weekends.

3.3.9 Open Ended Logic

Only two open ended activities are allowed: The first activity "NTP Acknowledged" may have no predecessor logic, and the last activity -"End Project" may have no successor logic.

Predecessor open ended logic may be allowed in a time impact analyses upon the Contracting Officer's approval.

3.3.10 Default Progress Data Disallowed

Actual Start and Finish dates must not automatically update with default mechanisms included in the scheduling software. Updating of the percent complete and the remaining duration of any activity must be independent functions. Disable program features that calculate one of these parameters from the other. Activity Actual Start (AS) and Actual Finish (AF) dates assigned during the updating process must match those dates provided in the Contractor Quality Control Reports. Failure to document the AS and AF dates in the Daily Quality Control report will result in disapproval of the Contractor's schedule.

3.3.11 Out-of-Sequence Progress

Activities that have progressed before all preceding logic has been satisfied (Out-of-Sequence Progress) will be allowed only on a case-by-case basis subject to approval by the Contracting Officer. Propose logic corrections to eliminate out of sequence progress or justify not changing the sequencing for approval prior to submitting an updated project schedule. Address out of sequence progress or logic changes in the Narrative Report and in the periodic schedule update meetings.

3.3.12 Added and Deleted Activities

Do not delete activities from the project schedule or add new activities to the schedule without approval from the Contracting Officer. Activity ID and description changes are considered new activities and cannot be changed without Contracting Officer approval.

3.3.13 Original Durations

Activity Original Durations (OD) must be reasonable to perform the work item. OD changes are prohibited unless justification is provided and approved by the Contracting Officer.

3.3.14 Leads, Lags, and Start to Finish Relationships

Lags must be reasonable as determined by the Government and not used in place of realistic original durations, must not be in place to artificially absorb float, or to replace proper schedule logic.

- a. Leads (negative lags) are prohibited.
- b. Start to Finish (SF) relationships are prohibited.

3.3.15 Retained Logic

Schedule calculations must retain the logic between predecessors and successors ("retained logic" mode) even when the successor activity(s) starts and the predecessor activity(s) has not finished (out-of-sequence progress). Software features that in effect sever the tie between predecessor and successor activities when the successor has started and the predecessor logic is not satisfied ("progress override") are not be allowed.

3.3.16 Percent Complete

Update the percent complete for each activity started, based on the realistic assessment of earned value. Activities which are complete but for remaining minor punch list work and which do not restrain the initiation of successor activities may be declared 100 percent complete to allow for proper schedule management.

3.3.17 Remaining Duration

Update the remaining duration for each activity based on the number of estimated work days it will take to complete the activity. Remaining duration may not mathematically correlate with percentage found under paragraph entitled Percent Complete.

3.3.18 Cost Loading of Closeout Activities

Cost load the "Correction of punch list from Government pre-final inspection" activity(ies) not less than 1 percent of the present contract value. Activity(ies) may be declared 100 percent complete upon the Government's verification of completion and correction of all punch list work identified during Government pre-final inspection(s).

3.3.18.1 As-Built Drawings

If there is no separate contract line item (CLIN) for as-built drawings, cost load the "Submission and approval of as-built drawings" activity not less than \$35,000 or 1 percent of the present contract value, which ever is greater, up to \$200,000. Activity will be declared 100 percent complete upon the Government's approval.

3.3.18.2 O & M Manuals

Cost load the "Submission and approval of O & M manuals" activity not less than \$20,000. Activity will be declared 100 percent complete upon the Government's approval of all O & M manuals.

3.3.19 Early Completion Schedule and the Right to Finish Early

An Early Completion Schedule is an Initial Project Schedule (IPS) that indicates all scope of the required contract work will be completed before the contractually required completion date.

- a. No IPS indicating an Early Completion will be accepted without being fully resource-loaded (including crew sizes and manhours) and the Government agreeing that the schedule is reasonable and achievable.
- b. The Government is under no obligation to accelerate work items it is responsible for to ensure that the early completion is met nor is it responsible to modify incremental funding (if applicable) for the project to meet the contractor's accelerated work.

3.4 PROJECT SCHEDULE SUBMISSIONS

Provide the submissions as described below. The data CD/DVD, reports, and network diagrams required for each submission are contained in paragraph SUBMISSION REQUIREMENTS. If the Contractor fails or refuses to furnish the information and schedule updates as set forth herein, then the Contractor will be deemed not to have provided an estimate upon which a

progress payment can be made.

Review comments made by the Government on the schedule(s) do not relieve the Contractor from compliance with requirements of the Contract Documents.

3.4.1 Preliminary Project Schedule Submission

Within 15 calendar days after the NTP is acknowledged submit the Preliminary Project Schedule defining the planned operations detailed for the first 90 calendar days for approval. The approved Preliminary Project Schedule will be used for payment purposes not to exceed 90 calendar days after NTP. Completely cost load the Preliminary Project Schedule to balance the contract award CLINS shown on the Price Schedule. The Preliminary Project Schedule may be summary in nature for the remaining performance period. It must be early start and late finish constrained and logically tied as specified. The Preliminary Project Schedule forms the basis for the Initial Project Schedule specified herein and must include all of the required plan and program preparations, submissions and approvals identified in the contract (for example, Quality Control Plan, Safety Plan, and Environmental Protection Plan) as well as design activities, planned submissions of all early design packages, permitting activities, design review conference activities, and other non-construction activities intended to occur within the first 90 calendar days. Government acceptance of the associated design package(s) and all other specified Program and Plan approvals must occur prior to any planned construction activities. Activity code any activities that are summary in nature after the first 90 calendar days with Bid Item (CLIN) code (BIDI), Responsibility Code (RESP) and Feature of Work code (FOW).

3.4.2 Initial Project Schedule Submission

Submit the Initial Project Schedule for approval within 42 calendar days after notice to proceed is issued. The schedule must demonstrate a reasonable and realistic sequence of activities which represent all work through the entire contract performance period. No payment will be made for work items not fully detailed in the Project Schedule.

3.4.3 Periodic Schedule Updates

Update the Project Schedule on a regular basis, monthly at a minimum. Provide a draft Periodic Schedule Update for review at the schedule update meetings as prescribed in the paragraph PERIODIC SCHEDULE UPDATE MEETINGS. These updates will enable the Government to assess Contractor's progress.

- a. Update information including Actual Start Dates (AS), Actual Finish Dates (AF), Remaining Durations (RD), and Percent Complete is subject to the approval of the Government at the meeting.
- b. AS and AF dates must match the date(s) reported on the Contractor's Quality Control Report for an activity start or finish.

3.5 SUBMISSION REQUIREMENTS

Submit the following items for the Preliminary Schedule, Initial Schedule, and every Periodic Schedule Update throughout the life of the project:

3.5.1 Data CD/DVDs

Provide two sets of data CD/DVDs containing the current project schedule and all previously submitted schedules in the format of the scheduling software (e.g., .xer). Also include on the data CD/DVDs the Narrative Report and all required Schedule Reports. Label each CD/DVD indicating the type of schedule (Preliminary, Initial, Update), full contract number, Data Date and file name. Each schedule must have a unique file name and use project specific settings.

3.5.2 Narrative Report

Provide a Narrative Report with each schedule submission. The Narrative Report is expected to communicate to the Government the thorough analysis of the schedule output and the plans to compensate for any problems, either current or potential, which are revealed through that analysis. Include the following information as minimum in the Narrative Report:

- a. Identify and discuss the work scheduled to start in the next update period.
- b. A description of activities along the two most critical paths where the total float is less than or equal to 20 work days.
- c. A description of current and anticipated problem areas or delaying factors and their impact and an explanation of corrective actions taken or required to be taken.
- d. Identify and explain why activities based on their calculated late dates should have either started or finished during the update period but did not.
- e. Identify and discuss all schedule changes by activity ID and activity name including what specifically was changed and why the change was needed. Include at a minimum new and deleted activities, logic changes, duration changes, calendar changes, lag changes, resource changes, and actual start and finish date changes.
- f. Identify and discuss out-of-sequence work.

3.5.3 Schedule Reports

The format, filtering, organizing and sorting for each schedule report will be as directed by the Contracting Officer. Typically, reports contain Activity Numbers, Activity Description, Original Duration, Remaining Duration, Early Start Date, Early Finish Date, Late Start Date, Late Finish Date, Total Float, Actual Start Date, Actual Finish Date, and Percent Complete. Provide the reports electronically in .pdf format. The following lists typical reports that will be requested:

3.5.3.1 Activity Report

List of all activities sorted according to activity number.

3.5.3.2 Logic Report

List of detailed predecessor and successor activities for every activity in ascending order by activity number.

3.5.3.3 Total Float Report

A list of all incomplete activities sorted in ascending order of total float. List activities which have the same amount of total float in ascending order of Early Start Dates. Do not show completed activities on this report.

3.5.3.4 Earnings Report by CLIN

A compilation of the Total Earnings on the project from the NTP to the data date, which reflects the earnings of activities based on the agreements made in the schedule update meeting defined herein. Provided a complete schedule update has been furnished, this report serves as the basis of determining progress payments. Group activities by CLIN number and sort by activity number. Provide a total CLIN percent earned value, CLIN percent complete, and project percent complete. The printed report must contain the following for each activity: The Activity Number, Activity Description, Original Budgeted Amount, Earnings to Date, Earnings this period, Total Quantity, Quantity to Date, and Percent Complete (based on cost).

3.5.3.5 Schedule Log

Provide a Scheduling/Leveling Report generated from the current project schedule being submitted.

3.5.4 Network Diagram

The Network Diagram is required for the Preliminary, Initial and Periodic Updates. Depict and display the order and interdependence of activities and the sequence in which the work is to be accomplished. The Contracting Officer will use, but is not limited to, the following conditions to review compliance with this paragraph:

3.5.4.1 Continuous Flow

Show a continuous flow from left to right with no arrows from right to left. Show the activity number, description, duration, and estimated earned value on the diagram.

3.5.4.2 Project Milestone Dates

Show dates on the diagram for start of project, any contract required interim completion dates, and contract completion dates.

3.5.4.3 Critical Path

Show all activities on the critical path. The critical path is defined as the longest path.

3.5.4.4 Banding

Organize activities using the WBS or as otherwise directed to assist in the understanding of the activity sequence. Typically, this flow will group activities by major elements of work, category of work, work area and/or responsibility.

3.5.4.5 Cash Flow / Schedule Variance Control (SVC) Diagram

With each schedule submission, provide a SVC diagram showing 1) Cash Flow S-Curves indicating planned project cost based on projected early and late activity finish dates, and 2) Earned Value to-date.

3.6 PERIODIC SCHEDULE UPDATE

3.6.1 Periodic Schedule Update Meetings

Conduct periodic schedule update meetings for the purpose of reviewing the proposed Periodic Schedule Update, Narrative Report, Schedule Reports, and progress payment. Conduct meetings at least monthly within five days of the proposed schedule data date. Provide a computer with the scheduling software loaded and a projector which allows all meeting participants to view the proposed schedule during the meeting. The Contractor's authorized scheduler must organize, group, sort, filter, perform schedule revisions as needed and review functions as requested by the Contractor and/or Government. The meeting is a working interactive exchange which allows the Government and Contractor the opportunity to review the updated schedule on a real time and interactive basis. The meeting will last no longer than 8 hours. Provide a draft of the proposed narrative report and schedule data file to the Government a minimum of two workdays in advance of the meeting. The Contractor's Project Manager and scheduler must attend the meeting with the authorized representative of the Contracting Officer. Superintendents, foremen and major subcontractors must attend the meeting as required to discuss the project schedule and work. Following the periodic schedule update meeting, make corrections to the draft submission. Include only those changes approved by the Government in the submission and invoice for payment.

3.6.2 Update Submission Following Progress Meeting

Submit the complete Periodic Schedule Update of the Project Schedule containing all approved progress, revisions, and adjustments, pursuant to paragraph SUBMISSION REQUIREMENTS not later than 4 work days after the periodic schedule update meeting.

3.7 WEEKLY PROGRESS MEETINGS

Conduct a weekly meeting with the Government (or as otherwise mutually agreed to) between the meetings described in paragraph entitled PERIODIC SCHEDULE UPDATE MEETINGS for the purpose of jointly reviewing the actual progress of the project as compared to the as planned progress and to review planned activities for the upcoming two weeks. Use the current approved schedule update for the purposes of this meeting and for the production and review of reports. At the weekly progress meeting, address the status of RFIs, RFPs and Submittals.

3.8 REQUESTS FOR TIME EXTENSIONS

Provide a justification of delay to the Contracting Officer in accordance with the contract provisions and clauses for approval within 10 days of a delay occurring. Also prepare a time impact analysis for each Government request for proposal (RFP) to justify time extensions.

3.8.1 Justification of Delay

Provide a description of the event(s) that caused the delay and/or impact

to the work. As part of the description, identify all schedule activities impacted. Show that the event that caused the delay/impact was the responsibility of the Government. Provide a time impact analysis that demonstrates the effects of the delay or impact on the project completion date or interim completion date(s). Evaluate multiple impacts chronologically; each with its own justification of delay. With multiple impacts consider any concurrency of delay. A time extension and the schedule fragnet becomes part of the project schedule and all future schedule updates upon approval by the Contracting Officer.

3.8.2 Time Impact Analysis (Prospective Analysis)

Prepare a time impact analysis for approval by the Contracting Officer based on industry standard AACE 52R-06. Utilize a copy of the last approved schedule prior to the first day of the impact or delay for the time impact analysis. If Contracting Officer determines the time frame between the last approved schedule and the first day of impact is too great, prepare an interim updated schedule to perform the time impact analysis. Unless approved by the Contracting Officer, no other changes may be incorporated into the schedule being used to justify the time impact.

3.8.3 Forensic Schedule Analysis (Retrospective Analysis)

Prepare an analysis for approval by the Contracting Officer based on industry standard AACE 29R-03.

3.8.4 Fragmentary Network (Fragnet)

Prepare a proposed fragnet for time impact analysis consisting of a sequence of new activities that are proposed to be added to the project schedule to demonstrate the influence of the delay or impact to the project's contractual dates. Clearly show how the proposed fragnet is to be tied into the project schedule including all predecessors and successors to the fragnet activities. The proposed fragnet must be approved by the Contracting Officer prior to incorporation into the project schedule.

3.8.5 Time Extension

The Contracting Officer must approve the Justification of Delay including the time impact analysis before a time extension will be granted. No time extension will be granted unless the delay consumes all available Project Float and extends the projected finish date ("End Project" milestone) beyond the Contract Completion Date. The time extension will be in calendar days.

Actual delays that are found to be caused by the Contractor's own actions, which result in a calculated schedule delay will not be a cause for an extension to the performance period, completion date, or any interim milestone date.

3.8.6 Impact to Early Completion Schedule

No extended overhead will be paid for delay prior to the original Contract Completion Date for an Early Completion IPS unless the Contractor actually performed work in accordance with that Early Completion Schedule. The Contractor must show that an early completion was achievable had it not been for the impact.

3.9 FAILURE TO ACHIEVE PROGRESS

Should the progress fall behind the approved project schedule for reasons other than those that are excusable within the terms of the contract, the Contracting Officer may require provision of a written recovery plan for approval. The plan must detail how progress will be made-up to include which activities will be accelerated by adding additional crews, longer work hours, extra work days, etc.

3.9.1 Artificially Improving Progress

Artificially improving progress by means such as, but not limited to, revising the schedule logic, modifying or adding constraints, shortening activity durations, or changing calendars in the project schedule is prohibited. Indicate assumptions made and the basis for any logic, constraint, duration and calendar changes used in the creation of the recovery plan. Any additional resources, manpower, or daily and weekly work hour changes proposed in the recovery plan must be evident at the work site and documented in the daily report along with the Schedule Narrative Report.

3.9.2 Failure to Perform

Failure to perform work and maintain progress in accordance with the supplemental recovery plan may result in an interim and final unsatisfactory performance rating and may result in corrective action directed by the Contracting Officer pursuant to FAR 52.236-15 Schedules for Construction Contracts, FAR 52.249-10 Default (Fixed-Price Construction), and other contract provisions.

3.9.3 Recovery Schedule

Should the Contracting Officer find it necessary, submit a recovery schedule pursuant to FAR 52.236-15 Schedules for Construction Contracts.

3.10 OWNERSHIP OF FLOAT

Except for the provision given in the paragraph IMPACT TO EARLY COMPLETION SCHEDULE, float available in the schedule, at any time, may not be considered for the exclusive use of either the Government or the Contractor including activity and/or project float. Activity float is the number of work days that an activity can be delayed without causing a delay to the "End Project" finish milestone. Project float (if applicable) is the number of work days between the projected early finish and the contract completion date milestone.

3.11 TRANSFER OF SCHEDULE DATA INTO RMS/QCS

Import the schedule data into the Quality Control System (QCS) and export the QCS data to the Government. This data is considered to be additional supporting data in a form and detail required by the Contracting Officer pursuant to FAR 52.232-5 Payments under Fixed-Price Construction Contracts. The receipt of a proper payment request pursuant to FAR 52.232-27 Prompt Payment for Construction Contracts is contingent upon the Government receiving both acceptable and approvable hard copies and matching electronic export from QCS of the application for progress payment.

3.12 PRIMAVERA P6 MANDATORY REQUIREMENTS

If Primavera P6 is being used, request a backup file template (.xer) from the Government, if one is available, prior to building the schedule. The following settings are mandatory and required in all schedule submissions to the Government:

- a. Activity Codes must be Project Level, not Global or EPS level.
- b. Calendars must be Project Level, not Global or Resource level.
- c. Activity Duration Types must be set to "Fixed Duration & Units".
- d. Percent Complete Types must be set to "Physical".
- e. Time Period Admin Preferences must remain the default "8.0 hr/day, 40 hr/week, 172 hr/month, 2000 hr/year". Set Calendar Work Hours/Day to 8.0 Hour days.
- f. Set Schedule Option for defining Critical Activities to "Longest Path".
- g. Set Schedule Option for defining progressed activities to "Retained Logic".
- h. Set up cost loading using a single lump sum labor resource. The Price/Unit must be \$1/hr, Default Units/Time must be "8h/d", and settings "Auto Compute Actuals" and "Calculate costs from units" selected.
- i. Activity ID's must not exceed 10 characters.
- j. Activity Names must have the most defining and detailed description within the first 30 characters.

-- End of Section --

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

1.1.1 Submittal Information

The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Each submittal is to be complete and in sufficient detail to allow ready determination of compliance with contract requirements.

Units of weights and measures used on all submittals are to be the same as those used in the contract drawings.

1.1.2 Submission of Submittals

Schedule and provide submittals requiring Government approval before acquiring the material or equipment covered thereby. Pick up and dispose of samples not incorporated into the work in accordance with manufacturer's Safety Data Sheets (SDS) and in compliance with existing laws and regulations.

1.2 DEFINITIONS

1.2.1 Submittal Descriptions (SD)

Submittal requirements are specified in the technical sections. Examples and descriptions of submittals identified by the Submittal Description (SD) numbers and titles follow:

SD-01 Preconstruction Submittals

Preconstruction Submittals include schedules and a tabular list of locations, features, and other pertinent information regarding products, materials, equipment, or components to be used in the work.

Certificates of Insurance

Surety Bonds

List of Proposed Subcontractors

List of Proposed Products

Baseline Network Analysis Schedule (NAS)

Submittal Register

Schedule of Prices or Earned Value Report

Accident Prevention Plan Health and Safety Plan

Work Plan

Quality Control (QC) plan

Environmental Protection Plan

SD-02 Shop Drawings

Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.

Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project.

Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

SD-03 Product Data

Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials, systems or equipment for some portion of the work.

Samples of warranty language when the contract requires extended product warranties.

SD-04 Samples

Fabricated or unfabricated physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.

Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.

Field samples and mock-ups constructed on the project site establish standards ensuring work can be judged. Includes assemblies or portions of assemblies that are to be incorporated into the project and those that will be removed at conclusion of the work.

SD-05 Design Data

Design calculations, mix designs, analyses or other data pertaining to a part of work.

SD-06 Test Reports

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. Unless specified in another section, testing must have been within three years of date of contract award for the project.

Report that includes findings of a test required to be performed on an actual portion of the work or prototype prepared for the project

before shipment to job site.

Report that includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

Investigation reports

Daily logs and checklists

Final acceptance test and operational test procedure

SD-07 Certificates

Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that the product, system, or material meets specification requirements. Must be dated after award of project contract and clearly name the project.

Document required of Contractor, or of a manufacturer, supplier, installer or Subcontractor through Contractor. The document purpose is to further promote the orderly progression of a portion of the work by documenting procedures, acceptability of methods, or personnel qualifications.

Confined space entry permits

Text of posted operating instructions

SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and (SDS) concerning impedances, hazards and safety precautions.

SD-09 Manufacturer's Field Reports

Documentation of the testing and verification actions taken by manufacturer's representative at the job site, in the vicinity of the job site, or on a sample taken from the job site, on a portion of the work, during or after installation, to confirm compliance with manufacturer's standards or instructions. The documentation must be signed by an authorized official of a testing laboratory or agency and state the test results; and indicate whether the material, product, or system has passed or failed the test.

Factory test reports.

SD-10 Operation and Maintenance Data

Data provided by the manufacturer, or the system provider, including manufacturer's help and product line documentation, necessary to maintain and install equipment, for operating and maintenance use by facility personnel.

Data required by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item.

Data incorporated in an operations and maintenance manual or control system.

SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

Submittals required for Guiding Principle Validation (GPV) or Third Party Certification (TPC).

Special requirements necessary to properly close out a construction contract. For example, Record Drawings and as-built drawings. Also, submittal requirements necessary to properly close out a major phase of construction on a multi-phase contract.

1.2.2 Approving Authority

Office or designated person authorized to approve the submittal.

1.2.3 Work

As used in this section, on-site and off-site construction required by contract documents, including labor necessary to produce submittals, construction, materials, products, equipment, and systems incorporated or to be incorporated in such construction. In exception, excludes work to produce SD-01 submittals.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Submittal Register; G

1.4 SUBMITTAL CLASSIFICATION

1.4.1 For Information Only

Submittals not requiring Government approval will be for information only. Within the terms of the Contract Clause SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION, they are not considered to be "shop drawings."

1.5 PREPARATION

1.5.1 Submittal Format

1.5.1.1 Format of SD-01 Preconstruction Submittals

When the submittal includes a document that is to be used in the project, or is to become part of the project record, other than as a submittal, do not apply the Contractor's approval stamp to the document itself, but to a separate sheet accompanying the document.

Provide data in the unit of measure used in the contract documents.

1.5.1.2 Format for SD-02 Shop Drawings

Provide shop drawings not less than 8 1/2 by 11 inches nor more than 30 by 42 inches, except for full-size patterns or templates. Prepare drawings to accurate size, with scale indicated, unless another form is required. Ensure drawings are suitable for reproduction and of a quality to produce clear, distinct lines and letters, with dark lines on a white background.

- a. Include the nameplate data, size, and capacity on drawings. Also include applicable federal, military, industry, and technical society publication references.
- b. Dimension drawings, except diagrams and schematic drawings. Prepare drawings demonstrating interface with other trades to scale. Use the same unit of measure for shop drawings as indicated on the contract drawings. Identify materials and products for work shown.

Submit an electronic copy of drawings in PDF format.

1.5.1.2.1 Drawing Identification

Include on each drawing the drawing title, number, date, and revision numbers and dates, in addition to information required in paragraph IDENTIFYING SUBMITTALS.

Number drawings in a logical sequence. Each drawing is to bear the number of the submittal in a uniform location next to the title block. Place the Government contract number in the margin, immediately below the title block, for each drawing.

1.5.1.3 Format of SD-03 Product Data

Present product data submittals for each section as a complete, bound volume. Include a table of contents, listing the page and catalog item numbers for product data.

Indicate, by prominent notation, each product that is being submitted; indicate the specification section number and paragraph number to which it pertains.

1.5.1.3.1 Product Information

Supplement product data with material prepared for the project to satisfy the submittal requirements where product data does not exist. Identify this material as developed specifically for the project, with information and format as required for submission of SD-07 Certificates.

Provide product data in units used in the Contract documents. Where product data are included in preprinted catalogs with another unit, submit the dimensions in contract document units, on a separate sheet.

1.5.1.3.2 Standards

Where equipment or materials are specified to conform to industry or technical-society reference standards of such organizations as the American National Standards Institute (ANSI), ASTM International (ASTM),

National Electrical Manufacturer's Association (NEMA), Underwriters Laboratories (UL), or Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Contracting Officer. State on the certificate that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

1.5.1.3.3 Data Submission

Collect required data submittals for each specific material, product, unit of work, or system into a single submittal that is marked for choices, options, and portions applicable to the submittal. Mark each copy of the product data identically. Partial submittals will not be accepted for expedition of the construction effort.

Submit the manufacturer's instructions before installation.

1.5.1.4 Format of SD-04 Samples

1.5.1.4.1 Sample Characteristics

Furnish samples in the following sizes, unless otherwise specified or unless the manufacturer has prepackaged samples of approximately the same size as specified:

- a. Sample of Equipment or Device: Full size.
- b. Sample of Materials Less Than 2 by 3 inches: Built up to 8 1/2 by 11 inches.
- c. Sample of Materials Exceeding 8 1/2 by 11 inches: Cut down to 8 1/2 by 11 inches and adequate to indicate color, texture, and material variations.
- d. Sample of Linear Devices or Materials: 10 inch length or length to be supplied, if less than 10 inches. Examples of linear devices or materials are conduit and handrails.
- e. Sample Volume of Nonsolid Materials: Pint. Examples of nonsolid materials are sand and paint.
- f. Color Selection Samples: 2 by 4 inches. Where samples are specified for selection of color, finish, pattern, or texture, submit the full set of available choices for the material or product specified. Sizes and quantities of samples are to represent their respective standard unit.
- g. Sample Panel: 4 by 4 feet.
- h. Sample Installation: 100 square feet.

1.5.1.4.2 Sample Incorporation

Reusable Samples: Incorporate returned samples into work only if so specified or indicated. Incorporated samples are to be in undamaged

condition at the time of use.

Recording of Sample Installation: Note and preserve the notation of any area constituting a sample installation, but remove the notation at the final clean-up of the project.

1.5.1.4.3 Comparison Sample

Samples Showing Range of Variation: Where variations in color, finish, pattern, or texture are unavoidable due to nature of the materials, submit sets of samples of not less than three units showing extremes and middle of range. Mark each unit to describe its relation to the range of the variation.

When color, texture, or pattern is specified by naming a particular manufacturer and style, include one sample of that manufacturer and style, for comparison.

1.5.1.5 Format of SD-05 Design Data

Provide design data and certificates on 8 1/2 by 11 inch PDFs. Provide a bound volume for submittals containing numerous pages.

1.5.1.6 Format of SD-06 Test Reports

Provide reports on 8 1/2 by 11 inch PDFs in a complete bound volume.

By prominent notation, indicate each report in the submittal. Indicate the specification number and paragraph number to which each report pertains.

1.5.1.7 Format of SD-07 Certificates

Provide design data and certificates on 8 1/2 by 11 inch PDFs. Provide a bound volume for submittals containing numerous pages.

1.5.1.8 Format of SD-08 Manufacturer's Instructions

Present manufacturer's instructions submittals for each section as a complete, bound volume. Include the manufacturer's name, trade name, place of manufacture, and catalog model or number on product data. Also include applicable federal, military, industry, and technical-society publication references. If supplemental information is needed to clarify the manufacturer's data, submit it as specified for SD-07 Certificates.

Submit the manufacturer's instructions before installation.

1.5.1.8.1 Standards

Where equipment or materials are specified to conform to industry or technical-society reference standards of such organizations as the American National Standards Institute (ANSI), ASTM International (ASTM), National Electrical Manufacturer's Association (NEMA), Underwriters Laboratories (UL), or Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Contracting Officer. State on the certificate that the item has been

tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

1.5.1.9 Format of SD-09 Manufacturer's Field Reports

Provide reports on 8 1/2 by 11 inch PDFs in a complete bound volume.

By prominent notation, indicate each report in the submittal. Indicate the specification number and paragraph number to which each report pertains.

1.5.1.10 Format of SD-10 Operation and Maintenance Data (O&M)

Comply with the requirements specified in Section 01 78 23 OPERATION AND MAINTENANCE DATA for O&M Data format.

1.5.1.11 Format of SD-11 Closeout Submittals

When the submittal includes a document that is to be used in the project or is to become part of the project record, other than as a submittal, do not apply the Contractor's approval stamp to the document itself, but to a separate sheet accompanying the document.

Provide data in the unit of measure used in the contract documents.

1.5.2 Source Drawings for Shop Drawings

1.5.2.1 Source Drawings

The entire set of source drawing files (DWG) will not be provided to the Contractor. Request the specific Drawing Number for the preparation of shop drawings. Only those drawings requested to prepare shop drawings will be provided. These drawings are provided only after award.

1.5.2.2 Terms and Conditions

Data contained on these electronic files must not be used for any purpose other than as a convenience in the preparation of construction data for the referenced project. Any other use or reuse is at the sole risk of the Contractor and without liability or legal exposure to the Government. The Contractor must make no claim, and waives to the fullest extent permitted by law any claim or cause of action of any nature against the Government, its agents, or its subconsultants that may arise out of or in connection with the use of these electronic files. The Contractor must, to the fullest extent permitted by law, indemnify and hold the Government harmless against all damages, liabilities, or costs, including reasonable attorney's fees and defense costs, arising out of or resulting from the use of these electronic files.

These electronic source drawing files are not construction documents. Differences may exist between the source drawing files and the corresponding construction documents. The Government makes no representation regarding the accuracy or completeness of the electronic source drawing files, nor does it make representation to the compatibility of these files with the Contractor hardware or software. The Contractor is responsible for determining if any conflict exists. In the event that a conflict arises between the signed and sealed construction documents prepared by the Government and the furnished source drawing files, the

signed and sealed construction documents govern. Use of these source drawing files does not relieve the Contractor of the duty to fully comply with the contract documents, including and without limitation the need to check, confirm and coordinate the work of all contractors for the project. If the Contractor uses, duplicates or modifies these electronic source drawing files for use in producing construction data related to this contract, remove all previous indication of ownership (seals, logos, signatures, initials and dates).

1.5.3 Electronic File Format

Provide submittals in electronic format, with the exception of material samples required for SD-04 Samples items. Compile the submittal file as a single, complete document, to include the Transmittal Form described within. Name the electronic submittal file specifically according to its contents, and coordinate the file naming convention with the Contracting Officer. Electronic files must be of sufficient quality that all information is legible. Use PDF as the electronic format, unless otherwise specified or directed by the Contracting Officer. Generate PDF files from original documents with bookmarks so that the text included in the PDF file is searchable and can be copied. If documents are scanned, optical character resolution (OCR) routines are required. Index and bookmark files exceeding 30 pages to allow efficient navigation of the file. When required, the electronic file must include a valid electronic signature or a scan of a signature.

1.6 QUANTITY OF SUBMITTALS

1.6.1 Number of SD-01 Preconstruction Submittal Copies

Unless otherwise specified, submit three sets of administrative submittals.

1.6.2 Number of SD-04 Samples

- a. Submit two samples, or two sets of samples showing the range of variation, of each required item. One approved sample or set of samples will be retained by the approving authority and one will be returned to the Contractor.
- b. Submit one sample panel or provide one sample installation where directed. Include components listed in the technical section or as directed.
- c. Submit one sample installation, where directed.
- d. Submit one sample of nonsolid materials.

1.6.3 Number of SD-10 Operation and Maintenance Data Copies

Submit five copies of O&M data to the Contracting Officer for review and approval.

1.6.4 Number of SD-11 Closeout Submittals Copies

Unless otherwise specified, submit three sets of administrative submittals.

1.7 INFORMATION ONLY SUBMITTALS

Submittals without a "G" designation must be certified by the QC manager

and submitted to the Contracting Officer for information-only. Approval of the Contracting Officer is not required on information only submittals. The Contracting Officer will mark "receipt acknowledged" on submittals for information and will return only the transmittal cover sheet to the Contractor. Normally, submittals for information only will not be returned. However, the Government reserves the right to return unsatisfactory submittals and require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe.

1.8 PROJECT SUBMITTAL REGISTER AND DATABASE

A sample Project Submittal Register showing items of equipment and materials for when submittals are required by the specifications is provided as "Appendix A - Submittal Register."

1.8.1 Submittal Management

Prepare and maintain a submittal register, as the work progresses. Do not change data that is output in columns (c), (d), (e), and (f) as delivered by Government; retain data that is output in columns (a), (g), (h), and (i) as approved. As an attachment, provide a submittal register showing items of equipment and materials for which submittals are required by the specifications. This list may not be all-inclusive and additional submittals may be required.

Column (c): Lists specification section in which submittal is required.

Column (d): Lists each submittal description (SD Number. and type, e.g., SD-02 Shop Drawings) required in each specification section.

Column (e): Lists one principal paragraph in each specification section where a material or product is specified. This listing is only to facilitate locating submitted requirements. Do not consider entries in column (e) as limiting the project requirements.

Thereafter, the Contractor is to track all submittals by maintaining a complete list, including completion of all data columns and all dates on which submittals are received by and returned by the Government.

1.8.2 Preconstruction Use of Submittal Register

Submit the submittal register as an electronic database, using the submittal management program furnished to Contractor. Include the QC plan and the project schedule. Verify that all submittals required for the project are listed and add missing submittals. Coordinate and complete the following fields on the register database submitted with the QC plan and the project schedule:

Column (a) Activity Number: Activity number from the project

schedule.

Column (g) Contractor Submit Date: Scheduled date for the approving authority to receive submittals.

Column (h) Contractor Approval Date: Date that Contractor needs approval of submittal.

Column (i) Contractor Material: Date that Contractor needs material delivered to Contractor control.

1.8.3 Contractor Use of Submittal Register

Update the following fields in the Government-furnished submittal register program or equivalent fields in the program used by the Contractor with each submittal throughout the contract.

Column (b) Transmittal Number: List of consecutive, Contractor-assigned numbers.

Column (j) Action Code (k): Date of action used to record Contractor's review when forwarding submittals to QC.

Column (l) Date submittal transmitted.

Column (q) Date approval was received.

1.8.4 Approving Authority Use of Submittal Register

Update the following fields:

Column (b) Transmittal Number: List of consecutive, Contractor-assigned numbers.

Column (l) Date submittal was received.

Column (m) through (p) Dates of review actions.

Column (q) Date of return to Contractor.

1.8.5 Action Codes

Entries for columns (j) and (o) are to be used as follows (others may be prescribed by the Transmittal Form):

1.8.5.1 Government Review Action Codes

"A" - "Approved as submitted"; "Completed"

"B" - "Approved, except as noted on drawings"; "Completed"

"C" - "Approved, except as noted on drawings; resubmission required"; "Resubmit"

"D" - "Returned by separate correspondence"; "Completed"

"E" - "Disapproved (See attached)"; "Resubmit"

"F" - "Receipt acknowledged"; "Completed"

"G" - "Other (Specify)"; "Resubmit"

"X" - "Receipt acknowledged, does not comply with contract requirements"; "Resubmit"

1.8.6 Delivery of Copies

Submit an updated electronic copy of the submittal register to the Contracting Officer with each invoice request, unless a paper copy is requested by the Contracting Officer. Provide an updated Submittal Register monthly regardless of whether an invoice is submitted.

1.9 VARIATIONS

Variations from contract requirements require Contracting Officer approval pursuant to contract Clause FAR 52.236-21 Specifications and Drawings for Construction, and will be considered where advantageous to the Government.

1.9.1 Considering Variations

Discussion of variations with the Contracting Officer before submission of a variation submittal will help ensure that functional and quality requirements are met and minimize rejections and resubmittals. For variations that include design changes or some material or product substitutions, the Government may require an evaluation and analysis by a licensed professional engineer hired by the contractor.

Specifically point out variations from contract requirements in a transmittal letter. Failure to point out variations may cause the Government to require rejection and removal of such work at no additional cost to the Government.

1.9.2 Proposing Variations

Specifically point out variations from contract requirements in a transmittal letter. Failure to point out variations may cause the Government to require rejection and removal of such work at no additional cost to the Government.

1.9.3 Warranting that Variations are Compatible

When delivering a variation for approval, the Contractor warrants that this contract has been reviewed to establish that the variation, if incorporated, will be compatible with other elements of work.

1.9.4 Review Schedule Extension

In addition to the normal submittal review period, a period of 14 calendar working days will be allowed for the Government to consider submittals with variations.

1.10 SCHEDULING

Schedule and submit concurrently product data and shop drawings covering component items forming a system or items that are interrelated. Submit pertinent certifications at the same time. No delay damages or time extensions will be allowed for time lost in late submittals.

- a. Coordinate scheduling, sequencing, preparing, and processing of submittals with performance of work so that work will not be delayed by submittal processing. The Contractor is responsible for additional time required for Government reviews resulting from required resubmittals. The review period for each resubmittal is the same as for the initial submittal.
- b. Submittals required by the contract documents are listed on the submittal register. If a submittal is listed in the submittal register but does not pertain to the contract work, the Contractor is to include the submittal in the register and annotate it "N/A" with a brief explanation. Approval by the Contracting Officer does not relieve the Contractor of supplying submittals required by the contract documents but that have been omitted from the register or marked "N/A."
- c. Resubmit the submittal register and annotate it monthly with actual submission and approval dates. When all items on the register have been fully approved, no further resubmittal is required.

Contracting Officer review will be completed within 14 calendar working days after the date of submission.

1.11 GOVERNMENT APPROVING AUTHORITY

When the approving authority is the Contracting Officer, the Government will:

- a. Note the date on which the submittal was received from the QC manager.
- b. Review submittals for approval within the scheduling period specified and only for conformance with project design concepts and compliance with contract documents.
- c. Identify returned submittals with one of the actions defined in paragraph REVIEW NOTATIONS and with comments and markings appropriate for the action indicated.

Upon completion of review of submittals requiring Government approval, stamp and date submittals. If the Government performs a conformance review of other Designer of Record approved submittals, the submittals will be identified and returned, as described above.

1.11.1 Review Notations

Submittals will be returned to the Contractor with the following notations:

- a. Submittals marked "approved" or "accepted" authorize proceeding with the work covered.
- b. Submittals marked "approved as noted" or "approved, except as noted, resubmittal not required," authorize proceeding with the work covered provided that the Contractor takes no exception to the corrections.
- c. Submittals marked "not approved," "disapproved," or "revise and resubmit" indicate incomplete submittal or noncompliance with the contract requirements or design concept. Resubmit with appropriate changes. Do not proceed with work for this item until the resubmittal is approved.

- d. Submittals marked "not reviewed" indicate that the submittal has been previously reviewed and approved, is not required, does not have evidence of being reviewed and approved by Contractor, or is not complete. A submittal marked "not reviewed" will be returned with an explanation of the reason it is not reviewed. Resubmit submittals returned for lack of review by Contractor or for being incomplete, with appropriate action, coordination, or change.
- e. Submittals marked "receipt acknowledged" indicate that submittals have been received by the Government. This applies only to "information-only submittals" as previously defined.

1.12 DISAPPROVED SUBMITTALS

Make corrections required by the Contracting Officer. If the Contractor considers any correction or notation on the returned submittals to constitute a change to the contract drawings or specifications, give notice to the Contracting Officer as required under the FAR clause titled CHANGES. The Contractor is responsible for the dimensions and design of connection details and the construction of work. Failure to point out variations may cause the Government to require rejection and removal of such work at the Contractor's expense.

If changes are necessary to submittals, make such revisions and resubmit in accordance with the procedures above. No item of work requiring a submittal change is to be accomplished until the changed submittals are approved.

1.13 APPROVED SUBMITTALS

The Contracting Officer's approval of submittals is not to be construed as a complete check, and indicates only that the general method of construction, materials, detailing, and other information are satisfactory.

Approval or acceptance by the Government for a submittal does not relieve the Contractor of the responsibility for meeting the contract requirements or for any error that may exist, because under the Quality Control (QC) requirements of this contract, the Contractor is responsible for ensuring information contained within each submittal accurately conforms with the requirements of the contract documents.

After submittals have been approved or accepted by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

1.14 APPROVED SAMPLES

Approval of a sample is only for the characteristics or use named in such approval and is not to be construed to change or modify any contract requirements. Before submitting samples, provide assurance that the materials or equipment will be available in quantities required in the project. No change or substitution will be permitted after a sample has been approved.

Match the approved samples for materials and equipment incorporated in the work. If requested, approved samples, including those that may be damaged in testing, will be returned to the Contractor, at its expense, upon

completion of the contract. Unapproved samples will also be returned to the Contractor at its expense, if so requested.

Failure of any materials to pass the specified tests will be sufficient cause for refusal to consider, under this contract, any further samples of the same brand or make as that material. The Government reserves the right to disapprove any material or equipment that has previously proved unsatisfactory in service.

Samples of various materials or equipment delivered on the site or in place may be taken by the Contracting Officer for testing. Samples failing to meet contract requirements will automatically void previous approvals. Replace such materials or equipment to meet contract requirements.

1.15 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained. No payment will be made for any materials incorporated into the work for any conformance review submittals or information-only submittals found to contain errors or deviations from the Solicitation or Accepted Proposal.

1.16 CERTIFICATION OF SUBMITTAL DATA

Certify the submittal data as follows on Form ENG 4025: "I certify that the above submitted items had been reviewed in detail and are correct and in strict conformance with the contract drawings and specifications except as otherwise stated.

_____NAME OF CONTRACTOR _____ SIGNATURE OF CONTRACTOR

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

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SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION

Military Working Dog Kennel Hunter Army Airfield

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		DATE FWD TO APPR AUTH/	APPROVING AUTHORITY				MAILED TO CONTR/	REMARKS
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION	DATE RCD FRM APPR AUTH	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		01 11 00	SD-01 Preconstruction Submittals Salvage Plan	1.6	G												
		01 14 00	SD-01 Preconstruction Submittals List of Contact Personnel	1.3.1.1													
		01 30 00	SD-01 Preconstruction Submittals View Location Map	1.3													
			Progress and Completion	1.4													
			Pictures														
		01 32 01.00 10	SD-01 Preconstruction Submittals Project Scheduler Qualifications	1.3	G												
			Preliminary Project Schedule	3.4.1	G												
			Initial Project Schedule	3.4.2	G												
			Periodic Schedule Update	3.6.2	G												
		01 33 00	SD-01 Preconstruction Submittals Submittal Register	1.8	G												
		01 33 29	SD-01 Preconstruction Submittals Preliminary High Performance and Sustainable Building Checklist	1.5.4.2	G S												
			Sustainability Action Plan	1.4.1	G S												
			Preliminary Sustainability eNotebook	1.5.4.2	G												
			SD-11 Closeout Submittals Sustainability Progress Reports	1.5.3	G S												
			Final High Performance and Sustainable Building Checklist	1.5.4.2	G S												
			Final Sustainability eNotebook	1.5.4.2	G												

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						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION	DATE RCD FRM APPR AUTH	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		01 33 29	Amended Final Sustainability eNotebook	1.5.4.2	G												
			Amended Final High Performance and Sustainable Building Checklist	1.5.4.2	G S												
			Third Party Certification Certificate, Assessment, or Validation and Compliance Report	3.2	G S												
		01 35 26	SD-01 Preconstruction Submittals														
			Accident Prevention Plan (APP)	1.8.1	G												
			Radiography Operation Planning Work Sheet	1.14.1													
			Portable Gauge Operations Planning Worksheet	1.14.1													
			Final IAQ Management Plan	1.16	S												
			Indoor Air Quality (IAQ) Management Plan	1.16	G												
			SD-06 Test Reports														
			Accident Reports	1.12.2	G												
			LHE Inspection Reports	1.12.3													
			Monthly Exposure Reports	1.5	G												
			SD-07 Certificates														
			Activity Hazard Analysis (AHA)	1.9	G												
			Hot Work Permit	1.13													
			License Certificates	1.14													
			Standard Lift Plan	1.12.4.1	G												

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CONTRACT NO.

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Military Working Dog Kennel Hunter Army Airfield

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		DATE FWD TO APPR AUTH/	APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		01 35 26	Critical Lift Plan	1.12.4.1	G												
		01 45 00.00 10	SD-01 Preconstruction Submittals														
			Contractor Quality Control (CQC) Plan	3.2	G												
			SD-06 Test Reports														
			Verification Statement	3.9.2													
		01 45 35	SD-01 Preconstruction Submittals														
			Written NDT Practices	3.1.2													
			SD-06 Test Reports														
			Daily Reports	3.1.2													
			Biweekly Reports	3.1.1													
			SD-07 Certificates														
			AISC Certified Steel Fabricator	2.1													
			AC472 Accreditation	2.1													
			Certificate of Compliance	2.1													
			Special Inspector	1.5	G RO												
			Qualification Records	3.1.2													
			SD-11 Closeout Submittals														
			Comprehensive Final Report	3.1.2	G RO												
		01 50 00	SD-01 Preconstruction Submittals														
			Construction Site Plan	1.3	G												
			Traffic Control Plan	3.3.1	G												
			Haul Road Plan	2.2.1	G												
			Contractor Computer	1.6.1.4	G												
			Cybersecurity Compliance Statements														

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(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		01 50 00	Contractor Temporary Network Cybersecurity Compliance Statements	1.6.6	G												
			SD-03 Product Data Backflow Preventers	1.4	G												
			SD-06 Test Reports Backflow Preventer Tests	3.4													
			SD-07 Certificates Backflow Tester	1.4.1													
			Backflow Preventers	1.4													
		01 57 19	SD-01 Preconstruction Submittals Preconstruction Survey	1.5.1													
			Solid Waste Management Permit	1.9	G												
			Regulatory Notifications	1.5.2	G												
			Environmental Protection Plan	1.6	G												
			Stormwater Pollution Prevention Plan	3.2.1.1	G												
			Stormwater Notice of Intent	3.2.1.2	G												
			Dirt and Dust Control Plan	1.6.9.1	G												
			Employee Training Records	1.5.5	G												
			Environmental Manager Qualifications	1.5.4	G												
			SD-06 Test Reports Inspection Reports	3.2.1.3													
			Monthly Solid Waste Disposal Report	1.9.1	G												

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		01 57 19	SD-07 Certificates														
			Employee Training Records	1.5.5	G												
			Erosion and Sediment Control	1.5.5													
			Inspector														
			SD-11 Closeout Submittals														
			Stormwater Pollution Prevention	3.2.1.4	G												
			Plan Compliance Notebook														
			Stormwater Notice of Termination	3.2.1.5	G												
			Waste Determination	3.6.1	G												
			Documentation														
			Disposal Documentation for	3.6.3.5	G												
			Hazardous and Regulated Waste														
			Assembled Employee Training	1.5.5	G												
			Records														
			Solid Waste Management Permit	1.9	G												
			Project Solid Waste Disposal	3.6.2.1	G												
			Documentation Report														
			Hazardous Waste/Debris	3.6.3.1	G												
			Management														
			Regulatory Notifications	1.5.2	G												
			Sales Documentation	3.6.2.1	G												
			Contractor Certification	3.6.2.1													
		01 58 00	SD-02 Shop Drawings														
			Sign Legend Orders	1.3.1	G												
		01 74 19	SD-01 Preconstruction Submittals														

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		01 74 19	Construction Waste Management Plan	1.6	G												
			SD-06 Test Reports														
			Quarterly Reports	1.8.2													
			Annual Report	1.8.3													
			SD-11 Closeout Submittals														
			Final Construction Waste	1.9													
			Diversion Report														
		01 78 00	SD-03 Product Data														
			Warranty Management Plan	1.8.1													
			Warranty Tags	1.8.5													
			Final Cleaning	3.7													
			Spare Parts Data	1.6													
			SD-08 Manufacturer's Instructions														
			Instructions	1.8.1													
			SD-10 Operation and Maintenance Data														
			Operation and Maintenance Manuals	3.6	G												
			SD-11 Closeout Submittals														
			As-Built Drawings	3.1	G												
			Record Drawings	3.3	G												
			Record Model	2.2	G												
			As-Built Record of Equipment and Materials	1.8.1													

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		01 78 00	As-Built Record of Equipment and Materials	3.5													
			Construction Contract Specifications	3.4	G												
			Certification of EPA Designated Items	2.3	G												
			Certification Of USDA Designated Items	2.4	G												
		01 78 23	SD-10 Operation and Maintenance Data														
			O&M Database	1.3	G												
			Training Plan	3.1.1	G												
			Training Outline	3.1.3	G												
			Training Content	3.1.2	G												
			SD-11 Closeout Submittals														
			Training Video Recording	3.1.4	G												
			Validation of Training Completion	3.1.6	G												
		01 91 00.15 10	SD-01 Preconstruction Submittals														
			Commissioning Firm	1.8	G RO												
			Lead Commissioning Specialist	1.8.1	G RO												
			Technical Commissioning Specialists	1.8.2	G RO												
			Commissioning Firm's Contract	1.8	G RO												
			SD-06 Test Reports														
			Design Review Report	3.1.4	G RO												

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		01 91 00.15 10	Interim Construction Phase	3.1.3.1	G RO												
			Commissioning Plan														
			Final Construction Phase	3.1.3.2	G RO												
			Commissioning Plan														
			Template Building Envelope	3.1.3.1.2	G RO												
			Inspection Checklists														
			Building Envelope Inspection	3.1.6.2	G RO												
			Checklists														
			Pre-Functional Checklists	3.1.6.3	G RO												
			Issues Log	1.10													
			Commissioning Report	3.2	G RO												
			Post-Construction Trend Log	3.3.1	G RO												
			Report														
			SD-07 Certificates														
			Certificate of Readiness	1.11	G RO												
			SD-10 Operation and Maintenance														
			Data														
			Training Plan	3.1.7	G RO												
			Training Attendance Rosters	3.1.7	G RO												
			Systems Manual	3.1.8	G RO												
			Maintenance and Service Life	3.1.9	G RO												
			Plans														
			SD-11 Closeout Submittals														
			Final Commissioning Report	3.2	S RO												
			Final Construction Phase	3.1.3.2	S												
			Commissioning Plan														

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		02 41 00	SD-01 Preconstruction Submittals														
			Demolition Plan	1.2.2	G												
			Existing Conditions	1.10													
			SD-07 Certificates														
			Notification	1.6	G												
			SD-11 Closeout Submittals														
			Receipts	3.3.4													
		02 82 00	SD-03 Product Data														
			Amended Water	1.2.2	G												
			Safety Data Sheets (SDS) for All Materials	1.3.9	G												
			Respirators	3.1.2.1	G												
			Local Exhaust Equipment	3.1.7	G												
			Vacuums	3.1.8	G												
			SD-06 Test Reports														
			Air Sampling Results	1.5.5	G												
			Pressure Differential Recordings for Local Exhaust System	1.5.6	G												
			Clearance Sampling	3.2.10.5	G												
			Asbestos Disposal Quantity Report	3.3.3.2	G												
			SD-07 Certificates														
			Employee Training	1.3.4	G												
			Notifications	1.3.5	G												
			Respiratory Protection Program	1.3.7	G												
			Asbestos Hazard Abatement Plan	1.3.10	G												

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		02 82 00	Testing Laboratory	1.3.11	G												
			Landfill Approval	1.3.12	G												
			Delivery Tickets	1.3.12	G												
			Waste Shipment Records	1.3.12	G												
			Transporter Certification	1.3.13	G												
			Medical Certification	1.3.14	G												
			Private Qualified Person (PQP)	1.5.1	G												
			Documentation														
			Designated Competent Person	1.5.2	G												
			Worker's License	1.5.3	G												
			Contractor's License	1.5.4	G												
			Federal, State or Local Citations	1.5.7	G												
			on Previous Projects														
			Equipment Used to Contain	3.1	G												
			Airborne Asbestos Fibers														
			Water Filtration Equipment	3.1.3.2	G												
			Vacuums	3.1.8	G												
			Ventilation Systems	3.1.8	G												
			SD-11 Closeout Submittals														
			Permits and Licenses	1.3.5	G												
			Notifications	1.3.5	G												
			Respirator Program Records	1.3.7.1	G												
			Rental Equipment	1.7.1	G												
		02 83 00	SD-01 Preconstruction Submittals														
			Hazardous Waste Management	3.5.2	G												
			Plan														

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		02 83 00	Competent Person	1.5.1.1	G												
			Training Certification	1.5.1.2	G												
			Occupational and Environmental Assessment Data Report	1.5.2.3	G												
			Medical Examinations	1.5.2.4	G												
			Lead Waste Management Plan	1.5.2.8	G												
			Licenses, Permits and Notifications	1.5.4	G												
			Lead Compliance Plan	1.5.2.2	G												
			Lead Compliance Plan	3.1.1.6	G												
			Written Evidence of TSD Approval	3.5.2.1	G												
			SD-03 Product Data														
			Respirators	1.6.1	G												
			Vacuum Filters	1.6.4	G												
			Negative Air Pressure System	1.6.7	G												
			Materials and Equipment	2.1	G												
			Expendable Supplies	2.1.1	G												
			Local Exhaust Equipment	3.1.1.5	G												
			SD-06 Test Reports														
			Sampling and Analysis	1.3.3	G												
			Occupational and Environmental Assessment Data Report	1.5.2.3	G												
			SD-07 Certificates														
			Testing Laboratory	1.5.1.3	G												

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		02 83 00	Notification of the Commencement of LBP Hazard Abatement	3.1.1.1	G												
			Clearance Certification	3.5.1.1	G												
			SD-11 Closeout Submittals														
			Hazardous Waste Manifest	3.5.2.1	G												
			Turn-In Documents or Weight Tickets	3.5.2.1	G												
		03 30 00	SD-01 Preconstruction Submittals														
			Concrete Curing Plan	1.6.3.1													
			Quality Control Plan	1.6.5	G RO												
			Quality Control Personnel Certifications	1.6.6	G RO												
			Quality Control Organizational Chart	1.6.6													
			Laboratory Accreditation	1.6.8	G RO												
			SD-02 Shop Drawings														
			Formwork	1.7.1													
			Reinforcing Steel	1.6.2.1	G RO												
			SD-03 Product Data														
			Joint Sealants	2.4.5													
			Joint Filler	2.4.4													
			Formwork Materials	2.1													
			Cementitious Materials	2.3.1													
			Vapor Barrier	2.4.6													
			Concrete Curing Materials	2.4.1													

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		03 30 00	Reinforcement	2.6													
			Liquid Chemical Floor Hardeners and Sealers	2.4.3.1													
			Admixtures	2.3.4													
			Local/Regional Materials	1.8.1													
			Biodegradable Form Release Agent	2.2.2													
			Pumping Concrete	1.6.3.2													
			Finishing Plan	1.6.3.3													
			Nonshrink Grout	2.4.2													
			SD-05 Design Data														
			Concrete Mix Design	1.6.1.1	G RO												
			SD-06 Test Reports														
			Concrete Mix Design	1.6.1.1	G AE												
			Fly Ash	1.6.4.1													
			Pozzolan	1.6.4.1													
			Pozzolan	2.3.1.5													
			Slag Cement	1.6.4.2													
			Aggregates	1.6.4.3													
			Tolerance Report	3.9.2.1													
			Compressive Strength Tests	3.12.3.3	G AE												
			Chloride Ion Concentration	3.12.3.5													
			Air Content	3.12.3.4													
			Slump Tests	3.12.3.1													
			Water	2.3.2													
			SD-07 Certificates														

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		03 30 00	Reinforcing Bars	2.6.1													
			Welder Qualifications	1.9													
			VOC Content for Form Release	1.6.3.4													
			Agents, Curing Compounds, and														
			Concrete Penetrating Sealers														
			Safety Data Sheets	1.6.3.5													
			Forest Stewardship Council	1.8.2													
			(FSC) Certification														
			Field Testing Technician and	1.6.6.2													
			Testing Agency														
			SD-08 Manufacturer's Instructions														
			Liquid Chemical Floor Hardeners	2.4.3.1													
			and Sealers														
			Joint Sealants	2.4.5													
			Curing Compound	1.7													
		03 33 00	SD-02 Shop Drawings														
			Detail Drawings	1.4.1	G RO												
			SD-04 Samples														
			Materials	2.1													
		03 42 13.00 10	SD-01 Preconstruction Submittals														
			Quality Control Procedures	1.3.2.2													
			SD-02 Shop Drawings														
			Standard Precast Units	2.1.1	G												
			Custom-Made Precast Units	2.1.2	G												
			Special Finishes	3.2.4.3													
			SD-03 Product Data														

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		03 42 13.00 10	Standard Precast Units	2.1.1													
			Proprietary Precast Units	2.1.3													
			Embedded Items	3.1.3													
			Accessories	2.2.6													
			SD-05 Design Data														
			Design Calculations	2.1.2	G												
			Concrete Mix Proportions	2.1.5.1													
			SD-06 Test Reports														
			Test Reports	1.3.2.4													
			SD-07 Certificates														
			Quality Control Procedures	1.3.2.2													
			SD-11 Closeout Submittals														
			Recycled content for fly ash and pozzolan	2.2.1	S												
			Recycled content for Ground Iron Blast-Furnace Slag	2.2.1	S												
			Recycled content for Silica Fume	2.2.1	S												
			Recycled content for Synthetic Fiber Reinforcement	2.2.1	S												
			Recycled content for steel	2.2.1	S												
		04 20 00	SD-02 Shop Drawings														
			Detail Drawings	3.4.1.1													
			SD-03 Product Data														
			Hot Weather Procedures	1.5.1													
			Cold Weather Procedures	1.5.2													
			Clay or Shale Brick	2.2.2	G RO												

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		04 20 00	Thin Brick Veneer	2.2.2.4	G RO												
			Cement	2.2.3.2.1													
			Cementitious Materials	1.4.3													
			Insulation	2.6.8													
			SD-04 Samples														
			Mock-Up Panel	1.3.1.1	G RO												
			Clay or Shale Brick	2.2.2	G RO												
			Thin Brick Veneer	2.2.2.4	G RO												
			Concrete Masonry Units (CMU)	2.2.3.2													
			Admixtures for Masonry Mortar	2.4.1.2													
			Anchors, Ties, and Bar	2.6.2													
			Positioners														
			Joint Reinforcement	2.6.3													
			SD-05 Design Data														
			Masonry Compressive Strength	2.1.2													
			Fire-Rated Concrete Masonry	2.2.3.3													
			Units														
			Bracing Calculations	3.2.5													
			SD-06 Test Reports														
			Efflorescence Test	2.2.2.1.4													
			Field Testing of Mortar	3.6.1.1													
			Prism Tests	3.6.1.3													
			SD-07 Certificates														
			Special Masonry Inspector	1.3.2													
			Qualifications														
			Clay or Shale Brick	2.2.2													

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		04 20 00	Concrete Masonry Units (CMU)	2.2.3.2													
			Cementitious Materials	1.4.3													
			Admixtures for Masonry Mortar	2.4.1.2													
			Admixtures for Grout	2.4.2.2													
			Anchors, Ties, and Bar	2.6.2													
			Positioners														
			Joint Reinforcement	2.6.3													
			SD-08 Manufacturer's Instructions														
			Thin Brick Veneer Applications	2.2.2.4.2													
			Admixtures for Masonry Mortar	2.4.1.2													
			Admixtures for Grout	2.4.2.2													
			SD-10 Operation and Maintenance														
			Data														
			Take-Back Program	3.8													
			SD-11 Closeout Submittals														
			Clay Units	2.2.2.1.3	S												
			Recycled Content	2.2.3.2.2	S												
		05 12 00	SD-01 Preconstruction Submittals														
			Erection and Erection Bracing	1.4.1.1	G RO												
			Drawings														
			SD-02 Shop Drawings														
			Fabrication Drawings	1.4.2	G RO												
			SD-03 Product Data														
			Shop Primer	2.6.2													
			Welding Electrodes and Rods	2.4.1													
			Direct Tension Indicator Washers	2.3.2.3													

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		05 12 00	Non-Shrink Grout	2.4.2													
			Tension Control Bolts	2.3.3													
			Recycled Content for Structural Steel	2.2.1	S												
			SD-06 Test Reports														
			Class B Coating	2.6.2													
			Bolts, Nuts, and Washers	2.3													
			Weld Inspection Reports	3.7.1.2													
			Direct Tension Indicator Washer Inspection Reports	3.7.2.1													
			Bolt Testing Reports	3.7.3.1													
			SD-07 Certificates														
			Steel	2.2													
			Bolts, Nuts, and Washers	2.3													
			Galvanizing	2.5													
			Welding Procedures and Qualifications	1.4.4.1													
			Welding Electrodes and Rods	2.4.1													
			Certified Welding Inspector	3.7.1.1													
			NDT Technician	3.7.1.2													
			Welding Procedure Specifications (WPS)	3.4													
		05 30 00	SD-02 Shop Drawings														
			Fabrication Drawings	1.3.5	G RO												
			SD-03 Product Data														
			Accessories	2.2													

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		05 30 00	Deck Units	2.1													
			Galvanizing Repair Paint	2.1.5													
			Mechanical Fasteners	2.2.13													
			Touch-Up Paint	2.1.5													
			Sound Absorbing Materials	2.1.2													
			Welding Equipment	1.3.3													
			Welding Rods and Accessories	1.3.3													
			Recycled Content of Steel	2.1	S												
			Products														
			SD-04 Samples														
			Metal Roof Deck Units	2.1.1													
			Flexible Closure Strips	2.2.4													
			Acoustical Material	2.2.12													
			SD-05 Design Data														
			Deck Units	2.1	G RO												
			SD-07 Certificates														
			Powder-Actuated Tool Operator	1.3.2													
			Welder Qualifications	1.3.3													
			Welding Procedures	1.3.3													
			Fire Safety	1.3.4.1													
			Wind Storm Resistance	1.3.4.2													
			Manufacturer's Certificate	1.3.1													
		05 40 00	SD-02 Shop Drawings														
			Framing Components	1.6.1	G AE												
			SD-03 Product Data														
			Studs, Joists	2.1	G AE												

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		05 40 00	Recycled Content of Steel Products	2.1	S												
			SD-05 Design Data														
			Metal Framing Calculations	1.6.2	G RO												
			SD-07 Certificates														
			Load-Bearing Cold-Formed Metal Framing	1.4													
			Welds	3.1.1													
		05 50 13	SD-02 Shop Drawings														
			Bollards/Pipe Guards	2.4													
			Angles and Plates	2.5													
			SD-03 Product Data														
			Recycled Content	2.1	S												
			SD-07 Certificates														
			Certificates of Compliance	2.1													
		06 10 00	SD-02 Shop Drawings														
			Nailing Strips	2.2.1													
			SD-03 Product Data														
			Adhesives	2.4.2													
			SD-06 Test Reports														
			Preservative-treated	1.4.3													
			SD-07 Certificates														
			Certificates of Grade	1.10.1													
			Preservative Treatment	1.7													
			Indoor Air Quality for Aerosol	2.4.2	S												
			Adhesives														

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		06 10 00	Indoor Air Quality for Non-aerosol Adhesives	2.4.2	S												
		06 41 16.00 10	SD-02 Shop Drawings														
			Shop Drawings	2.10													
			Installation	3.1													
			SD-03 Product Data														
			Wood Materials	2.1													
			Certification	1.5.2													
			SD-04 Samples														
			Plastic Laminates	2.3	G RO												
			Cabinet Hardware	2.6													
			SD-07 Certificates														
			Quality Assurance	1.5													
			Laminate Clad Casework	3.1													
		06 61 16	SD-02 Shop Drawings														
			Detail Fabrication Drawings	2.1													
			Installation	3.1													
			SD-03 Product Data														
			Solid Polymer	2.1.1													
			Indoor air quality for solid surface seam and sealant products	2.2.2	S												
			SD-04 Samples														
			Material	2.1	G RO												
			SD-06 Test Reports														
			Test Report Results	2.1.1													
			SD-07 Certificates														

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		06 61 16	Qualifications	1.4.1													
			Indoor Air Quality for solid surface fabrication products	2.1.1	S												
			SD-10 Operation and Maintenance Data														
			Solid Polymer	2.1.1	G RO												
		07 05 23	SD-01 Preconstruction Submittals														
			Work Plan	1.4	G RO												
			SD-03 Product Data														
			Thermal Imaging Camera	2.2	G RO												
			SD-07 Certificates														
			Pressure Test Agency	1.6.2.1													
			Thermographer Qualifications	1.6.2.2													
			Test Instruments	1.6.3													
			Date Of Last Calibration	1.6.3													
			SD-06 Test Reports														
			Pressure Test Procedures	3.5													
			Air Leakage Test Report	1.6.4	G RO												
			Air Leakage Test Report	3.5.7	G RO												
			Diagnostic Test Report	1.6.4	G RO												
			Diagnostic Test Report	3.6.4	G RO												
		07 21 13	SD-03 Product Data														
			Manufacturer's Standard Details	1.3													
			Block or Board Insulation	2.1													
			Protection Board or Coatings	1.4													
			Accessories	2.3													

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		07 21 13	Recycled Content for Block or Board Insulation	2.1.5	S												
			SD-07 Certificates														
			Block or Board Insulation	2.1													
			Protection Board or Coating	2.2													
			Protection Board or Coating	3.4.4													
			Special Warranties	1.8													
			Special Warranties	1.8													
			Indoor Air Quality For Block Or Board Insulation	2.1.6	S												
			SD-08 Manufacturer's Instructions														
			Block or Board Insulation	2.1													
			Adhesive	2.3.1													
		07 21 16	SD-03 Product Data														
			Blanket Insulation	2.1													
			Recycled Content for Insulation Materials	2.1.2	S												
			Accessories	2.3													
			SD-07 Certificates														
			Indoor Air Quality for Insulation Materials	2.1.4	S												
			Indoor Air Quality for Adhesives	2.3.1	S												
			SD-08 Manufacturer's Instructions														
			Insulation	3.3.1													
		07 22 00	SD-02 Shop Drawings														
			Insulation Board Layout	1.3	G RO												

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		07 22 00	Verification of Existing Conditions	1.3													
			SD-03 Product Data														
			Insulation	2.1	G RO												
			Cover Board	1.4													
			Fasteners	2.3													
			Recycled Content For Insulation	2.1.3	S												
			SD-06 Test Reports														
			Flame Spread Rating	1.8.1	G RO												
			SD-07 Certificates														
			Installer Qualifications	1.6	G RO												
			Certificates Of Compliance For Felt Materials	1.6													
			Indoor Air Quality For Insulation	2.1.4	S												
			SD-08 Manufacturer's Instructions														
			Fasteners	2.3													
			Insulation	2.1													
		07 27 10.00 10	SD-02 Shop Drawings														
			Air Barrier System Shop Drawings	2.1	G RO												
			SD-03 Product Data														
			Air Barrier System Product Data	2.1	G RO												
			SD-04 Samples														
			Mock-Up	3.1.2	G RO												
			Material Samples for Air Barrier System	2.1													
			SD-05 Design Data														

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		07 27 10.00 10	Design Data and Calculations For The Air Barrier System	1.8													
			SD-06 Test Reports														
			Design Review Report	1.8													
			Testing and Inspection	3.1.3													
			SD-07 Certificates														
			Air Barrier Inspector	1.7	G RO												
		07 27 19.01	SD-01 Preconstruction Submittals														
			Qualifications of Manufacturer	1.8.1	G RO												
			Qualifications of Installer	1.8.2	G RO												
			SD-02 Shop Drawings														
			Self-adhering Air Barrier	1.4	G RO												
			SD-03 Product Data														
			Self-adhering Air Barrier	1.4	G RO												
			Primers, Adhesives, and Mastics	2.2													
			Safety Data Sheets	1.4.2													
			SD-06 Test Reports														
			Field Peel Adhesion Test	1.6													
			Flame Propagation of Wall Assemblies	1.4.3													
			Flame Spread and Smoke Developed Index Ratings	1.4.3													
			Site Inspections and Testing	3.4.1													
			SD-07 Certificates														
			Self-adhering Air Barrier	1.4													
			SD-08 Manufacturer's Instructions														

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		07 27 19.01	Self-adhering Air Barrier	1.4													
			Primers, Adhesives, and Mastics	2.2													
		07 27 26	SD-01 Preconstruction Submittals														
			Qualifications of Manufacturer	1.9.1													
			Qualifications of Installer	1.9.2													
			SD-02 Shop Drawings														
			Fluid-Applied Membrane Air Barrier	1.4	G RO												
			SD-03 Product Data														
			Fluid-Applied Membrane Air Barrier	1.4	G RO												
			Transition Membrane	2.3	G RO												
			Primers, Adhesives, and Mastics	2.2													
			Reinforcement	2.6													
			Safety Data Sheets	1.4.2													
			SD-06 Test Reports														
			Capillary Moisture Test	1.6													
			Field Peel Adhesion Test	1.4.3													
			Flame Propagation of Wall Assemblies	1.4.3													
			Flame Spread and Smoke Developed Index Ratings	1.4.3													
			Site Inspections	3.4.1													
			SD-07 Certificates														
			Fluid-Applied Membrane Air Barrier	1.4													

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		07 27 26	Transition Membrane	2.3													
			SD-08 Manufacturer's Instructions														
			Fluid-Applied Membrane Air Barrier	1.4													
			Transition Membrane	2.3													
			Primers, Adhesives, and Mastics	2.2													
		07 27 36	SD-01 Preconstruction Submittals														
			Qualification of Manufacturer	1.10.1	G RO												
			Qualification of Installer	1.10.2	G RO												
			Quality Control Plan	1.11													
			Safety Plan	1.11													
			Fire Prevention Plan	1.9.1													
			Respirator Plan	1.9.2													
			SD-02 Shop Drawings														
			Spray Foam Air Barrier	1.5													
			Foam Air Barrier System	1.11	G RO												
			Fire-Rated Assemblies	1.5.1	G RO												
			SD-03 Product Data														
			Transition Membrane	2.2													
			Primers, Adhesives, and Mastics	2.3	G RO												
			Sealants	2.5	G RO												
			Safety Data Sheets	1.5.2	G RO												
			Thermal Barrier Materials	2.1.1	G RO												
			Ignition Barrier Coatings	2.1.1	G RO												
			Accessories	2.1.6													

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		07 27 36	Recycled Content for Closed Cell Spray Foam Air Barrier	2.1.2	S												
			SD-04 Samples														
			Spray Foam Air Barrier	1.5	G RO												
			SD-06 Test Reports														
			Air Barrier Test	1.8	G RO												
			Primers	1.5.3	G RO												
			Fire-Ratings Of Thermal and/or Ignition Barrier Materials	1.5.4	G RO												
			Flame Spread and Smoke	1.5.4	G RO												
			Developed Index Ratings of SPF Products														
			Flame Propagation of Wall Assemblies	1.5.4	G RO												
			Site Inspections	3.4.1	G RO												
			SD-07 Certificates														
			Transition Membrane	2.2	G RO												
			Indoor Air Quality for Spray Foam Air Barrier	2.1.5	S												
			SD-08 Manufacturer's Instructions														
			SPF Handling, Storage, and Spray Procedures	1.6.1	G RO												
			Substrate Preparation	3.2.1	G RO												
			Thermal Barrier	1.5.1	G RO												
			Ignition Barrier	1.5.1	G RO												
			Transition Membrane	2.2	G RO												

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		07 27 36	Primers, Adhesives, and Mastics	2.3	G RO												
			SD-09 Manufacturer's Field														
			Reports														
			Core Samples	1.11	G RO												
			Daily Work Record	3.3.3	G RO												
		07 42 13	SD-01 Preconstruction Submittals														
			Qualification of Manufacturer	1.5.3													
			Qualification of Installation	1.5.4	G RO												
			Contractor														
			Warranty	1.8	G RO												
			SD-02 Shop Drawings														
			Installation Drawings	1.5.1.1	G RO												
			SD-03 Product Data														
			Recycled Content;	2.1													
			Wall Panels	2.2.1	G RO												
			Factory Color Finish	2.2.2													
			Closure Materials	1.5.5													
			Pressure Sensitive Tape	2.5.4.4													
			Sealants and Caulking	2.5.4.1													
			Galvanizing Repair Paint	1.5.3.1													
			Enamel Repair Paint	1.5.3.1													
			Accessories	1.5.5													
			Accessories	2.5													
			SD-04 Samples														
			Wall Panels	2.2.1													
			Fasteners	1.5.3.1													

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		07 42 13	Metal Closure Strips	2.5.3													
			SD-05 Design Data														
			Wind load design analysis	1.5.1.2	G RO												
			SD-06 Test Reports														
			Leakage Tests	3.7.2													
			Wind Load Tests	1.3.2													
			Coating	2.2.2.6													
			Chalking	2.2.2.6													
			Seismic Tests	1.3.2													
			SD-07 Certificates														
			Coil Stock	1.5.3.1													
			Fasteners	1.5.3.1													
			Enamel Repair Paint	1.5.3.1													
			SD-08 Manufacturer's Instructions														
			Installation	3.3													
			SD-09 Manufacturer's Field														
			Reports														
			Manufacturer's Field Reports	3.8.1													
			SD-11 Closeout Submittals														
			Warranty	1.8	G RO												
			Maintenance Instructions	1.5.6													
			20 year 'No Dollar Limit' warranty	1.8.1													
			for labor and material														
		07 60 00	SD-02 Shop Drawings														
			Exposed Sheet Metal	2.2.1													
			Gutters	3.1.17													

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		07 60 00	Downspouts	3.1.18													
			Expansion Joints	3.1.24													
			Gravel Stops and fascia	2.2.1													
			Base Flashing	3.1.11													
			Counterflashing	3.1.12													
			Reglets	2.2.14													
			Drip Edges	3.1.16													
			Eave Flashing	3.1.22													
			Recycled Content	2.1	S												
			SD-04 Samples														
			Finish Samples	1.4.2													
			SD-08 Manufacturer's Instructions														
			Instructions for Installation	1.4.3													
			Quality Control Plan	3.5													
			SD-10 Operation and Maintenance														
			Data														
			Cleaning and Maintenance	1.4.3													
		07 61 14.00 20	SD-02 Shop Drawings														
			Roofing	1.2.5	G RO												
			SD-03 Product Data														
			Roofing Panels	2.1	G RO												
			Energy Star Label for Steel	2.1	S												
			Roofing Product														
			Recycled Content for Steel	2.1.1	S												
			Roofing Product														
			Attachment Clips	2.3													

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		07 61 14.00 20	Closures	2.4.1													
			Accessories	2.4													
			Fasteners	2.4.2													
			Sealants	2.4.3													
			Warranty	1.7	G RO												
			SD-04 Samples														
			Panel	2.1													
			Accessories	2.4													
			Sealants	2.4.3													
			Intermediate Support	2.2													
			SD-05 Design Data														
			Design Calculations	1.5													
			SD-06 Test Reports														
			Field Inspection	3.6	G RO												
			Structural Performance	1.3.3													
			Finish	1.6.6													
			SD-07 Certificates														
			Manufacturer's Technical	1.6.3													
			Representative														
			Installer's Qualifications	1.6.4													
			SD-08 Manufacturer's Instructions														
			Installation	3.3													
			SD-11 Closeout Submittals														
			Information Card	3.8													
			Warranty	1.7													
		07 84 00	SD-02 Shop Drawings														

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		07 84 00	Firestopping System	2.1	G RO												
			SD-03 Product Data														
			Firestopping Materials	2.2	G RO												
			SD-06 Test Reports														
			Inspection	3.3													
			SD-07 Certificates														
			Inspector Qualifications	1.5.2													
			Firestopping Materials	2.2													
			Installer Qualifications	1.5.1													
		07 92 00	SD-03 Product Data														
			Sealants	2.1													
			Primers	2.2													
			Bond Breakers	2.3													
			Backstops	2.4													
			SD-06 Test Reports														
			Field Adhesion	3.1													
			SD-07 Certificates														
			Indoor Air Quality For Interior	2.1.1	S												
			Sealants														
			Indoor Air Quality For Interior	2.1.3	S												
			Floor Joint Sealants														
			Indoor Air Quality For Interior	2.1.4	S												
			Acoustical Sealants														
			Indoor Air Quality For Interior	2.5	S												
			Caulking														
		08 11 13	SD-02 Shop Drawings														

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		08 11 13	Doors	2.1	G RO												
			Doors	2.1	G RO												
			Frames	2.6	G RO												
			Frames	2.6	G RO												
			Guillotine Kennel Door	2.4	G RO												
			Guillotine Kennel Door Lift Cable	2.4.1	G RO												
			Assembly														
			Accessories	2.3													
			SD-03 Product Data														
			Doors	2.1	G RO												
			Recycled Content for Steel Door	2.1	S												
			Product														
			Frames	2.6	G RO												
			Guillotine Kennel Door	2.4	G RO												
			Guillotine Kennel Door Lift Cable	2.4.1	G RO												
			Assembly														
			Recycled Content for Steel Frame	2.6	S												
			Product														
			Accessories	2.3													
		08 31 00	SD-02 Shop Drawings														
			Access Doors And Panels	1.3	G RO												
			SD-03 Product Data														
			Access Doors And Panels	1.3	G RO												
			Hardware	1.3.2	G RO												
			Accessories	2.2.8													
			Recycled Content	2.1	S												

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		08 31 00	SD-06 Test Reports														
			Fire-rating(s) of Assemblies	1.3.1													
			Acoustical Ratings of Assemblies	1.3.1													
		08 41 13	SD-01 Preconstruction Submittals														
			Sample Warranty	1.2.1													
			List of Product Installations	1.2.1													
			SD-02 Shop Drawings														
			Installation Drawings	3.3	G AE												
			Fabrication Drawings	2.2	G AE												
			SD-03 Product Data														
			Manufacturer's Catalog Data	1.2.1													
			Finish	2.2.3	G RO												
			Recycled Content of Aluminum Material	2.1.1.2	S												
			SD-04 Samples														
			Finish and Color Samples	1.2.1	G RO												
			SD-06 Test Reports														
			Certified Test Reports	1.2.1	G RO												
			Deflection	3.4.3													
			Air Infiltration	3.4.1													
			Condensation Resistance and Thermal Transmittance	3.4.4													
			Water Infiltration	3.4.5													
			SD-08 Manufacturer's Instructions														
			Manufacturer's Instructions	3.3													
			SD-11 Closeout Submittals														

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		08 41 13	Manufacturer's Product Warranty	3.6													
		08 71 00	SD-02 Shop Drawings														
			Manufacturer's Detail Drawings	1.3	G RO												
			Verification of Existing Conditions	1.3	G RO												
			Hardware Schedule	1.5	G RO												
			Keying System	2.3.6	G RO												
			SD-03 Product Data														
			Hardware Items	2.3	G RO												
			SD-08 Manufacturer's Instructions														
			Installation	3.1													
			SD-10 Operation and Maintenance														
			Data														
			Hardware Schedule	1.5	G RO												
			SD-11 Closeout Submittals														
			Key Bitting	1.6.1													
		08 81 00	SD-03 Product Data														
			Insulating Glass	2.2	G RO												
			Glazing Accessories	1.3													
			Sealants	2.3.3.1	G RO												
			Joint Backer	2.3.4	G RO												
			SD-04 Samples														
			Insulating Glass	2.2	G RO												
			Glazing Compound	2.3.2													
			Tape	2.3.6													
			Sealing Tapes	2.3.6													
			SD-07 Certificates														

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		08 81 00	Insulating Glass	2.2	G RO												
			SD-08 Manufacturer's Instructions														
			Setting and Sealing Materials	2.3													
			Glass Setting	3.2													
			SD-11 Closeout Submittals														
			Insulated Glass Units	1.7.1	G RO												
		08 91 00	SD-02 Shop Drawings														
			Wall Louvers	1.4													
			SD-03 Product Data														
			Metal Wall Louvers	2.2	G RO												
			SD-04 Samples														
			Louver Samples	1.5													
		09 22 00	SD-03 Product Data														
			Metal Support Systems	2.1													
			Recycled Content for Metal	2.1	S												
			Support Systems														
		09 29 00	SD-03 Product Data														
			Cementitious Backer Units	2.1.7													
			Glass Mat Water-Resistant	2.1.4													
			Gypsum Tile Backing Board														
			Water-Resistant Gypsum Backing	2.1.3													
			Board														
			Glass Mat Covered or Reinforced	2.1.5													
			Gypsum Sheathing														
			Glass Mat Covered or Reinforced	2.1.5.1													
			Gypsum Sheathing Sealant														

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		09 29 00	Accessories	2.1.12													
			Gypsum Board	2.1.1													
			Recycled Content for Gypsum Board	2.1.1	S												
			Recycled Content for Paper Facing and Gypsum Cores	2.1.1	S												
			VOC Content of Joint Compound	2.1.8	S												
			SD-06 Test Reports														
			ASTM E90 Factory Test Report	2.1.6.1	G RO												
			ASTM E90 Factory Test Report	3.7	G RO												
			ASTM E90 Factory Test Report	3.10	G RO												
			ASTM E336 Field Test Report	3.10	G RO												
			SD-07 Certificates														
			Asbestos Free Materials	2.1													
			Indoor Air Quality for Gypsum Board	2.1.1	S												
			Indoor Air Quality for Non-aerosol Adhesives	2.1.10	S												
			Indoor Air Quality for Aerosol Adhesives	2.1.10	S												
			SD-08 Manufacturer's Instructions														
			Safety Data Sheets	2.1													
			SD-10 Operation and Maintenance Data														
			Manufacturer Maintenance Instructions	2.1													

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		09 30 10	SD-02 Shop Drawings														
			Detail Drawings	3.2	G RO												
			SD-03 Product Data														
			Porcelain Tile	2.1.1													
			Metal Strips	2.6.1													
			Setting-Bed	2.2													
			Mortar, Grout, and Adhesive	2.4													
			SD-04 Samples														
			Tile	2.1													
			Accessories	2.1													
			Metal Strips	2.6.1													
			SD-07 Certificates														
			Water Absorption Rates	1.3.2													
			SD-08 Manufacturer's Instructions														
			Manufacturer's Approved	3.7													
			Cleaning Instructions														
			SD-10 Operation and Maintenance														
			Data														
			Porcelain Tile	2.1.1	G RO												
			Metal Strips	2.6.1	G RO												
		09 51 00	SD-02 Shop Drawings														
			Approved Detail Drawings	2.1													
			SD-03 Product Data														
			Acoustical Units	2.2													
			Recycled Content for Type IV	2.2.1.1	S												
			Ceiling Tiles														

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		09 51 00	Recycled Content for Suspension Systems	2.3	S												
			Acoustical Performance	2.1.1	G RO												
			SD-04 Samples														
			Acoustical Units	2.2	G RO												
			SD-07 Certificates														
			Indoor Air Quality for Type IV Ceiling Tiles	2.2.1.1	S												
		09 62 38	SD-03 Product Data														
			Static-Control Resilient Flooring	2.1													
			Recycled content for Static-Dissipative Vinyl Tile	2.1.1.1	S												
			Accessories	2.3													
			Adhesives	2.2													
			Warranty	1.9													
			SD-04 Samples														
			Static-Control Resilient Flooring	2.1	G RO												
			SD-06 Test Reports														
			Fire Resistance	2.6													
			Moisture, Alkalinity and Bond Testing	3.2													
				3.6													
			SD-07 Certificates														
			Indoor Air Quality for Static-Dissipative Vinyl Tile	2.1.1.1	S												
			Indoor Air Quality for Adhesives	2.2	S												
			Qualifications of Applicator	1.6													

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		09 62 38	SD-08 Manufacturer's Instructions														
			Static-Control Resilient Flooring	2.1	G RO												
			Accessories	2.3	G RO												
			SD-10 Operation and Maintenance Data														
			Static-Control Resilient Flooring	2.1	G RO												
			Accessories	2.3	G RO												
		09 65 00	SD-02 Shop Drawings														
			Resilient Flooring and Accessories	2.8	G RO												
			SD-03 Product Data														
			Resilient Flooring and Accessories	2.8	G RO												
			Adhesives	2.4													
			Sheet Vinyl Flooring	2.1													
			Wall Base	2.2													
			SD-04 Samples														
			Resilient Flooring and Accessories	2.8	G RO												
			SD-07 Certificates														
			Indoor Air Quality for Sheet Vinyl Flooring	2.1	S												
			Indoor Air Quality for Adhesives	2.4	S												
			SD-08 Manufacturer's Instructions														
			Surface Preparation	3.2													
			Installation	3.1													

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		09 65 00	SD-10 Operation and Maintenance Data														
			Resilient Flooring and Accessories	2.8													
		09 67 23.13	SD-02 Shop Drawings														
			Installation Drawings	2.1	G RO												
			Fabrication Drawings	2.1	G RO												
			SD-03 Product Data														
			Manufacturer's Catalog Data	1.2.2	G RO												
			SD-04 Samples														
			Hardboard Mounted Resinous Flooring	1.5.4	G RO												
			SD-07 Certificates														
			Listing of Product Installations	1.5.2													
			Referenced Standards	1.5													
			Certificates														
			SD-11 Closeout Submittals														
			Warranty	1.6	G RO												
		09 84 20	SD-02 Shop Drawings														
			Approved Detail Drawings	2.1													
			SD-03 Product Data														
			Installation	3.2													
			Acoustical Panels	2.1													
			SD-04 Samples														
			Acoustical Panels	2.1	G RO												
			SD-07 Certificates														

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		09 84 20	Acoustical Panels	2.1													
			SD-11 Closeout Submittals														
			Warranty	1.3													
		09 90 00	SD-03 Product Data														
			Coating	2.1	G RO												
			Product Data Sheets	2.1													
			SD-04 Samples														
			Color	2.2	G RO												
			SD-07 Certificates														
			Qualification Testing	1.6.6.2	G RO												
			Indoor Air Quality for Paints and Primers	1.6.5													
			Indoor Air Quality for Consolidated Latex Paints	1.6.5													
			SD-08 Manufacturer's Instructions														
			Mixing	2.1													
			Manufacturer's Safety Data Sheets	1.8.1													
			SD-10 Operation and Maintenance Data														
			Coatings	2.1	G RO												
		10 11 00	SD-02 Shop Drawings														
			Placement Schedule	3.1	G RO												
			SD-03 Product Data														
			Visual Display Unit	1.2	G RO												
			Visual Display Unit	2.1	G RO												

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		10 11 00	Coat Hooks	2.3	G RO												
			SD-04 Samples														
			Aluminum	2.1.2	G RO												
			Porcelain Enamel	2.1.1	G RO												
			SD-07 Certificates														
			Indoor air quality for	2.2.1	S												
			markerboards														
			Certificate of Compliance	1.2													
			SD-08 Manufacturer's Instructions														
			Manufacturer's Cleaning	3.3													
			Instructions														
			Manufacturer's Printed	3.2													
			Installation Instructions														
			SD-10 Operation and Maintenance														
			Data														
			Visual Display Unit	1.2	G RO												
			Visual Display Unit	2.1	G RO												
		10 14 00.20	SD-02 Shop Drawings														
			Detail Drawings	1.3.2	G RO												
			SD-03 Product Data														
			Room Identification And	2.1	G RO												
			Directional Signage System														
			SD-04 Samples														
			Interior Signage	1.3.1	G RO												
			Room Identification And	2.1	G RO												
			Directional Signage System														

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		10 14 00.20	SD-10 Operation and Maintenance Data														
			Approved Manufacturer's Instructions	3.1	G RO												
			Protection and Cleaning	3.1.2	G RO												
		10 14 53	SD-03 Product Data														
			Traffic Sign Posts	2.1													
			Traffic Sign Retroreflective Sheeting	2.4													
			SD-04 Samples														
			Flexible Posts	2.6.2													
		10 21 13	SD-02 Shop Drawings														
			Fabrication Drawings	2.1													
			Installation Drawings	3.3													
			SD-03 Product Data														
			Cleaning and Maintenance Instructions	2.1													
			Colors And Finishes	2.7													
			Anchoring Devices and Fasteners	2.2.2													
			Hardware and Fittings	2.2.4													
			Brackets	2.2.3													
			Door Hardware	2.2.5													
			Toilet Enclosures	2.3.1													
			Pilaster Shoes	2.5													
			Finishes	2.2.4.2													
			Finishes	2.7.2													

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		10 21 13	SD-04 Samples														
			Colors and Finishes	2.7	G RO												
			Hardware and Fittings	2.2.4													
			Anchoring Devices and Fasteners	2.2.2													
			SD-07 Certificates														
			Warranty	1.6													
			SD-10 Operation and Maintenance														
			Data														
			Plastic Identification	2.1.1	G RO												
		10 22 13	SD-02 Shop Drawings														
			Wire Mesh Partitions	1.4													
			Kennel Units	2.6	G RO												
			SD-03 Product Data														
			Wire Mesh Partitions	1.4													
			Kennel Units	2.6	G RO												
			Recycled Content for Metal Post and Framing Materials	2.1	S												
			Recycled Content for Wire Materials	2.1	S												
		10 26 00	SD-02 Shop Drawings														
			Corner Guards	2.2													
			Wall Covering and Panels	2.3													
			SD-03 Product Data														
			Corner Guards	2.2													
			Wall Covering and Panels	2.3													

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		10 26 00	Recycled content for aluminum component of corner guards	2.2.1	S												
			SD-04 Samples														
			Corner Guards	2.2	G RO												
			Wall Covering and Panels	2.3	G RO												
			SD-06 Test Reports														
			Fire Resistance Rating	2.1.1.2													
			SD-07 Certificates														
			Indoor air quality for wall covering/panels	2.3	S												
			Indoor air quality for adhesives	2.6	S												
			SD-10 Operation and Maintenance Data														
			Corner Guards	2.2	G RO												
			Wall Covering and Panels	2.3	G RO												
		10 28 13	SD-02 Shop Drawings														
			Product Schedule	2.1	G RO												
			SD-03 Product Data														
			Recycled content for stainless steel toilet accessories	2.1	S												
			Item A5074	2.1.4	G RO												
			Item A5083	2.1.5	G RO												
			Item A5090	2.1.6	G RO												
			Item A5109	2.1.7	G RO												
			Item A5110	2.1.8	G RO												
			Item A5135	2.1.9	G RO												

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		10 28 13	Item A5170	2.1.10	G RO												
			Item A5200	2.1.11	G RO												
			Towel Pin	2.1.12	G RO												
			Mirror	2.1.13	G RO												
			Sanitary Seat Cover Dispenser	2.1.14	G RO												
			Electric Hand Dryer	2.1.15	G RO												
			SD-10 Operation and Maintenance Data														
			Item A5074	2.1.4	G RO												
			Item A5083	2.1.5	G RO												
			Item A5090	2.1.6	G RO												
			Item A5109	2.1.7	G RO												
			Item A5110	2.1.8	G RO												
			Item A5135	2.1.9	G RO												
			Item A5170	2.1.10	G RO												
			Item A5200	2.1.11	G RO												
			Towel Pin	2.1.12	G RO												
			Mirror	2.1.13	G RO												
			Sanitary Seat Cover Dispenser	2.1.14	G RO												
			Electric Hand Dryer	2.1.15	G RO												
		10 44 16	SD-02 Shop Drawings														
			Fire Extinguishers	2.1.1	G RO												
			Accessories	Part 2													
			Cabinets	Part 2	G RO												
			Schedule	1.5	G RO												
			SD-03 Product Data														

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		10 44 16	Fire Extinguishers	2.1.1	G RO												
			Accessories	Part 2													
			Cabinets	Part 2	G RO												
			Replacement Parts List	3.2.1													
			SD-04 Samples														
			Equipment Samples	1.3.1													
			SD-07 Certificates														
			Fire Extinguishers Certifications	2.1.1													
			Manufacturer's Warranty with	1.4													
			Inspection Tag														
		10 51 13	SD-02 Shop Drawings														
			Types	2.1	G RO												
			Location	1.4	G RO												
			Installation	3.1													
			Numbering system	3.2													
			SD-03 Product Data														
			Material	2.2													
			Locking Devices	2.3.2													
			Handles	2.3.5													
			Finish	2.2.4													
			components	2.3													
			Assembly	3.1													
			SD-04 Samples														
			Color chips	1.5.1	G RO												
		11 48 00	SD-01 Preconstruction Submittals														

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		11 48 00	Contractor's Field Verification Data	1.1	G												
			SD-02 Shop Drawings														
			Detail Drawings	1.3.1	G												
			Installation Instructions and Diagrams	1.3.1	G												
			SD-03 Product Data														
			Equipment	1.3.1	G												
			Equipment	2.1	G												
			SD-05 Design Data														
			Manufacturer's Descriptive and Technical Literature	1.3.1	G												
			SD-06 Test Reports														
			Manufacturer's Test Data	1.3.1	G												
			Field Test Reports	3.2.1	G												
			SD-08 Manufacturer's Instructions														
			Manufacturer's Instructions	1.3.1	G												
			SD-10 Operation and Maintenance Data														
			Equipment	1.3.1	G												
			Equipment	2.1	G												
			SD-11 Closeout Submittals														
			Manufacturer's Warranty	3.3													
			Contractor's Warranty for Installation	3.4													
		11 72 13	SD-02 Shop Drawings														

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		11 72 13	detail drawings	3.2													
			SD-06 Test Reports														
			field tests and inspections	3.6													
		12 31 00	SD-02 Shop Drawings														
			Fabrication Drawings	1.2.1	G RO												
			Installation Drawings	1.2.1	G RO												
			SD-03 Product Data														
			Cabinets	1.2.1	G RO												
			Adhesives	1.2.1	G RO												
			Filler Material	1.2.1	G RO												
			Fasteners	1.2.1													
			Accessories and Hardware	1.2.1													
			SD-04 Samples														
			Accessories and Hardware	1.2.1													
			Manufacturer's Standard Color Charts	1.2.1	G RO												
			SD-07 Certificates														
			Adhesives	1.2.1													
			Filler Material	1.2.1													
			Fasteners	1.2.1													
			Accessories and Hardware	1.2.1													
			SD-08 Manufacturer's Instructions														
			Manufacturer's Instructions	1.2.1													
		12 36 00	SD-02 Shop Drawings														
			Fabrication	2.2	G RO												
			Installation Drawings	3.1	G RO												

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		12 36 00	SD-03 Product Data														
			Stainless Steel	2.2.1	G RO												
			Fasteners	2.3	G RO												
			Joint Sealants	2.4.2	G RO												
			Indoor Air Quality for Joint Sealants	2.4.2	S												
			SD-04 Samples														
			Countertop	2.2.1	G RO												
			Backsplash	2.2.1	G RO												
			Manufacturer's Standard Color Charts	2.1	G RO												
			SD-08 Manufacturer's Instructions														
			Manufacturer's Instructions	2.1													
		12 48 13	SD-02 Shop Drawings														
			Installation Drawings	3.2	G RO												
			Detail Drawings	3.2	G RO												
			SD-03 Product Data														
			Entrance Floor Mats and Frames	2.1.1	G RO												
			SD-04 Samples														
			Entrance Floor Mats and Frames	2.1.1	G RO												
			SD-08 Manufacturer's Instructions														
			Manufacturer's Instructions	3.2													
			SD-10 Operation and Maintenance Data														
			Protection, Maintenance, and Repair Information	3.2													

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		12 93 00	SD-02 Shop Drawings														
			Bollards	2.5	G												
			Assembly Instruction Drawings	1.3.3													
			SD-03 Product Data														
			Bollards	2.5													
			SD-04 Samples														
			Finish	2.3.4	G												
			SD-07 Certificates														
			Primer Certificate	1.3.4													
			Powder Coatings Certificate	1.3.5													
		13 34 19	SD-01 Preconstruction Submittals														
			Manufacturer's Qualifications	1.6.3	G RO												
			SD-02 Shop Drawings														
			Detail Drawings	1.6.1	G RO												
			Erection Plan	1.2.5	G RO												
			Isolation Joint Covers	2.3.5	G RO												
			SD-03 Product Data														
			Manufacturer's Catalog Data	1.6.1													
			Recycled Content for Structural Steel Shapes and Plates	2.1.1	S												
			Recycled Content for Steel Pipe	2.1.2	S												
			Recycled Content for Aluminum Sheet Materials	2.4.1	S												
			Isolation Joint Covers	2.3.5	G RO												
			SD-04 Samples														
			Roof Panels	1.6.1	G RO												

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		13 34 19	Fasteners	2.5.2	G RO												
			Metal Closure Strips	2.8.1	G RO												
			Manufacturer's Color Charts and Chips	2.4.2	G RO												
			SD-05 Design Data														
			Manufacturer's Descriptive and Technical Literature	1.6.1	G RO												
			Manufacturer's Building Design Analysis	1.6.1	G RO												
			Lateral Force Calculations	1.6.1	G RO												
			SD-06 Test Reports														
			Test Reports	1.6.1													
			Coatings and Base Metals	1.6.1													
			Factory Color Finish Performance Requirements	1.6.1													
			SD-07 Certificates														
			System Components	1.6.1													
			Aluminized Steel Repair Paint	1.6.1													
			Galvanizing Repair Paint	1.6.1													
			Enamel Repair Paint	1.6.1													
			Qualification of Manufacturer	1.6.1	G RO												
			Qualification of Erector	1.6.1	G RO												
			SD-08 Manufacturer's Instructions														
			Installation of Roof Panels	1.6.2	G RO												
			Shipping, Handling, and Storage	1.7													
			SD-11 Closeout Submittals														

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		13 34 19	Manufacturer's Warranty	3.12.1	G RO												
			Contractor's Warranty for	3.12.2	G RO												
			Installation														
		13 49 10	SD-01 Preconstruction Submittals														
			Installer Experience	1.3.2	G RO												
			SD-03 Product Data														
			Lead-Lined Gypsum Wallboard	2.1	G RO												
			SD-06 Test Reports														
			Testing and Certification	3.3	G RO												
		21 13 13	SD-01 Preconstruction Submittals														
			Qualified Fire Protection Engineer	1.2.3	G AE												
			(QFPE)														
			Sprinkler System Designer	1.4.2.1	G AE												
			Sprinkler System Installer	1.4.2.2	G AE												
			SD-02 Shop Drawings														
			Shop Drawing	1.2.1.1	G AE												
			SD-03 Product Data														
			Pipe	2.2.1	G AE												
			Fittings	2.3.1.2	G AE												
			Valves	2.3.4	G AE												
			Sprinklers	2.7	G AE												
			Pipe Hangers and Supports	2.3.3	G AE												
			Sprinkler Alarm Switch	2.4.1	G AE												
			Valve Supervisory (Tamper)	2.4.2	G AE												
			Switch														
			Backflow Prevention Assembly	2.5	G AE												

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		21 13 13	Air Vent	2.8.5	G AE												
			Seismic Bracing	2.3.3	G AE												
			Nameplates	2.1.2	G AE												
			SD-05 Design Data														
			Seismic Bracing	2.3.3	G AE												
			Hydraulic Calculations	1.2.1.2	G AE												
			SD-06 Test Reports														
			Test Procedures	3.7.1	G AE												
			SD-07 Certificates														
			Verification of Compliant	3.7.2.1	G AE												
			Installation														
			Request for Government Final	3.7.2.2	G AE												
			Test														
			SD-10 Operation and Maintenance														
			Data														
			Operating and Maintenance	3.9	G												
			(O&M) Instructions														
			Spare Parts	1.6	G												
			SD-11 Closeout Submittals														
			As-built drawings	3.9	G AE												
		21 13 16	SD-01 Preconstruction Submittals														
			Nitrogen Generation System	1.5.1.1	G												
			Commissioning Technician														
			SD-03 Product Data														
			Sprinkler Alarm Switch	2.4.1	G												

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		21 13 16	High/Low-Nitrogen Pressure Supervisory Switch	2.4.2	G												
			Nitrogen Generation System	1.5.1.1	G												
			Dry Pipe Valve	2.2	G												
		22 00 00	SD-02 Shop Drawings														
			Plumbing System	3.9.1	G RO												
			SD-03 Product Data														
			Recycled Content for Steel Pipe	2.1	S												
			Recycled Content for Cast Iron Pipe	2.1	S												
			Backflow Prevention Assemblies	3.9.1.1	G RO												
			Shower Faucets	2.6.2	G RO												
			Fixtures	2.4													
			Flush Valve Water Closets	2.4.2													
			WaterSense Label for Flush Valve Water Closet	2.4.2	S												
			Flush Valve Urinals	2.4.3													
			WaterSense Label for Urinal	2.4.3	S												
			Wall Hung Lavatories	2.4.4													
			WaterSense Label for Lavatory Faucet	2.4.1	S												
			Double Bowl Break Area Sinks	2.4.5													
			Single Bowl Break Area Sinks	2.4.6													
			Surgeon's Scrub Sink	2.4.7													
			Wheelchair Drinking Water Cooler	2.4.8	G RO												

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		22 00 00	Energy Star Label for Wheelchair	2.4.8	S												
			Electric Water Cooler														
			Solid Surface Shower Base	2.4.9													
			WaterSense Label for Showerhead	2.6.2	S												
			Tub Table Faucet	2.4.10													
			Pet Bath	2.4.11													
			Floor Sinks	2.6.4													
			Trench Drains	2.6.3													
			Water Heaters	2.8	G RO												
			Energy Star Label for Gas Storage Water Heater	2.8.1.1	S												
			Pumps	2.9	G RO												
			Water Flow Meters	2.10	G RO												
			Heat Trace Cable	2.11	G RO												
			Welding	1.5.1													
			Plumbing System	3.9.1													
			SD-06 Test Reports														
			Tests, Flushing and Disinfection	3.9													
			Test of Backflow Prevention Assemblies	3.9.1.1	G RO												
			SD-07 Certificates														
			Materials and Equipment	1.3													
			Bolts	2.1.1													
			SD-10 Operation and Maintenance Data														

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		22 00 00	Plumbing System	3.9.1	G RO												
		23 05 48.19	SD-02 Shop Drawings														
			Coupling and Bracing	3.1													
			Equipment Restraint	2.2													
			Contractor Designed Bracing	1.2.4	G RO												
			SD-03 Product Data														
			Coupling and Bracing	3.1	G RO												
			Equipment Restraint	2.2	G RO												
			Contractor Designed Bracing	1.2.4	G RO												
			Anchor Bolts	3.7													
			Vibration Isolators	2.2.2													
			SD-05 Design Data														
			Design Calculations	1.2.4													
			SD-06 Test Reports														
			Anchor Bolts	3.7	G RO												
		23 05 93	SD-01 Preconstruction Submittals														
			Independent TAB Agency and Personnel Qualifications	1.5.1	G RO												
			TAB Design Review Report	1.5.3.1	G RO												
			TAB Design Review Report	1.6.1.1	G RO												
			TAB Firm	1.5.8.1	G RO												
			TAB Team Assistants	1.2	G RO												
			TAB Team Engineer	1.2	G RO												
			TAB Specialist	1.5.8.2	G RO												
			TAB Team Field Leader	1.2	G RO												
			SD-02 Shop Drawings														

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		23 05 93	TAB Schematic Drawings and Report Forms	1.3.3	G RO												
			SD-03 Product Data														
			Equipment and Performance Data	1.3	G RO												
			TAB Related HVAC Submittals	1.5.1.3	G RO												
			TAB Related HVAC Submittals	1.5.8.4	G RO												
			TAB Procedures	1.5.6	G RO												
			Calibration	1.5.6	G RO												
			Systems Readiness Check	1.3.3	G RO												
			TAB Execution	1.5.9	G RO												
			TAB Verification	1.5.9.3	G RO												
			SD-06 Test Reports														
			Completed Pre-Final DALT Report	3.3.5	G RO												
			Certified Final DALT Report	3.3.8	G RO												
			Prerequisite HVAC Work	1.5.3.2	G RO												
			Checkout List														
			Prerequisite HVAC Work	1.5.3.2	G RO												
			Checkout List														
			Prerequisite HVAC Work	1.5.3.2	G RO												
			Checkout List														
			Proportional Balancing	3.4.4.1	G RO												
			Proportional Balancing	3.7	G RO												
			Season 1	3.4.4.2	G RO												
			Season 1	3.7	G RO												

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		23 05 93	Season 2	3.4.4.2	G RO												
			Season 2	3.7	G RO												
			TAB Design Review Report	1.5.3.1	G RO												
			TAB Design Review Report	1.6.1.1	G RO												
			TAB Report for Season 1	1.5.10.2	G RO												
			TAB Report for Season 2	1.5.10.2	G RO												
			SD-07 Certificates														
			Independent TAB Agency and Personnel Qualifications	1.5.1	G RO												
			DALT and TAB Submittal and Work Schedule	1.5.3.1	G RO												
			DALT and TAB Submittal and Work Schedule	1.6.1	G RO												
			TAB Pre-Field Engineering Report	1.5.3.2	G RO												
			TAB Pre-Field Engineering Report	1.6.1.3	G RO												
			Instrument Calibration Certificates	1.5.5	G RO												
			DALT and TAB Procedures Summary	3.7	G RO												
			Completed Pre-Final DALT Work Checklist	3.7	G RO												
			Advance Notice of Pre-Final DALT Field Work	3.3.2	G RO												
			Proportional Balancing	3.4.4.1	G RO												

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		23 05 93	Proportional Balancing	3.7	G RO												
			Season 1	3.4.4.2	G RO												
			Season 1	3.7	G RO												
			Season 2	3.4.4.2	G RO												
			Season 2	3.7	G RO												
			TAB Firm	1.5.8.1	G RO												
			Design Review Report	1.3.3	G RO												
			Pre-field DALT Preliminary	1.6.1.2	G RO												
			Notification														
			Advanced Notice for Season 1	1.6.1	G RO												
			TAB Field Work														
			Prerequisite HVAC Work Check	1.6.1	G RO												
			Out List For Season 1														
			Advanced Notice for Season 2	1.6.1	G RO												
			TAB Field Work														
			Prerequisite HVAC Work Check	1.6.1	G RO												
			Out List For Season 2														
		23 07 00	SD-02 Shop Drawings														
			Pipe Insulation Systems	2.3													
			Pipe Insulation Systems	3.2													
			Duct Insulation Systems	3.3													
			Equipment Insulation Systems	3.4													
			Recycled content for insulation materials	2.3.1	S												
			SD-03 Product Data														
			Pipe Insulation Systems	2.3	G RO												

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		23 07 00	Pipe Insulation Systems	3.2	G RO												
			Duct Insulation Systems	3.3	G RO												
			Equipment Insulation Systems	3.4	G RO												
			SD-07 Certificates														
			Indoor air quality for adhesives	2.2.1	S												
			SD-08 Manufacturer's Instructions														
			Pipe Insulation Systems	2.3	G RO												
			Pipe Insulation Systems	3.2	G RO												
			Duct Insulation Systems	3.3	G RO												
			Equipment Insulation Systems	3.4	G RO												
		23 09 00	SD-02 Shop Drawings														
			DDC Contractor Design Drawings	3.3	G RO												
			Draft As-Built Drawings	3.3	G RO												
			Final As-Built Drawings	3.3	G RO												
			SD-03 Product Data														
			Programming Software	1.8.3	G RO												
			Controller Application Programs	1.8.4	G RO												
			Configuration Software	1.8.1	G RO												
			Controller Configuration Settings	1.8.2	G RO												
			Manufacturer's Product Data	2.2	G RO												
			SD-06 Test Reports														
			Pre-Construction Quality Control (QC) Checklist	1.9.1	G RO												
			Post-Construction Quality Control (QC) Checklist	1.9.2	G RO												
			Start-Up Testing Report	3.5.2	G RO												

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		23 09 00	PVT Procedures	3.6.1	G RO												
			PVT Report	3.6.3	G RO												
			SD-10 Operation and Maintenance Data														
			Operation and Maintenance (O&M) Instructions	3.7	G RO												
			Training Documentation	3.9.1	G RO												
			SD-11 Closeout Submittals														
			Enclosure Keys	2.5	G RO												
			Password Summary Report	3.2.6.1	G RO												
			Closeout Quality Control (QC) Checklist	1.9.3	G RO												
		23 11 20	SD-02 Shop Drawings														
			Gas Piping System	1.5.2	G RO												
			Gas Piping System	2.2	G RO												
			Gas Piping System	3.3	G RO												
			SD-03 Product Data														
			Pipe and Fittings	2.2.9	G RO												
			Gas Equipment Connectors	1.5.2	G RO												
			Gas Piping System	1.5.2	G RO												
			Gas Piping System	2.2	G RO												
			Gas Piping System	3.3	G RO												
			Pipe Coating Materials	2.1	G RO												
			Pressure Regulators	3.16	G RO												
			Risers	2.4	G RO												
			Valves	2.3	G RO												

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		23 11 20	Warning and Identification Tape	2.2.3	G RO												
			SD-06 Test Reports														
			Testing	3.18	G RO												
			Pressure Tests	3.18.1	G RO												
			Test with Gas	3.18.2	G RO												
			SD-07 Certificates														
			Welders Procedures and	1.5.1	G RO												
			Qualifications														
			Assigned Number, Letter, or	1.5.1	G RO												
			Symbol														
			SD-08 Manufacturer's Instructions														
			Pipe Coating Materials	2.1	G RO												
			SD-10 Operation and Maintenance														
			Data														
			Gas Facility System and	1.3.1	G RO												
			Equipment Operation														
			Gas Facility System Maintenance	1.3.2	G RO												
			Gas Facility Equipment	1.3.3	G RO												
			Maintenance														
		23 23 00	SD-02 Shop Drawings														
			Refrigerant Piping System	2.3	G RO												
			SD-03 Product Data														
			Refrigerant Piping System	2.3													
			Spare Parts	1.5.2													
			Refrigerant Piping Tests	3.5													
			Verification of Dimensions	3.1													

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		23 23 00	SD-06 Test Reports														
			Refrigerant Piping Tests	3.5													
			SD-07 Certificates														
			Service Organization	2.1													
			SD-10 Operation and Maintenance														
			Data														
			Maintenance	1.5	G RO												
			Operation and Maintenance	3.4	G RO												
			Manuals														
			Demonstrations	3.4	G RO												
		23 30 00	SD-02 Shop Drawings														
			Detail Drawings	1.4.4	G RO												
			SD-03 Product Data														
			Insulated Nonmetallic Flexible	2.9.1.1													
			Duct Runouts														
			Duct Connectors	2.9.1.1													
			Duct Access Doors	2.9.2	G RO												
			Fire Dampers	2.9.3													
			Manual Balancing Dampers	2.9.4	G RO												
			Diffusers	2.9.8.1													
			Registers and Grilles	2.9.8.2													
			Louvers	2.9.9													
			Gravity Hoods	2.9.10													
			In-Line Centrifugal Fans	2.10.1.1													
			Axial Flow Fans	2.10.1.2	GQFPE												
			Ceiling Fans	2.10.1.3													

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		23 30 00	Variable Volume, Single Duct Terminal Units	2.11.1.1	G RO												
			Test Procedures	1.4.5													
			Diagrams	1.2.1.2	G RO												
			Indoor Air Quality for Duct Sealants	2.9.1	S												
			SD-06 Test Reports														
			Performance Tests	3.11	G RO												
			SD-07 Certificates														
			Ozone Depleting Substances Technician Certification	1.4.3													
			SD-08 Manufacturer's Instructions														
			Manufacturer's Installation Instructions	3.2													
			Operation and Maintenance Training	3.13.2													
			SD-10 Operation and Maintenance Data														
			Operation and Maintenance Manuals	3.13.1	G RO												
			Fire Dampers	2.9.3	G RO												
			Manual Balancing Dampers	2.9.4	G RO												
			In-Line Centrifugal Fans	2.10.1.1	G RO												
			Axial Flow Fans	2.10.1.2	G RO												
			Ceiling Fans	2.10.1.3	G RO												

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		23 30 00	Variable Volume, Single Duct Terminal Units	2.11.1.1	G RO												
			SD-11 Closeout Submittals														
			Indoor Air Quality During Construction	3.12	S												
		23 81 00	SD-03 Product Data														
			Spare Parts	3.7.1													
			Posted Instructions	3.4													
			System Performance Tests	3.6													
			Training	3.4	G RO												
			Inventory	1.4													
			Supplied Products	2.2													
			Manufacturer's Standard Catalog Data	2.3													
			Controls Coordination Submittal	2.1	G RO												
			SD-06 Test Reports														
			Refrigerant Tests, Charging, and Start-Up	3.5	G RO												
			System Performance Tests	3.6	G RO												
			SD-07 Certificates														
			Service Organizations	3.7.2													
			SD-10 Operation and Maintenance Data														
			Operation and Maintenance Manuals	3.4	G RO												
			SD-11 Closeout Submittals														

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		23 81 00	Ozone Depleting Substances	2.3.2.2	S												
		25 05 11.01	SD-01 Preconstruction Submittals														
			Device Account Lock Exception Request	3.3.2	G												
			Multiple Ethernet Connection Device Request	3.2.3.2	G												
			Contractor Computer Cybersecurity Compliance Statements	1.10.1.6	G												
			Contractor Temporary Network Cybersecurity Compliance Statements	1.10.6	G												
			Cybersecurity Interconnection Schedule	1.8.2	G												
			Proposed STIG and SRG Applicability Report	1.8.1	G												
			SD-02 Shop Drawings														
			Network Communication Report	1.8.3	G												
			Cybersecurity Riser Diagram	1.8.6	G												
			SD-03 Product Data														
			Control System Cybersecurity Documentation	1.8.8	G												
			SD-07 Certificates														
			Software Licenses	1.9	G												
			SD-11 Closeout Submittals														
			Confidential Password Report	3.4.4.4	G												

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		25 05 11.01	Password Change Summary Report	3.4.4.4	G												
			Enclosure Keys	3.3.5	G												
			Software and Configuration Backups	1.8.5	G												
			Auditing Front End Software	3.5.3	G												
			Device Audit Record Upload Software	3.5.4.1	G												
			System Maintenance Tool Software	3.9	G												
			Control System Scanning Tools	3.11.1	G												
			STIG, SRG and Vendor Guide	1.8.7	G												
			Compliance Result Report														
			Control System Inventory Report	1.8.4	G												
		25 05 11.02	SD-01 Preconstruction Submittals														
			Device Account Lock Exception Request	3.3.2	G												
			Multiple Ethernet Connection Device Request	3.2.4.2	G												
			Contractor Computer Cybersecurity Compliance Statements	1.10.1.6	G												
			Contractor Temporary Network Cybersecurity Compliance Statements	1.10.6	G												

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		25 05 11.02	Cybersecurity Interconnection Schedule	1.8.2	G												
			Protection of Information At Rest Proposal	3.7.4	G												
			Proposed STIG and SRG Applicability Report	1.8.1	G												
			SD-02 Shop Drawings Network Communication Report	1.8.3	G												
			Cybersecurity Riser Diagram	1.8.6	G												
			SD-03 Product Data Control System Cybersecurity Documentation	1.8.8	G												
			SD-06 Test Reports Control System Cybersecurity Testing Procedures	3.14.1	G												
			Control System Cybersecurity Testing Report	3.14.3	G												
			SD-07 Certificates Software Licenses	1.9	G												
			SD-11 Closeout Submittals Confidential Password Report	3.4.4.4	G												
			Password Change Summary Report	3.4.4.4	G												
			Enclosure Keys	3.3.7	G												
			Software and Configuration Backups	1.8.5	G												

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		25 05 11.02	Auditing Front End Software	3.5.3	G												
			Device Audit Record Upload	3.5.4.2	G												
			Software														
			System Maintenance Tool	3.9	G												
			Software														
			Control System Scanning Tools	3.11.2	G												
			STIG, SRG and Vendor Guide	1.8.7	G												
			Compliance Result Report														
			Control System Inventory Report	1.8.4	G												
			Integrity Verification Software	3.13.2	G												
		26 05 48.00 10	SD-02 Shop Drawings														
			Lighting Fixtures in Buildings	3.2													
			Equipment Requirements	1.3													
			SD-03 Product Data														
			Lighting Fixtures in Buildings	3.2	G												
			Equipment Requirements	1.3	G												
			Contractor Designed Bracing	1.2.4	G												
		26 08 00	SD-06 Test Reports														
			Acceptance Tests and	3.1	G												
			Inspections														
			SD-07 Certificates														
			Qualifications	1.4.1	G												
			Acceptance Test and Inspections	1.4.3	G												
			Procedure														
		26 20 00	SD-02 Shop Drawings														
			Panelboards	2.12	G												

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		26 20 00	Transformers	2.15.3	G												
			Cable Trays	2.3	G												
			Marking Strips	3.1.9.1	G												
			SD-03 Product Data														
			Receptacles	2.11	G												
			Circuit Breakers	2.12.3	G												
			Switches	2.9	G												
			Transformers	2.15.3	G												
			Enclosed Circuit Breakers	2.13	G												
			Manual Motor Starters	2.16	G												
			Metering	2.12.4	G												
			Surge Protective Devices	2.25	G												
			Cable Trays	2.3	G												
			SD-06 Test Reports														
			600-volt Wiring Test	3.5.2	G												
			Grounding System Test	3.5.5	G												
			Transformer Tests	3.5.3	G												
			Ground-fault Receptacle Test	3.5.4	G												
			SD-07 Certificates														
			Fuses	2.10	G												
			SD-09 Manufacturer's Field														
			Reports														
			Transformer Factory Tests	2.27.1													
			SD-10 Operation and Maintenance														
			Data														
			Electrical Systems	1.5.1	G												

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		26 20 00	Metering	2.12.4	G												
		26 28 01.00 10	SD-03 Product Data														
			Fault Current Analysis	2.1													
			Protective Device Coordination Study	2.1													
			System Coordinator	1.4.1													
		26 29 23	SD-02 Shop Drawings														
			Schematic Diagrams	1.5.1	G												
			Interconnecting Diagrams	1.5.2	G												
			Installation Drawings	1.5.3	G												
			As-Built Drawings	1.5.3	G												
			SD-03 Product Data														
			Adjustable Speed Drives	2.1	G												
			Wires and Cables	2.3													
			Equipment Schedule	1.5.4													
			SD-06 Test Reports														
			ASD Test	3.3.1													
			Performance Verification Tests	3.3.2													
			Endurance Test	3.3.3													
			SD-07 Certificates														
			Testing Agency's Field Supervisor	3.3.1	G												
			SD-08 Manufacturer's Instructions														
			Installation instructions	1.5.5													
			SD-09 Manufacturer's Field Reports														

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		26 29 23	ASD Test Plan	2.5.1	G												
			Standard Products	1.5.6													
			SD-10 Operation and Maintenance														
			Data														
			Adjustable Speed Drives	2.1													
		26 32 15.00	SD-02 Shop Drawings														
			Engine-Generator Set and	2.1.1	G												
			Auxiliary Equipment														
			Auxiliary Systems	1.4.10	G												
			Detailed Drawings	1.4.9	G												
			Acceptance	3.16	G												
			SD-03 Product Data														
			Harmonic Requirements	2.1.8	G												
			Engine-Generator Set	2.1.1	G												
			Efficiencies														
			Emissions	2.12	G												
			Filters	2.7.2	G												
			Special tools	1.6	G												
			Remote Alarm Annunciator	2.13.4	G												
			Engine-Generator Parameter	2.1.1													
			Schedule														
			Heat Exchanger	2.8.2													
			Generator	2.15													
			Manufacturer's Catalog	2.5													
			Site Welding	1.4.2													
			Spare Parts	1.7.2													

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		26 32 15.00	Onsite Training	3.11													
			Vibration-Isolation	2.1.7													
			Posted Data and Instructions	3.15	G												
			Instructions	3.5.7.1	G												
			Experience	1.4.7													
			Field Engineer	1.4.8													
			General Installation	3.2													
			Exciter	2.16													
			SD-05 Design Data														
			Performance Criteria	2.15													
			Sound Limitations	2.9	G												
			Power Factor	3.5.1.2													
			Heat Exchanger	2.8.2													
			Time-Delay on Alarms	2.19.5													
			Cooling System	2.8													
			Vibration Isolation	2.1.7													
			Battery Charger	2.13.3.2													
			Capacity Calculations for Engine-Generator Set	2.1.1	G												
			Capacity Calculations for Batteries	2.1.1	G												
			SD-06 Test Reports														
			Performance Tests	3.5.9													
			Factory Inspection and Tests	2.28													
			Factory Tests	2.28.2													
			Onsite Inspection and Tests	3.5	G												

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		26 32 15.00	Acceptance Checks and Tests	3.8.1	G												
			Functional Acceptance Tests	3.9.2	G												
			Maintenance Procedures	3.11	G												
			Operation and Maintenance Manuals	3.11	G												
			Inspections	3.5.3	G												
			Functional Acceptance Test Procedure	3.8.5	G												
			SD-07 Certificates														
			Cooling System	2.8													
			Vibration Isolation	2.1.7													
			Prototype Test	2.28.2													
			Reliability and Durability	2.1.5													
			Start-Up Engineer	3.7	G												
			Instructor's Qualification Resume	3.10.1	G												
			Sound Limitations	2.9													
			Site Visit	3.1													
			Current Balance	2.15.1													
			Materials and Equipment	2.4													
			Factory Inspection and Tests	2.28													
			SD-09 Manufacturer's Field Reports														
			Engine Tests	3.5.4	G												
			Generator Tests	3.5.5	G												
			Assembled Engine-Generator Set Tests	3.5.6	G												

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		26 32 15.00	SD-10 Operation and Maintenance Data														
			Preliminary Assembled Operation and Maintenance Manuals	3.8.4	G												
			SD-11 Closeout Submittals														
			Posted Data and Instructions	3.15	G												
			Training Plan	3.10.2	G												
		26 33 53	SD-02 Shop Drawings														
			UPS Drawings	1.5.1	G												
			UPS Installation	1.5.2	G												
			SD-03 Product Data														
			UPS Module	2.5	G												
			Technical Requirements UPS System	2.4													
			Energy Star Label for Battery Charging Systems and AC-DC/AC-AC Power Supply Products	2.4.9	S												
			Spare Parts	1.4.2	G												
			SD-06 Test Reports														
			Work Plan	1.5.3	G												
			Factory Test Plan	1.5.4	G												
			Factory Test Report	1.5.5	G												
			SD-09 Manufacturer's Field Reports														
			Initial Inspection and Tests	3.2.2	G												

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		26 33 53	Performance Tests	3.2.3	G												
			Performance Test Plan	1.5.6	G												
			Performance Test Report	1.5.7	G												
			SD-10 Operation and Maintenance Data														
			UPS Operation and Maintenance	1.4.1	G												
			SD-11 Closeout Submittals Installation	3.1													
		26 36 23	SD-02 Shop Drawings														
			Automatic Transfer Switch Drawings	1.5.2	G												
			SD-03 Product Data														
			Automatic Transfer Switches	2.1	G												
			SD-06 Test Reports														
			Acceptance Checks and Tests	3.3.1	G												
			Functional Acceptance Tests	3.3.2	G												
			Factory Testing	2.3	G												
			Factory Test Reports	2.3.2	G												
			SD-07 Certificates														
			Proof of Listing	1.5.1	G												
			SD-10 Operation and Maintenance Data														
			Operation and Maintenance Manual	1.4	G												
		26 41 00	SD-02 Shop Drawings														

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(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		26 41 00	Overall lightning protection system	1.4.1.1	G												
			Each major component	1.4.1.2	G												
			SD-06 Test Reports														
			Lightning Protection and Grounding System Test Plan	1.4.3	G												
			Lightning Protection and Grounding System Test	3.5.1	G												
			SD-07 Certificates														
			Lightning Protection System Installers Documentation	1.2.3	G												
			Component UL Listed and Labeled	1.4.2	G												
			Lightning protection system inspection certificate	1.4.4	G												
			Roof manufacturer's warranty	3.1.1	G												
		26 51 00	SD-02 Shop Drawings														
			Luminaire Drawings	1.5.1	G												
			Occupancy/Vacancy Sensor Coverage Layout	1.5.9	G												
			Lighting Control System One-Line Diagram	1.7.2	G												
			Sequence of Operation for Lighting Control System	2.5.1	G												
			SD-03 Product Data														
			luminaires	2.2	G												

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ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASS S I F I C A T I O N O R A / E R E V I O W R	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		DATE FWD TO APPR AUTH/	APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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		26 51 00	Light Sources	2.3	G												
			LED Drivers	2.4	G												
			Luminaire Warranty	1.6.1	G												
			Lighting Controls Warranty	1.6.2	G												
			Local Area Controller	2.5.1.1.1	G												
			Lighting Relay Panel	2.5.1.2.1	G												
			Lighting Control Panel	2.5.1.2.2	G												
			Gateway	2.5.1.2.3	G												
			Switches	2.5.2.1	G												
			Digital Switch Timers	2.5.2.2	G												
			Wall Box Dimmers	2.5.2.3	G												
			Scene Wallstations	2.5.2.4	G												
			Occupancy/Vacancy Sensors	2.5.2.5	G												
			Photosensors	2.5.2.6	G												
			Photosensors	3.1.5.3	G												
			Time Clocks	2.5.2.7	G												
			Power Packs	2.5.2.5.4	G												
			Power Hook Luminaire Hangers	2.7.4	G												
			Exit Signs	2.6.1	G												
			Emergency Drivers	2.6.2	G												
			Linear LED Lamps	2.3.1.1	G												
			SD-05 Design Data														
			Luminaire Design Data	1.5.2	G												
			Photometric Plan	1.5.8	G												
			SD-06 Test Reports														
			ANSI/IES LM-79 Test Report	1.5.3	G												

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		26 51 00	ANSI/IES LM-80 Test Report	1.5.4	G												
			ANSI/IES TM-21 Test Report	1.5.5	G												
			ANSI/IES TM-30 Test Report	1.5.6	G												
			Occupancy/Vacancy Sensor	3.2.1.1	G												
			Verification Test														
			Photosensor Verification Test	3.2.1.1	G												
			SD-07 Certificates														
			LED Driver and Dimming Switch	1.5.7	G												
			Compatibility Certificate														
			SD-10 Operation and Maintenance														
			Data														
			Lighting System	1.7.1	G												
			Lighting Control System	1.7.2	G												
			Maintenance Staff Training Plan	3.3.2.1	G												
			End-User Training Plan	3.3.2.2	G												
		26 55 80	SD-02 Shop Drawings														
			Structural Support	1.4.1	G												
			Structural Shop Drawings	1.4.1	G												
			SD-03 Product Data														
			Light Fixtures	2.1	G												
			Fixture Arm Supports	2.2	G												
			SD-09 Manufacturer's Field														
			Reports														
			Installation Report	3.2.1	G												
			SD-10 Operation and Maintenance														
			Data														

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		26 55 80	Operation and Maintenance Manual	1.3	G												
		26 56 00	SD-02 Shop Drawings														
			Luminaire Drawings	1.5.1.1	G												
			Control System One-Line Diagram	1.7.2	G												
			Sequence of Operation for Exterior Lighting Control System	2.5.1	G												
			SD-03 Product Data														
			Luminaires	2.2	G												
			Light Sources	2.3	G												
			LED Drivers	2.4	G												
			Luminaire Warranty	1.6.1	G												
			Lighting Controls Warranty	1.6.2	G												
			Dimming Panel	2.5.1.2	G												
			Motion Sensors	3.1.3.2	G												
			Photosensors	2.5.2.2	G												
			Time Clock	2.5.2.1	G												
			Lighting Contactor	2.5.2.3	G												
			Brackets	3.1.4													
			SD-05 Design Data														
			Photometric Plan	1.5.2	G												
			SD-06 Test Reports														
			ANSI/IES LM-79 Test Reports	1.5.3	G												
			ANSI/IES LM-80 Test Reports	1.5.3	G												

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		26 56 00	SD-10 Operation and Maintenance Data														
			Lighting System	1.7.1	G												
			Exterior Lighting Control System	1.7.2	G												
			Maintenance Staff Training Plan	3.3.1.1	G												
			End-User Training Plan	3.3.1.2	G												
		27 05 29.00 10	SD-02 Shop Drawings														
			PDS Design	1.3.3	G												
			PDS Design Technical Review	1.3.4	G												
			PDS Design Approval	1.3.5	G												
			SD-03 Product Data														
			PDS Hardened Carrier	1.5.3													
			SD-04 Samples														
			PDS Carrier Surface Mounted	2.1.1													
			Pull Boxes	2.1.2.5													
			Fittings	2.1.2.3													
			SD-11 Closeout Submittals														
			User Drop Box	3.3.2.1													
			Other Enclosures	3.3.2.2													
		27 10 00	SD-02 Shop Drawings														
			Telecommunications Drawings	1.6.1.1	G												
			Telecommunications Space	1.6.1.2	G												
			Drawings														
			SD-03 Product Data														
			Telecommunications Cabling	2.3	G												
			Patch Panels	2.4.5	G												

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		27 10 00	Telecommunications	2.5	G												
			Outlet/Connector Assemblies														
			Equipment Support Frame	2.4.2	G												
			Connector Blocks	2.4.3	G												
			SD-06 Test Reports														
			Telecommunications Cabling	3.5.1	G												
			Testing														
			SD-07 Certificates														
			Telecommunications Contractor	1.6.2.1	G												
			Key Personnel	1.6.2.2	G												
			Manufacturer Qualifications	1.6.2.3	G												
			Test Plan	1.6.3	G												
			SD-09 Manufacturer's Field														
			Reports														
			Factory Reel Tests	2.10.1	G												
			SD-10 Operation and Maintenance														
			Data														
			Telecommunications Cabling and	1.10.1	G												
			Pathway System														
			SD-11 Closeout Submittals														
			Record Documentation	1.10.2	G												
		27 53 19.13	SD-01 Preconstruction Submittals														
			Qualifications	1.7.3	G AE												
			SD-02 Shop Drawings														
			System Description	1.6	G AE												
			System Layout	1.2.1	G AE												

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		27 53 19.13	Detail Drawings	1.7.2.1	G AE												
			Coordination Drawings	1.7.2.2	G AE												
			SD-03 Product Data														
			Material and Equipment	2.1	G AE												
			Uninterruptible Power Supply	2.9	G AE												
			Warranty	1.10	G AE												
			SD-05 Design Data														
			Design Analysis and Calculations	1.6.8	G AE												
			SD-06 Test Reports														
			Acceptance Test Plan	3.8.1	G AE												
			Acceptance Test Procedure	3.8.5.2	G AE												
			Acceptance Test Report	3.8.7	G AE												
			SD-07 Certificates														
			Accreditation	1.7.1	G AE												
			Certificates of Compliance	3.8.5.1	G AE												
			SD-08 Manufacturer's Instructions														
			Installation	3.4	G AE												
			SD-10 Operation and Maintenance														
			Data														
			Operation and Maintenance	1.11.1	G AE												
			Manuals														
			Training Plan	3.9.1	G AE												
			SD-11 Closeout Submittals														
			As-built System Drawings	3.8.5.1	G AE												
			Closeout Documentation	3.9.10	G AE												
		28 31 76	SD-01 Preconstruction Submittals														

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		28 31 76	Qualified Fire Protection Engineer (QFPE)	1.3.2	G												
			Fire alarm system designer	1.8.2.1	G												
			Supervisor	1.8.2.2	G												
			Technician	1.8.2.3	G												
			Installer	1.8.2.4	G												
			Test Technician	1.8.2.5	G												
			Fire Alarm System Site-Specific Software Acknowledgement	1.7	G												
			SD-02 Shop Drawings														
			Nameplates	1.8.1.3	G												
			Instructions	2.2.4	G												
			Wiring Diagrams	1.8.1.4	G												
			System Layout	1.8.1.5	G												
			Notification Appliances	1.8.1.6	G												
			Initiating devices	1.8.1.7	G												
			Amplifiers	1.8.1.8	G												
			Battery Power	1.8.1.9	G												
			Voltage Drop Calculations	1.8.1.10	G												
			SD-03 Product Data														
			Fire Alarm and Mass Notification Control Unit (FMCU)	2.3	G												
			Local Operating Console (LOC)	1.4.4	G												
			Amplifiers	1.8.1.8	G												
			Tone Generators	2.5	G												
			Digitalized voice generators	2.5	G												

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		28 31 76	LCD Annunciator	2.6.1	G												
			Manual Stations	2.7	G												
			Smoke Detectors	2.8	G												
			Duct Smoke Detectors	2.8.2	G												
			Heat Detectors	2.9	G												
			Carbon monoxide detector	2.10	G												
			Addressable Interface Devices	2.11	G												
			Addressable Control Modules	2.12	G												
			Isolation Modules	1.8.1.5	G												
			Notification Appliances	1.8.1.6	G												
			Textual Display Signs	2.13.3	G												
			Batteries	2.15.1	G												
			Battery Chargers	2.15.2	G												
			Supplemental Notification	2.15.1.1	G												
			Appliance Circuit Panels														
			Surge Protective Devices	2.16	G												
			Alarm Wiring	2.16	G												
			Back Boxes and Conduit	3.3.4	G												
			Ceiling Bridges	3.2.9	G												
			Radio Transmitter and Interface	2.19.1	G												
			Panels														
			Mass Notification Transceiver	2.18.1	G												
			Environmental Enclosures or	2.21	G												
			Guards														
			Document Storage Cabinet	3.11.3	G												
			SD-06 Test Reports														

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		28 31 76	Test Procedures	3.7.1	G												
			SD-07 Certificates														
			Verification of Compliant Installation	3.7.2.1	G												
			Request for Government Final Test	3.7.2.2	G												
			SD-10 Operation and Maintenance Data														
			Operation and Maintenance (O&M) Instructions	3.9	G												
			Instruction of Government Employees	3.10	G												
			SD-11 Closeout Submittals														
			As-Built Drawings	1.8.1.13													
			Spare Parts	1.10.1													
		31 00 00	SD-01 Preconstruction Submittals														
			Shoring	3.4	G												
			Dewatering Work Plan	1.4.3	G												
			SD-03 Product Data														
			Utilization of Excavated Materials	3.8	G												
			Shoulder Construction	3.15													
			SD-06 Test Reports														
			Testing	3.18													
			Borrow Site Testing	2.1													
			SD-07 Certificates														
			Testing	3.18													

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		31 11 00	SD-01 Preconstruction Submittals														
			Herbicide Application Plan	3.1.1													
			SD-03 Product Data														
			Tree Wound Paint	2.1.1													
			Herbicides	1.3.2	G												
			SD-07 Certificates														
			Qualifications	1.3.2	G												
			SD-11 Closeout Submittals														
			Pest Management Report	3.5.1													
		31 31 16.13	SD-01 Preconstruction Submittals														
			Termiticide Application Plan	3.1.5	G												
			SD-03 Product Data														
			Termiticides	2.2.1													
			SD-05 Design Data														
			Mixing Formulation	3.2.2													
			SD-06 Test Reports														
			Soil Moisture	1.6.1													
			Calibration Test	3.2.1													
			SD-07 Certificates														
			Qualifications	1.4.2	G												
			Foundation Exterior	3.1.2													
			Utilities and Vents	3.1.3													
			Crawl and Plenum Air Spaces	3.1.4													
			List of Equipment	3.2.1													
			SD-08 Manufacturer's Instructions														
			Termiticides	2.2.1													

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(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		31 31 16.13	SD-11 Closeout Submittals														
			Verification of Measurement	3.3.1													
			Warranty	1.7													
			Pest Management Report	3.4													
		31 32 19.16	SD-03 Product Data														
			Thread	2.1.2													
			Manufacturing Quality Control	2.2													
			Sampling and Testing														
			SD-04 Samples														
			Quality Assurance Samples and	3.1													
			Tests														
			SD-07 Certificates														
			Geotextile	2.1.1													
		32 05 33	SD-01 Preconstruction Submittals														
			Integrated Pest Management	2.4	G												
			Plan														
			SD-03 Product Data														
			Fertilizer	2.1	G												
			Mulches Topdressing	2.3													
			SD-07 Certificates														
			Maintenance Inspection Report	3.3.1													
			Plant Quantities	3.3.2	G												
			SD-10 Operation and Maintenance														
			Data														
			Maintenance	3.2.1													
			SD-11 Closeout Submittals														

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		32 05 33	Tree Staking and Guying Removal	3.3.3													
		32 11 23	SD-03 Product Data														
			Plant, Equipment, and Tools	1.4	G												
			SD-06 Test Reports														
			Initial Tests	2.3.1	G												
			In-Place Tests	3.12.1	G												
		32 11 23.23	SD-03 Product Data														
			Plants, Equipment, and Tools	1.3.1	G												
			SD-06 Test Reports														
			Initial Tests	1.4.3.1	G												
			In-Place Tests	1.4.3.2	G												
			Test Section Construction Report	3.6.7													
		32 12 13	SD-06 Test Reports														
			Sampling and Testing	3.7													
		32 12 16.16	SD-02 Shop Drawings														
			Placement Plan	2.1	G												
			SD-03 Product Data														
			Diamond Grinding Plan	2.1.5	G												
			Mix Design	2.4	G												
			Contractor Quality Control	3.1	G												
			SD-04 Samples														
			Aggregates	2.2													
			Asphalt Cement Binder	2.3													
			SD-06 Test Reports														
			Aggregates	2.2	G												

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		32 12 16.16	QC Monitoring	3.1.3.9													
			SD-07 Certificates														
			Asphalt Cement Binder	2.3	G												
			Laboratory Accreditation and Validation	1.4.11													
		32 13 13.06	SD-03 Product Data														
			Curing Materials	2.1.6													
			Reinforcement	2.1.5.3													
			Epoxy Resin	2.1.8													
			Epoxy Resin	2.1.8													
			Cementitious Materials	2.1.1	G												
			Cementitious Materials	2.1.1	G												
			Dowel Bars	2.1.5.1													
			Expansion Joint Filler	2.1.9.1													
			SD-04 Samples														
			Test Section	1.5.2	G												
			SD-05 Design Data														
			Mix Design Report	2.2.2	G												
			SD-06 Test Reports														
			Concrete Slump Tests	3.7.2													
			Concrete Uniformity	2.3.1													
			Flexural Strength	3.7.3													
			Air Content	3.7.4													
			SD-07 Certificates														
			Batch Tickets	1.3.3													

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						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION	DATE RCD FRM APPR AUTH	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		32 13 13.06	NRMCA Certificate Of Conformance	1.3.1													
			SD-08 Manufacturer's Instructions Diamond Grinding Plan	3.7.5.3													
		32 13 73.19	SD-03 Product Data Equipment	2.1													
			Manufacturer's Instructions	3.1.1													
			SD-04 Samples Compression Seals	2.2	G												
			SD-06 Test Reports Test Requirements	2.1.3	G												
		32 15 00	SD-03 Product Data Plant, Equipment, and Tools	1.4	G												
			SD-06 Test Reports Initial Tests	2.3.1	G												
			In-Place Tests	3.11.1	G												
		32 16 19	SD-03 Product Data Concrete	2.1													
			Biodegradable Form Release Agent	3.2													
			SD-06 Test Reports Field Quality Control	3.8													
		32 17 23	SD-03 Product Data Surface Preparation Equipment List	2.1.1.1	G												
			Application Equipment List	2.1.2	G												

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		32 17 23	Exterior Surface Preparation	3.2													
			Safety Data Sheets	1.3.1	G												
			Reflective media for airfields	2.2.2.1	G												
			Waterborne Paint	2.2.1	G												
			SD-06 Test Reports														
			Reflective Media for Airfields	2.2.2.1	G												
			Waterborne Paint	2.2.1	G												
			Test Reports	3.4.1													
			SD-07 Certificates														
			Qualifications	1.3.2	G												
			Reflective Media for Airfields	2.2.2.1													
			Waterborne Paint	2.2.1													
			Volatile Organic Compound	1.3.1	G												
			SD-08 Manufacturer's Instructions														
			Waterborne Paint	2.2.1	G												
		32 31 13.53	SD-02 Shop Drawings														
			Fence Installation Drawings	3.2.1	G												
			Ornamental Fence Systems	3.2.3	G												
			Installation Drawings														
			Security Slide Gate System	3.2.3	G												
			Installation Drawings														
			SD-03 Product Data														
			Fabric	2.1.1.1													
			Posts	2.1.3													
			Post Caps	2.1.3.2													
			Chain Link Braces	2.1.4													

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		32 31 13.53	Line Posts	2.1.3.1													
			Bottom Rail	2.1.4													
			Tension Wire	2.1.3.2													
			Barbed Wire	2.2.1.2													
			Barbed Wire Supporting Arms	2.1.3.2													
			Latches	2.1.5.3													
			Hinges	2.1.5.3													
			Stops	2.1.5.3													
			Keepers	2.1.5.3													
			Rollers	2.1.5.3													
			Turnstiles	2.1.7													
			Padlocks	2.1.8													
			Wire Ties	2.2.1.1													
			Blast Fence	2.4													
			Security Swing Gates	2.5													
			Security Slide Gates	2.6													
			Slide Gates	2.1.6.1													
			Fence Fabric Reinforcement	2.3													
			SD-07 Certificates														
			Chain Link Fence	2.1.3.1													
			Fabric	2.1.1.1													
			Barbed Wire	2.2.1.2													
			Gate Hardware and Accessories	3.2.1													
			Concrete	2.2.2													
			Gate Operator	2.1.9													

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		32 31 13.53	SD-10 Operation and Maintenance Data														
			Electro-Mechanical Locks	2.1.10													
			Gate Operator	2.1.9													
			Operating and maintenance instructions	3.2.10													
		32 92 23	SD-03 Product Data														
			Fertilizer	2.4													
			SD-06 Test Reports														
			Topsoil composition tests	2.2.3													
			SD-07 Certificates														
			sods	2.1													
		33 11 00	SD-01 Preconstruction Submittals														
			Connections	3.1.1	G												
			SD-03 Product Data														
			Pipe, Fittings, Joints and Couplings	2.1.1	G												
			Valves	2.1.2	G												
			Valve Boxes	2.1.2.4	G												
			Fire Hydrants	2.1.3.1	G												
			Pipe Restraint	2.2.1	G												
			Tapping Sleeves	2.2.2	G												
			Disinfection Procedures	3.2.2	G												
			SD-06 Test Reports														
			Bacteriological Samples	3.3.1.4	G												
			Hydrostatic Sewer Test	3.2.1.1.6													

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		33 11 00	Leakage Test	3.3.1.3													
			Hydrostatic Test	3.3.1.1													
			SD-07 Certificates														
			Pipe, Fittings, Joints and Couplings	2.1.1													
			Lining for Fittings	2.1.1.1.1.2													
			Valves	2.1.2													
			Fire Hydrants	2.1.3.1													
			SD-08 Manufacturer's Instructions														
			PVC Piping	2.1.1.1.1.1													
			PVC Piping For Service Lines	2.1.1.1.2													
		33 11 23	SD-03 Product Data														
			Valve Box	2.7													
			Pressure Regulator	2.4.3													
			Gas Equipment Connectors	2.6													
			Valves	2.4													
			Warning and Identification Tape	2.9													
			Risers	2.2.3													
			Transition Fittings	2.2.4													
			Gas meter	2.5													
			SD-07 Certificates														
			Welder's Qualifications	1.3.1													
			PE Welder's Qualifications	1.3.2													
			Welder's Identification Symbols	1.3.1													
			SD-08 Manufacturer's Instructions														
			PE Pipe and Fittings	2.2.2													

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		33 30 00	SD-01 Preconstruction Submittals														
			Contractor's License	1.3.1	G												
			SD-02 Shop Drawings														
			Installation Drawings	3.1.1	G												
			SD-03 Product Data														
			Precast Concrete Manholes	2.2.5													
			Frames, Covers, and Gratings	2.2.8													
			Gravity Pipe	2.2.1													
			SD-06 Test Reports														
			Precast Concrete Sewer Manhole	3.3.1.2.1	G												
			Test														
			Hydrostatic Sewer Test	3.3.1.1	G												
			Negative Air Pressure Test	3.3.1.2.1	G												
			Low-Pressure Air Tests	3.3.1.2.2	G												
			SD-07 Certificates														
			Portland Cement	2.2.3													
			Gaskets	2.2.1.1.2													
			Pre-Installation Inspection	3.3.2.1	G												
			Request														
			Post-Installation Inspection	3.3.2.2	G												
		33 31 23.00 10	SD-06 Test Reports														
			Disposal of Waste Water	3.2													
			Final Test Report	3.2													
		33 32 16	SD-02 Shop Drawings														
			Fabrication Drawings	2.1													
			Erection/Installation Drawings	2.1													

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		33 32 16	SD-03 Product Data														
			Submersible Sewage Nonclog Pumps	2.2	G												
			Pump Performance Curve	2.3	G												
			Pump Motor	2.3	G												
			Pump Control System	2.4	G												
			Wet Well and Valve Vault	2.5.1	G												
			Flexible Flanged Coupling	2.6.5	G												
			Station Piping	2.6	G												
			Valves	2.7	G												
			Spare Parts Data	3.3.1	G												
			Access Hatch Covers	2.5.2													
			SD-05 Design Data														
			Buoyancy Calculations	2.5.1.1	G												
			Buoyancy Calculations	2.5.1.2	G												
			SD-06 Test Reports														
			Pump Test	3.2.1	G												
			Float Test	3.2.1	G												
			SD-07 Certificates														
			Submersible Sewage Nonclog Pumps	2.2	G												
			Recycled Material Content	2.5.1.2	G												
			Manhole Chamber	2.1	G												
			Access Hatch Covers	2.5.2													
			Gate Valves	2.7.1	G												
			Check Valves	2.7.2	G												

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		33 32 16	Blowers	2.5.3.1	G												
			Pump Motor	2.3	G												
			SD-08 Manufacturer's Instructions														
			Manhole Chamber	2.1	G												
			Access Hatch Covers	2.5.2													
			Pump Control System	2.4	G												
			Gate Valves	2.7.1	G												
			Check Valves	2.7.2	G												
			Blowers	2.5.3.1	G												
			Pump Motor	2.3	G												
			Special Tools	3.3.1	G												
			Posted Instructions	3.3.1	G												
			SD-10 Operation and Maintenance														
			Data														
			Operation And Maintenance	3.3.1													
			Manuals														
			SD-11 Closeout Submittals														
			Warranty	1.5	G												
		33 40 00	SD-04 Samples														
			Pipe for Culverts and Storm	2.1													
			Drains														
			SD-07 Certificates														
			Resin Certification	2.1.3													
			Resin Certification	2.1.4													
			Oil Resistant Gasket	2.4.5.1													
			Leakage Test	3.9.3.1													

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(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		33 40 00	Hydrostatic Test on Watertight Joints	3.9.1.1													
			Determination of Density	3.9.1.2													
			Frame and Cover for Gratings	2.4.4													
			Post-Installation Inspection Report	3.9.2.1.3													
			SD-08 Manufacturer's Instructions														
			Placing Pipe	3.3													
		33 46 16	SD-04 Samples														
			Geotextile	2.2													
			Pipe and Pipe Fittings	2.1													
			SD-06 Test Reports														
			Geotextile JP-4 Fuel Resistance Test	2.5.1													
			SD-07 Certificates														
			Geotextile	2.2													
			Pipe and Pipe Fittings	2.1													
		33 82 00	SD-02 Shop Drawings														
			Telecommunications Outside Plant	1.6.1.1	G												
			Telecommunications Entrance Facility Drawings	1.6.1.2	G												
			SD-03 Product Data														
			Wire and Cable	2.7	G												
			Cable Splices, and Connectors	2.4	G												
			Closures	2.3	G												

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SECTION 01 33 29

SUSTAINABILITY REQUIREMENTS AND REPORTING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

COUNCIL ON ENVIRONMENTAL QUALITY (CEQ) (WHITE HOUSE)

HPSB Guiding Principles	(2016) Guiding Principles for Sustainable Federal Buildings and Determining Compliance with the Guiding Principles for Sustainable Federal Buildings

INTERNATIONAL CODE COUNCIL (ICC)

ICC IGCC	(2018) International Green Construction Code

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

ANSI/SMACNA 008	(2007) IAQ Guidelines for Occupied Buildings Under Construction, 2nd Edition

U.S. DEPARTMENT OF AGRICULTURE (USDA)

FSRIA 9002	Farm Security and Rural Investment Act Section 9002 (USDA BioPreferred Program)

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 1-200-02	(2020) High Performance and Sustainable Building Requirements

UFC 3-600-01	(2016; with Change 6, 2021) Fire Protection Engineering for Facilities

U.S. DEPARTMENT OF ENERGY (DOE)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED v4 BD+C	LEED v4 Building Design and Construction

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 247	Comprehensive Procurement Guideline for Products Containing Recovered Materials

1.2 SUMMARY

This section includes requirements for Sustainability documentation and reporting submittals per the federally mandated High Performance and Sustainable Building (HPSB) or HPSB "Guiding Principles" (GP), and Third Party Certification (TPC) requirements, in accordance with UFC 1-200-02 High Performance and Sustainable Building Requirements, and other identified requirements.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. All submittals go to the resident office (RO) since they administer the construction contract. The resident office then either reviews the submittal or routes it to others for review. All submittals go to the resident office (RO) since they administer the construction contract. The resident office then either reviews the submittal or routes it to others for review. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Preliminary High Performance and Sustainable Building Checklist; G S

Sustainability Action Plan; G S

Preliminary Sustainability eNotebook; G

SD-11 Closeout Submittals

Sustainability Progress Reports; G S

Final High Performance and Sustainable Building Checklist; G S

Final Sustainability eNotebook; G

Amended Final Sustainability eNotebook; G

Amended Final High Performance and Sustainable Building Checklist; G S

Third Party Certification Certificate, Assessment, or Validation and Compliance Report; G S

1.4 GUIDING PRINCIPLES VALIDATION (GPV)

Provide the following sustainability activities and documentation to verify achievement of HPSB Guiding Principles Validation (GPV):

- a. Analysis of each Guiding Principle Requirement and how project complies. Include final Government approved narrative(s) in the HPSB Checklist submittal. Multiple checklists indicate multiple buildings that require individual HPSB Checklist tracking.
- b. No changes to the HPSB Checklist are allowed without approval from the

Contracting Officer, in accordance with Section 01 33 00 SUBMITTAL REQUIREMENTS. Immediately bring to the attention of the Contracting Officer any project changes that impact meeting the approved HPSB Guiding Principles Requirements for this project. Demonstrate the change will not increase the life-cycle cost and maintains or improves the building performance.

- c. Documentation of all work required to incorporate the applicable HPSB Guiding Principles requirements indicated on the HPSB Checklist and in this contract, including all "S" submittals.
- d. Sustainability Action Plan.
- e. Design and construction related documentation for the project Sustainability eNotebook and keep updated with regularly-scheduled Construction Quality Control Meetings. Include design and construction related documentation containing the following components:
 - (1) HPSB Checklist(s)
 - (2) Sustainability Action Plan
 - (3) Documentation illustrating HPSB Guiding Principles Requirements compliance, including "S" submittals

1.4.1 Sustainability Action Plan

Include the following information in the Sustainability Action Plan:

- a. Analysis of each HPSB Guiding Principles Requirement and how project will comply. Final Government approved narrative(s) must be included in the HPSB Checklist submittal.
- b. Name and contact information for: Contractor's Point of Contact (POC) ensuring sustainability goals are accomplished and documentation is assembled.
- c. Indoor Air Quality plan.

1.4.2 Calculations

Provide all calculations, product data, labels and product certifications required in this specification to demonstrate compliance with the HPSB Guiding Principles Requirements.

1.5 SUSTAINABILITY SUBMITTALS

Provide HPSB Checklist and other documentation in the Sustainability Notebook to indicate compliance with the sustainability requirements of the project.

1.5.1 High Performance Sustainable Building (HPSB) Checklist

Provide construction documentation that provides proof of, and supports compliance with, the completed HPSB Checklist.

1.5.1.1 HPSB Checklist Submittals

Submit updated HPSB Checklist with each Sustainability eNotebook

submittal. Include the final HPSB Checklist(s) with the interim DD1354 Real Property Record Submittal.

1.5.2 "S" Submittals for Sustainability Documentation

"S" submittals are the sustainability documentation requirements cited in the various sections of this contract. Submit the GPV and TPC sustainability documentation required in this section as "S" submittals in all affected UFGS Sections.

- a. Highlight GPV and TPC compliance data in "S" submittal.
- b. Add "S" submittals to the Sustainability eNotebook only after submittal approval, and bookmark them as required in paragraph SUSTAINABILITY ENOTEBOOK below.
- c. Ensure all approved "S" submittals are included in each Sustainability eNotebook submittal.

1.5.3 Sustainability Progress Reports

Submit monthly progress reports comparing actual GPC and TPC activities to the Sustainability Action Plan.

1.5.4 Sustainability Notebook

The Sustainability Notebook is an electronic organizational file that serves as a repository for all required sustainability submittals. To support documentation of compliance with an approved HPSB and TPC checklist, provide and maintain a comprehensive and current Sustainability Notebook. Include all required data in Sustainability eNotebook, to support full compliance with the HPSB Guiding Principles Requirements, including:

- a. HPSB checklist
- b. Sustainability Action Plan
- c. Sustainability Progress Reports
- d. Calculations
- e. Labels
- f. "S" submittals
- g. Certifications, assessments, or validations and compliance report
- h. TPC documentation required in paragraph THIRD PARTY CERTIFICATION (TPC).

1.5.4.1 Sustainability eNotebook Format

Provide Sustainability eNotebook in the form of an Adobe PDF file; bookmark each HPSB Guiding Principles Requirement, TPC requirement, and sub-bookmark at each document. Match format to HPSB Guiding Principles numbering system indicated herein. Maintain up-to-date information, such as spreadsheets, templates, with each current submittals. For TPC projects, provide a second Table of Contents using TPC numbering system,

for maintaining documentation unique to TPC.

Contracting Officer may deduct from the monthly progress payment accordingly if Sustainability eNotebook information is not current and on track per project goals.

1.5.4.2 Sustainability eNotebook Submittal Schedule

Provide Sustainability eNotebook Submittals at the following milestones of the project:

a. Preliminary Sustainability eNotebook

Submit preliminary Sustainability eNotebook with updated Preliminary High Performance and Sustainable Building Checklist and TPC checklist at the first post award meeting in accordance with Section 01 30 00 ADMINISTRATIVE REQUIREMENTS.

b. Construction Quality Control Meetings.

Provide up-to-date GP and TPC documentation in the Sustainability eNotebook and TPC Online tool for each meeting.

c. Final Sustainability eNotebook

Submit updated Sustainability eNotebook with updated Final High Performance and Sustainable Building Checklist and TPC Checklist at Beneficial Occupancy Date (BOD). Final progress payment retainage may be held by Contracting Officer until Final Sustainability construction phase documentation is complete.

d. Amended Final Sustainability eNotebook

Amend and resubmit the Amended Final Sustainability eNotebook with Amended Final High Performance and Sustainable Building Checklist and amended TPC Checklist, to include post-occupancy corrections, updates, and requirements. Final progress payment retainage may be held by Contracting Officer until amended final sustainability documentation is complete. Submit the Amended Final Sustainability eNotebook Submittal on DVDs to the Contracting Officer no later than 30 days after final GP, TPC determination.

1.6 DOCUMENTATION REQUIREMENTS

a. Incorporate each of the following HPSB Guiding Principles requirements into project and provide documentation that proves compliance with each listed requirement. Items below are organized by HPSB Guiding Principles. For life-cycle cost analysis requirements, one document with all analyses is acceptable, with Contracting Officer approval.

b. For each of the following paragraphs that require the use of products listed on Government-required websites, provide documentation of the process used to select products, or process used to determine why listed products do not meet project performance requirements.

1.6.1 Commissioning (Cx)

Develop and incorporate Commissioning requirements into the documents, in

accordance with Section 01 91 00.15 10 TOTAL BUILDING COMMISSIONING.

1.6.2 Energy Efficient Products

Provide only energy-using products that are Energy Star rated or have Federal Energy Management Program (FEMP) recommended efficiency. Where Energy Star or FEMP recommendations have not been established, provide most efficient products that are life-cycle cost-effective. Provide only energy using products that meet FEMP requirements for low standby power consumption. Energy efficient products can be found at:
<https://www.energy.gov/eere/femp/federal-energy-management-program> and
<http://www.energystar.gov/>.

For construction submittal documentation, provide proof that product is labeled energy efficient and complies with the cited requirements.

1.6.3 Building-level Power Metering

Provide building-level meters for electricity, natural gas, and steam where applicable.

1.6.3.1 Construction Submittal Documentation

Provide manufacturer's data validating compatibility with base-wide system and component advanced meter requirements.

1.6.4 Indoor Water Use

Provide Construction Documentation proof that fixtures are labeled EPA WaterSense, for products available with EPA WaterSense labeling; for all other fixtures, proof they comply with EPA WaterSense efficiency requirements.

1.6.5 Indoor Water Metering

Provide building-level meters for potable water use. Provide the requirements cited in the following paragraphs:

1.6.5.1 Construction Submittal Documentation

Provide manufacturer's data validating compatibility with base-wide system and component advanced meter requirements.

1.6.6 Outdoor Water Use

Where new irrigation is required, provide only non-potable sources. Provide the requirements cited in the following paragraphs:

1.6.6.1 Construction Submittal Documentation

Provide manufacturer's data validating compatibility with base-wide system and component advanced meter requirements.

1.6.7 Outdoor Water Meters

Provide meters for outdoor systems that use potable water. Provide the requirements cited in the following paragraphs:

1.6.7.1 Construction Submittal Documentation

Provide manufacturer's data validating compatibility with base-wide system and component advanced meter requirements.

1.6.8 Moisture Control

Provide the following:

1.6.8.1 Construction Submittal Documentation

Ensure construction materials are separated and protected in accordance with other sections in this contract document, with adequate humidity controls during construction. Include and implement the following requirements in the IAQ construction management plan:

- a. Protect materials stored on-site, or materials installed that are absorptive, from moisture damage.
- b. Do not install materials that show visual evidence of biological growth due to the presence of moisture.

1.6.9 Reduce Volatile Organic Compounds (VOC) (Low-Emitting Materials)

Meet the requirements of Table 3-1 at the end of this specification.

For Construction submittal documentation, provide certifications or labels that demonstrate compliance with cited requirements, based on the attached TABLE 3-1.

1.6.10 Indoor Air Quality During Construction

Prior to construction, create indoor air quality plan. Develop and implement an IAQ construction management plan during construction and flush building air before occupancy.

Meet the requirements of ICC IGCC 1001.3.1.5 (10.3.1.4) Indoor Air Quality (IAQ) Construction Management and ANSI/SMACNA 008 IAQ Guidelines for Occupied Buildings Under Construction.

Provide documentation showing that after construction ends and prior to occupancy, HVAC filters were replaced and building air was flushed out in accordance with the cited standard.

1.6.11 Recycled Content

Comply with 40 CFR 247. Refer to:
<https://www.epa.gov/smm/comprehensive-procurement-guideline-cpg-program>
for assistance identifying products cited in 40 CFR 247. Selected products must comply with non-proprietary requirements of the Federal Acquisition Regulation and must meet performance requirements.

1.6.11.1 Construction Submittal Documentation

- a. Provide manufacturers' documents stating the recycled content by material, or written justification for claiming one of the exceptions allowed on the cited website.
- b. Substitutions: Submit for Government approval for proposed

alternative products or systems that provide equivalent performance and appearance and have greater contribution to project recycled content requirements. For all such proposed substitutions, submit with the Sustainability Action Plan accompanied by product data demonstrating equivalence.

- c. In order to complete compliance with FAR 52.223-9 Estimate of Percentage of Recovered Material Content for EPA Designated Items, refer to submittal requirement for recycled/recovered material content in Section 01 78 00 CLOSEOUT SUBMITTALS.

1.6.12 Bio-Based Products

Provide products and materials composed of the highest percentage of bio-based materials (including rapidly renewable resources and certified sustainably harvested products), consistent with FSRIA 9002 USDA BioPreferred Program, to the maximum extent possible without jeopardizing the intended end use or detracting from the overall quality delivered to the end user and when available at a reasonable cost. Use only supplies and materials of a type and quality that conform to applicable specifications and standards.

Comply with FSRIA 9002 USDA BioPreferred Program. Refer to www.biopreferred.gov for the product categories and BioPreferred Catalog. Selected products must comply with non-proprietary requirements of the Federal Acquisition Regulation and must meet performance requirements. Provide the following documentation:

- a. USDA BioPreferred label for each product; for bio-based products used on project but not listed with BioPreferred program, provide bio-based content and percentage.
- b. In order to complete compliance with FAR 52.223-1 Biobased Product Certification, refer to submittal requirement for biobased products in Section 01 78 00 CLOSEOUT SUBMITTALS, paragraphs CERTIFICATION OF EPA DESIGNATED ITEMS and CERTIFICATION OF USDA DESIGNATED ITEMS.

1.6.13 Waste Material Management (Recycling - Construction)

Divert demolition and construction debris in accordance with Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

1.6.14 Additional Sustainability Requirements

1.6.14.1 Third Party Certification (TPC) Documentation

Third Party Certification certificate, assessment, or validation, and compliance report requirements are in addition to all requirements under header above GUIDING PRINCIPLES VALIDATION (GPV).

1.6.14.1.1 TPC Already Registered

Project is already registered with TPC organization to achieve LEED v4 BD+C Silver. Project registered on May 2, 2022 number: 1000159257. When applicable, request TPC online access turnover from Government. Manage and provide all documentation for requirements of TPC and obtain Final Certification or validation. Third Party Certification is met when Government receives TPC organization certificate, assessment, or validation and compliance report and plaque.

1.6.14.1.2 TPC Management and Certification

Execute the following TPC Certification, assessment, or validation requirements:

- a. Refer to TPC Checklist at the end of this specification section.
(Multiple checklists indicate multiple buildings that require TPC.)
- b. Immediately bring to the attention of the Contracting Officer any project changes that impact meeting the approved TPC Requirements for this project. Demonstrate the change will not increase the life-cycle cost and maintains or improves the building performance.
- c. Complete all work required to incorporate the applicable TPC Requirements.
- d. Maintain the construction related information in the Sustainability eNotebook pertaining to additions and changes to the approved sustainability requirements. When construction changes are made that affect design sustainability requirements, provide all required updates to affected design requirements and update in the Sustainability eNotebook. Maintain the Sustainability eNotebook in electronic format. For more explanation, refer to paragraph SUSTAINABILITY eNOTEBOOK. Provide the following components in the Sustainability eNotebook, in addition to the GPV components above:
 - (1) TPC Checklist
 - (2) Completed TPC forms. Transmit by the method required by the TPC organization.
 - (3) Copy of all correspondence with the TPC organization including proof of TPC registration.
 - (4) Documentation illustrating compliance with TPC requirements and additional documentation as requested by the TPC.
 - (5) TPC Award Certificate, assessment, or validation and compliance report.
- e. Provide the following information in the Sustainability Action Plan. Provide this TPC information in addition to the Sustainability Action Plan items above:
 - (1) Planned method to achieve each TPC requirement.
 - (2) For each TPC requirement that is attempted but not achieved, provide narrative explaining how mission or activity precludes achieving specific sustainability requirement or goal. Provide analysis of particular requirement and level to which project is able to comply.
 - (3) Provide name and contact information for: Sustainability point of contact (POC) and other names of sustainability professionals responsible for ensuring TPC sustainability goals are accomplished and documentation is assembled. Sustainability POCs are also responsible for ensuring GPV required in paragraph GUIDING PRINCIPLES VALIDATION (GPV) above.

- (4) A LEED Accredited Professional(s) with BD+C Specialty on the Contractor's staff is responsible for ensuring LEED v4 BD+C prerequisites and credits are earned and responsible for assembling documentation. Provide statement of qualifications for LEED AP BD+C including resume, previous LEED v4 BD+C project experience, and copy of current BD+C credential.
- f. Bear all costs associated with construction changes that affect sustainability design requirements, constructing, demonstrating, and documenting that project complies with approved TPC requirements, including but not limited to:
- (1) Final TPC review, certification, assessment, or validation and plaque fees.
 - (2) Online (or offline with secure facilities) TPC management and documentation.
 - (3) Obtaining TPC certification or validation based on Government-approved sustainability goals.
 - (4) Construction work required to incorporate TPC requirements.
 - (5) Submittals required to demonstrate compliance with Government approved TPC checklists.
- g. Provide all calculations, product data, and certifications, assessments, or validations required in this specification to demonstrate compliance with the TPC Requirements.
- h. Provide all TPC management and documentation. Transmit TPC requirements by the method required by TPC organization.
- i. Provide all required responses to third party organization.
- j. Provide TPC Plaque and Certificate, assessment, or validation. Provide TPC compliance report that includes level achieved and reasons for non-compliance or not applicable elements. Use format below to create the Plaque, Certificate, assessment or validation, compliance report, and Letter of Congratulations (when provided). Forward to parties designated by Contracting Officer:
- (1) Plaque:

16 inch sand blasted clear glass plaque with Type B aluminum brackets (www.greenplaque.com)
 - (2) Certificate, Assessment or Validation:

Project Title, first line: P-(X); Form DD1391 Project Name).

Project Title, second line: UIC (Installation code)
 - (3) Letter Congratulations (when provided):

Address letter to Facility's Installation Commander Name. Address the letter to an individual person.

(4) Compliance Report:

Title page must cite Project title: P-(X); (1391 Project Name);
Final Building Name if known; UIC (installation code); Owner
Service; User organization if known; date of compliance.

Include TPC scoresheet if applicable.

- k. Once Final Certification is achieved, turn over Administrative rights to online TPC to the Department of Public Works or designee, contact information provided by the Contracting Officer.

1.7 TPC DOCUMENTATION

Incorporate LEED v4 BD+C prerequisites and credits as identified in Attachment 2 into Project construction.

- a. Provide documentation as required by Contract Documents and in full compliance with LEED v4 BD+C. Use LEED v4 BD+C credit forms and calculators.
- b. LEED v4 BD+C prerequisites and credits not identified elsewhere in the Contract Documents and those requiring further instruction are specified below.
- c. Contractor's LEED AP BD+C may evaluate substitution of LEED v4 and v4.1 credits in accordance with current USGBC requirements to maximize achievement of construction credits.

1.7.1 Materials and Resources: Building Product Disclosure and Optimization

1.7.1.1 Environmental Product Declarations

Use at least 20 different permanently installed products sourced from at least five different manufacturers with Environmental Product Declarations.

Additional Point Available: Use at least five permanently installed products sourced from at least three different manufacturers with a compliant embodied carbon optimization report or action plan.

1.7.1.2 Sourcing of Raw Materials

Use products sourced from at least three different manufacturers that meet at least one of the responsible sourcing and extraction criteria below for at least 15 percent, by cost, of the total value of permanently installed building products in the project.

Responsible sourcing and extraction criteria include Extended Producer Responsibility, Bio-based Materials, Certified Wood Products, Materials Reuse, and Recycled Content.

- a. Provide statement of material cost for each product. Document Sustainable Criteria Value (\$) by method described in LEED v4 BD+C.

Additional Point Available: Meet the requirements above for at least 30 percent, by cost, of the total value of permanently installed building products in the project.

1.7.1.3 Material Ingredients

Use at least 20 different permanently installed products from at least five different manufacturers that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1 percent (1000 ppm).

- a. ANSI/BIFMA e3 Furniture Sustainability Standard
- b. Cradle to Cradle
- c. Declare labels designated as Red List Free, LBC Red List Free, or Declared
- d. Declare labels designated as LBC Red List Approved or LBC Compliant that demonstrate content inventory to 0.1 percent (1000 ppm).
- e. Facts - NSF/ANSI 336: Sustainability Assessment for Commercial Furnishings Fabric
- f. Global Green TAG PHD labels
- g. Health Product Declaration
- h. Living Product Challenge
- i. Manufacturer Inventory
- j. Product Lens Certification

Additional Point Available: Use at least five permanently installed products sourced from at least three different manufacturers that have a compliant material ingredient optimization report or action plan.

1.7.2 Indoor Environmental Quality: Low-Emitting Materials

For field applications that are inside the weatherproofing system, meet the requirements of Table 3-1 at the end of this specification.

1.7.2.1 Paints and Coating

- a. Emissions: Document compliance for 75 percent of products, by volume.
- b. VOC Content (g/L): Document compliance for 100 percent of products, by volume, with SCAQMD Rule 1113, effective date per LEED v4 BD+C.
- c. Provide statement of application volume (L) for each product.

1.7.2.2 Adhesives and Sealants

- a. Emissions: Document compliance for 75 percent of products, by volume.
- b. VOC Content (g/L): Document compliance for 100 percent of products, by volume, with SCAQMD Rule 1168, effective date per LEED v4 BD+C.
- c. Provide statement of application volume (L) for each product.

1.7.2.3 Flooring

- a. Emissions: Document compliance for 90 percent of products, by cost.
- b. Provide statement of material cost for each product.

1.7.2.4 Wall Panels

- a. Emissions: Document compliance for 75 percent of products, by cost.
- b. Provide statement of material cost for each product.

1.7.2.5 Ceilings

- a. Emissions: Document compliance for 90 percent of products, by cost.
- b. Provide statement of material cost for each product.

1.7.2.6 Insulation

- a. Emissions: Document compliance for 75 percent of products, by cost.
- b. Provide statement of material cost for each product.

1.7.2.7 Furniture

- a. Emissions: Document compliance for 75 percent of products, by cost.
- b. Provide statement of material cost for each product.

1.7.2.8 Composite Wood

- a. Emissions: Document compliance for 75 percent of products, by cost.
- b. Provide statement of material cost for each product.

1.7.3 Indoor Environmental Quality: Construction IAQ Management Plan

Develop and implement an indoor air quality plan for the construction and preoccupancy phases of the building in compliance with SMACNA's "IAQ Guidelines for Occupied Buildings under Construction."

- a. If Contracting Officer authorizes use of permanent heating, cooling, and ventilating systems during construction period, install MERV 8 filter media at each return-air inlet for the air-handling system used during construction.
- b. Replace air filters immediately prior to occupancy.

1.7.4 Indoor Environmental Quality: IAQ Assessment

After construction ends and before occupancy, but under ventilation conditions typical for occupancy, conduct indoor air quality testing using protocols consistent with the methods listed in LEED v4 BD+C. Include IAQ assessment requirements in the Construction IAQ Management Plan.

Air-Quality Testing: Engage testing agency to perform the following:

- a. Conduct baseline IAQ testing, after construction ends and prior to

occupancy, using testing protocols consistent with the EPA's "Compendium of Methods for the Determination of Air Pollutants in Indoor Air" and as additionally detailed in LEED v4 BD+C.

- b. Demonstrate that the contaminant maximum concentrations listed below are not exceeded:

- (1) Particulates (PM10): 50 micrograms/cu. m.
- (2) Ozone: 0.075 ppm, according to ASTM D5149.
- (3) Carbon Monoxide: 9 ppm and no greater than 2 ppm above outdoor levels.
- (4) Total Volatile Organic Compounds: 500 micrograms/cu. m.
- (5) Formaldehyde: 27 ppb.
- (6) Target Volatile Organic Compounds: Maximum concentration as listed in CDPH Standard Method v1.1, Table 4-1 as detailed in the LEED BDC Ref Guide.

- c. For each sampling point where the maximum concentration limits are exceeded, take corrective action until requirements have been met.

- d. Conduct air-sample testing as follows:

- (1) Conduct all measurements prior to occupancy but during normal occupied hours, and with building ventilation system starting at the normal daily start time and operated at the minimum outside-air flow rate for the occupied mode throughout the duration of the air testing.
- (2) Conduct testing after all interior finishes are installed, including, but not limited to, millwork, doors, paint, carpet, and acoustic tiles. Install movable furnishings, such as workstations and partitions, prior to testing.
- (3) Number of sampling locations varies depending on the size of building and number of ventilation systems. Comply with LEED v4 BD+C.
- (4) Collect air samples between 3 and 6 feet from the floor to represent the breathing zone of occupants.

1.7.5 Innovation Credit: Exemplary Performance

Achieve Exemplary Performance for a minimum of one Construction Credit, in accordance with LEED v4 BD+C.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 SUSTAINABILITY COORDINATION

Provide sustainability focus and coordination at all meetings to achieve

sustainability goals. Coordinate meeting requirements with other UFGS Sections meeting requirements in this project. Ensure the designated TPC accredited sustainability professional responsible for GP and TPC documentation participates in these meetings to coordinate documentation completion. Review GP and TPC sustainability requirements, HPSB Checklist and TPC documentation, Sustainability Action Plan, and completeness status of Sustainability eNotebook, and TPC status at the following meetings:

- a. Pre-Construction Conference
- b. Construction Quality Control Meetings
- c. Facility Turnover Meetings

Conduct review no later than 60 days before final turnover and identify any outstanding issues that affect correct completion of all documentation and final TPC certification, assessment or validation, and actions that will achieve requirements. Conduct corrective actions prior to turnover, to ensure all requirements are achieved.

3.2 THIRD PARTY CERTIFICATION CERTIFICATE, ASSESSMENT, OR VALIDATION AND COMPLIANCE REPORT

Finalize the process requirements and obtain the TPC Plaque and Certificate, assessment, or validation, and compliance report, indicating completion of the project's sustainability goals. Include TPC compliance report with final TPC scoresheet as applicable.

Provide and hang Plaque in a prominent interior location approved by the Contracting Officer.

3.3 TABLE 3-1 VOLATILE ORGANIC COMPOUNDS (VOC) (LOW EMITTING MATERIALS) REQUIREMENTS

TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements				
Source: ICC IGCC Chapter 8 (Materials) (Interior Applications Only)				
MATERIAL CATEGORY	EMISSIONS REQUIREMENT		MATERIALS WITH ADDED VOC REQUIREMENT	EMISSIONS REQUIREMENTS
Adhesives and Sealants	CDPH/EHLE/Standard method V1.1 (California Section 01350) (Use "office" or "classroom" space limits for all applications)	and	Adhesives (carpet, resilient, wood flooring; base cove; ceramic tile; drywall and panel; primers) Sealants (acoustical; firestop; HVAC Air duct; primers) Caulks	SCAQMD Rule 1168 (Use "other" category for HVAC duct sealant) (for firestop adhesive, UFC 3-600-01 overrides conflicting requirements)
			Aerosol adhesives	Section 3 of Green Seal Standard GS-36 (except: cleaners, solvent cements, and primers used with plastic piping and conduit in plumbing, fire suppression, and electrical systems; HVAC air duct sealants when the application space air temp is less than 40 F (4.5 C).

TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements Source: ICC IGCC Chapter 8 (Materials) (Interior Applications Only)				
MATERIAL CATEGORY	EMISSIONS REQUIREMENT		MATERIALS WITH ADDED VOC REQUIREMENT	EMISSIONS REQUIREMENTS
Paints and Coatings	CDPH/EHLB/Standard method V1.1 (California Section 01350) (Use "office" or "classroom" space limits for all applications)	and	Flat and nonflat, nonflat high-gloss, specialty, basement specialty, fire-resistive, floor, low-solids, rust preventative, wood, reflective wall coatings; concrete/masonry sealers; primers; sealers; undercoaters; shellacs (clear and opaque); stains; varnishes; conjugated oil varnish; lacquer; clear brushing lacquer	Green Seal Standard GS-11

TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements Source: ICC IGCC Chapter 8 (Materials) (Interior Applications Only)				
MATERIAL CATEGORY	EMISSIONS REQUIREMENT		MATERIALS WITH ADDED VOC REQUIREMENT	EMISSIONS REQUIREMENTS
Paints and Coatings	CDPH/EHLB/Standard method V1.1 (California Section 01350) (Use "office" or "classroom" space limits for all applications)	and	Concrete curing compounds; dry fog, faux finishing, graphic arts (sign paints), industrial maintenance, mastic texture, metallic pigmented, multicolor, recycled coatings; pretreatment wash primers, reactive penetrating sealers; specialty primers, wood preservatives, and zinc primers	California Air Resources Board (CARB) Suggested Control Measure for Architectural Coatings or SCAQMD Rule 1113r
Paints and Coatings	CDPH/EHLB/Standard method V1.1 (California Section 01350) (Use "office" or "classroom" space limits for all applications)	and	High-temperature coatings; stone consolidants; swimming-pool coatings; tub- and tile-refining coatings; and waterproofing membranes	California Air Resources Board (CARB) Suggested Control Measure for Architectural Coatings

TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements Source: ICC IGCC Chapter 8 (Materials) (Interior Applications Only)				
MATERIAL CATEGORY	EMISSIONS REQUIREMENT		MATERIALS WITH ADDED VOC REQUIREMENT	EMISSIONS REQUIREMENTS
Floor Covering Materials	For carpet, all locations: CDPH/EHLB/Standard Method V1.1 (California Section 01350) or label for Section 9 of CDPH/EHLB/Standard Method V1.1 (California Section 01350)		none	none
Insulation	CDPH/EHLB/Standard method V1.1 (California Section 01350) (Use "office" or "classroom" space limits for all applications)		none	none

TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements

Source: ICC IGCC Chapter 8 (Materials) (Interior Applications Only)

MATERIAL CATEGORY	EMISSIONS REQUIREMENT		MATERIALS WITH ADDED VOC REQUIREMENT	EMISSIONS REQUIREMENTS
Composite Wood, Wood Structural Panel, and Agrifiber Products, no added urea-formaldehyde resins including laminating adhesives for composite wood and agrifiber assemblies - particleboard, medium density fiberboard (MDF), wheatboard, strawboard, panel substrates, door cores	Third-party certification (approved by CARB) of California Air Resource Board's (CARB) regulation, Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products	or	none	CDPH/EHLB/Standard method V1.1 (California Section 01350) (Use "office" or "classroom" space limits for all applications) (except: Structural panel components such as plywood, particle board, wafer board, and oriented strand board identified as "EXPOSURE 1," "EXTERIOR," or "HUD-APPROVED" are considered acceptable for interior use.)
Office Furniture Systems and Seating installed prior to occupancy	ANSI/BIFMA X7.1 ANSI/BIFMA X7.1: (95-percent of installed office furniture system workstations and seating units) Section 7.6.2 of ANSI/BIFMA e3 (50-percent of office furniture system workstations and seating units)		none	none

TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements Source: ICC IGCC Chapter 8 (Materials) (Interior Applications Only)				
MATERIAL CATEGORY	EMISSIONS REQUIREMENT		MATERIALS WITH ADDED VOC REQUIREMENT	EMISSIONS REQUIREMENTS
Ceiling and Wall assemblies and systems including: acoustical treatments; ceiling panels and tiles; tackable wall panels and coverings; wall coverings; wall and ceiling paneling and planking	CDPH/EHLB/Standard method V1.1 (California Section 01350) (Use "office" or "classroom" space limits for all applications)		none	none

-- End of Section --

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Project: HAAF MWD Kennel
Date: January 2026 / Ready to Advertise
Rating: Silver

Attachment 2
Burns & McDonnell
LEED-NC v4

Yes	?	No	Ph	AE	GC
Project Summary + Integrative Process					
Y					
1			D	X	
			D	X	

Location and Transportation					
		--			
1			D	X	
			D	X	
		2	D	X	
			D	X	
		5	D	X	
			D	X	
		5	D	X	
		1	D	X	
	1		D	X	
		1	D	X	

Sustainable Sites					
Y					
1			C		X
			D	X	
		2	D	X	
			D	X	
		1	D	X	
2	1		D	X	
2			D	X	
1			D	X	

Water Efficiency					
Y					
Y			D	X	
Y			D	X	
Y			D	X	
2			D	X	
4	2		D	X	
	2		D	X	
1			D	X	

Energy and Atmosphere					
Y					
Y			C	X	
Y			D	X	
Y			D	X	
Y			D	X	
5	1		C	X	
13	5		D	X	
1			D	X	
	2		C	X	
	3		D	X	
	1		D	X	
	2		C	X	

Legend: Ph = Review Phase (Split Design + Construction Review);
AE = Documentation by AE; GC = Documentation by Contractor

Yes	?	No	Ph	AE	GC
Materials and Resources					
Y					
Y			D	X	
			C		X
	1	4	C	X	
1	1		C		X
1	1		C		X
1	1		C		X
2			C		X

Indoor Environmental Quality					
Y					
Y			D	X	
Y			D	X	
1	1		D	X	
3			C		X
1			C		X
2			C		X
	1		D	X	
2			D	X	
	3		D	X	
	1		D	X	
1			D	X	

Innovation					
1					
1			C	X	
1			C	X	
1			C	X	
1			C		X
	1		C	X	
1			C	X	

Regional Priority					
1					
1			D	X	
1			D	X	
1			D	X	
1			D	X	
	x		D	X	
	x		D	X	

Certified 40-49 pts **Silver** 50-59 pts
Gold 60-79 pts **Platinum** 80-110 pts

Yes	?	No	
57	11	42	Project Total

Federal High Performance Sustainable Building Checklist

This checklist is used to track federal building compliance with the Guiding Principles for Sustainable Buildings and Major Renovations, which implement Executive Order 13423 and EISA 2007 for all new facilities and major renovations. The Government's goal is to incorporate (answer YES to) all numbered items. Refer to your contract for mandatory project requirements. **Complete and submit this checklist for each new climate-controlled building and major renovation of a climate-controlled building in the project at each of the project phases indicated below.**

General Building and Project Information		Input answers in this column. Prepare an updated checklist at each project phase. Obtain excel version of this document from Governments Project Manager.	Initial 1391 Programming Charette	Code 3/parametric estimate	Final RFP	RFP Technical Proposal	RFP Post-Award Final Design	Design Charette or Design Submittal	Design Bid Build Final Design	Construction Closeout
Project Phase:		check box								
Date:		17-Dec-25								
Project Name:		MWD Kennel								
Installation:		Hunter Army Airfield								
PN:		69262								
FY:		2024								
Building this Checklist is for:		NEW COF								
Building gross area:		12,243								
Building footprint area:		12,243								
Integrated Design		Yes								
1	Has a collaborative, integrated design process been used for all stages of project delivery?	Yes.								
2	Have comprehensive performance goals for siting, energy, water , materials and indoor environmental quality been set?	Yes.								
	Indicate building performance goals for siting:	See statement of work								
	Indicate building performance goals for energy:	See statement of work								
	Indicate building performance goals for water:	See statement of work								
	Indicate building performance goals for materials:	See statement of work								
	Indicate building performance goals for indoor environmental quality:	See statement of work								
3	Have performance goals been tracked and incorporated?	Yes								
4	Have all stages of building lifecycle been considered including deconstruction?	Yes								
Commissioning										
5A	Will/does project include whole building commissioning, tailored to complexity and systems?	Yes.								
5B	Will/does project include an experienced commissioning provider?	Yes.								
5C	Will/does project include incorporation of commissioning requirements in contract documents?	Yes.								
5D	Will/does project include a commissioning plan and a commissioning report?	Yes.								
	List special systems that require commissioning (in addition to HVAC & controls, lighting controls and domestic hot water):	See statement of work								
	Has commissioning of special systems been included in project 1391/cost estimate/budget?	Yes.								
Optimize Energy Performance										
6	Has a whole building energy performance target been established (Energy Star for applicable building types)?	See statement of work								
	If yes, indicate whole building energy performance target:									
7A	For new building, will/does building achieve minimum 30% energy use reduction compared to ASHRAE 90.1 2007 baseline?	See statement of work								
	If yes, has this been included in project 1391/cost estimate/budget?	Yes								
	If no, indicate what energy use reduction building will/does achieve and indicate why 30% reduction is not feasible:	See statement of work								
7B	For major renovation, will/does building achieve minimum 20% energy use reduction compared to pre-renovation 2003 baseline?	See statement of work								
	If yes, has this been included in project 1391/cost estimate/budget?	See statement of work								
	What is pre-renovation 2003 energy use baseline?	See statement of work								
	If no, indicate what energy use reduction building will/does achieve and indicate why 20% reduction is not feasible:									

		Input answers in this column. Prepare an updated checklist at each project phase. Obtain excel version of this document from Governments Project Manager.	Initial 1391 Programming Charette	Code 3/parametric estimate	Final RFP	RFP Technical Proposal	RFP Post-Award Final Design	Design Charette or Design Submittal	Design Bid Build Final Design	Construction Closeout
	General Building and Project Information									
8	Will/does building use Energy Star or FEMP designated energy efficient products where available?	Yes.								
	On-Site Renewable Energy									
	Has LCCA been accomplished for solar heating of domestic hot water?	See statement of work								
	If yes, has 30% solar water heating been determined LCC effective? If not, indicate what percentage is LCC effective.	See statement of work								
	If no, indicate why:									
9	Will/does the building include the solar water heating that is LCC effective?	See statement of work								
	If no, indicate why:									
	Has LCCA been accomplished for on-site renewable energy features?	See statement of work								
	If no, indicate why:									
	If yes, indicate what renewable energy features were analyzed and which were determined to be LCC effective:	See statement of work								
	Have LCC effective renewable energy features been included in project 1391/cost estimate/budget?	See statement of work								
10	Will/does the building include the LCC effective renewable energy features?	See statement of work								
	Indicate what percentage of building energy use is renewable energy:	See statement of work								
	Measurement and Verification									
11	Will/does project include building level metering for electricity, water, natural gas and steam if used?	Yes.								
	Benchmarking									
12	Will building performance data be compared to whole building energy target after one year of operation?	Yes by Installation.								
	If yes, does building meet or exceed design target or is it within 10% of design energy budget?	TBD								
	Protect and Conserve Water									
13	Will/does building achieve minimum 20% potable water use reduction compared to IPC 2006 fixture performance requirements baseline?	Yes.								
	If no, indicate what potable water use reduction building will/does achieve and indicate why 20% reduction is not feasible:									
14	If building has a permanent irrigation system, will/does building achieve minimum 50% outdoor potable water use reduction for irrigation compared to conventional plant species and density water use baseline? Answer YES if building has no permanent irrigation system.	Yes.								
	If no, indicate what potable water use reduction building will/does achieve and indicate why 50% reduction is not feasible:									
	If building will use nonpotable water for irrigation, has this been included in project 1391/cost estimate/budget?									
15	If building has a permanent irrigation system, will/does building use EPA WaterSense labeled irrigation products or other water conserving irrigation products where available (answer YES if building has no permanent irrigation system)?	Yes.								
	If no, indicate why:									
16	If building has a permanent irrigation system, will/does building use irrigation contractors that are certified through a EPA WaterSense labeled program (answer YES if building has no permanent irrigation system)?									
	If no, indicate why:									
17	Will/does building incorporate design and construction strategies that reduce storm water runoff and discharges of polluted water offsite?	Yes.								
	If yes, indicate design and construction strategies:	See statement of work								
	If yes, has this been included in project 1391/cost estimate/budget?	Yes.								
	If no, indicate why reduction is not feasible:									

		Input answers in this column. Prepare an updated checklist at each project phase. Obtain excel version of this document from Governments Project Manager.	Initial 1391 Programming Charette	Code 3/parametric estimate	Final RFP	RFP Technical Proposal	RFP Post-Award Final Design	Design Charette or Design Submittal	Design Bid Build Final Design	Construction Closeout
	General Building and Project Information									
18	Will/does building incorporate design and construction strategies that restore predevelopment hydrology of the site with regard to temperature, rate, volume and duration of flow to the maximum extent technically feasible?	Yes.								
	If yes, indicate design and construction strategies:	See statement of work								
	If yes, has this been included in project 1391/cost estimate/budget?	Yes								
	If no, indicate why:									
	Has LCCA been accomplished for features that reduce potable water use for process water?	See statement of work								
	If no, indicate why:									
	List features that LCCA has been accomplished for:	See statement of work								
	If yes, list features that have been determined LCC effective:									
	If yes, have LCC effective features been included in project 1391/cost estimate/budget?									
19	Will/does building include LCC effective potable process water conservation features?	See statement of work								
	Enhance Indoor Environmental Quality									
20	Will/does building comply with ASHRAE 55 2004?	Yes.								
	If no, indicate why:									
21	Will/does building comply with ASHRAE 62.1 2007?	Yes.								
	If no, indicate why:									
22	Will/does building include a moisture control strategy to minimize mold and condensation?	Yes.								
	If yes, indicate control strategies:	Wall design calculations and design for no condensation.								
	If yes, have control strategies been included in project 1391/cost estimate/budget?									
	If no, indicate why:	Yes.								
23A	Will/does building achieve 2% daylight factor (excluding direct sunlight) in 75% of all space occupied for critical visual tasks OR earn LEED Daylighting credit?	See statement of work								
	If yes, indicate special building features required to achieve this:	See statement of work								
	If yes, have special building features required to achieve this been included in project 1391/cost estimate/budget?	See statement of work								
	If no, indicate why:									
23B	Will/does building include automatic lighting dimming controls or occupant manual lighting controls and glare control?	Yes.								
	If yes, indicate special building features required to achieve this:	See statement of work								
	If yes, have special building features required to achieve this been included in project 1391/cost estimate/budget?	See statement of work								
	If no, indicate why:									
24	Will/does the building include, to the maximum extent technically feasible, low emitting composite wood products, adhesives, sealants, interior paints and finishes, carpet and furniture?	Yes.								
25	Will/does project comply with SMACNA Guidelines for Occupied Buildings Under Construction 2007 OR earn LEED IAQ Management During Construction credit?	Yes.								
	If no, indicate why:									
26	Will/does project include minimum 72 hour building flushout prior to occupancy with maximum 60% humidity OR earn LEED IAQ Management Before Occupancy credit?	Yes.								
	If no, indicate why:									
27	Will/does building include signage prohibiting smoking inside the building and within 25 feet of all building entrances, operable windows and ventilation intakes?	Yes.								
	If no, indicate why:									
	Environmental Impact of Materials									
28	Will/does building comply with EPA Comprehensive Procurement Guidelines for recycled content?	Yes.								
	If no, indicate why:									

		Input answers in this column. Prepare an updated checklist at each project phase. Obtain excel version of this document from Governments Project Manager.	Initial 1391 Programming Charette	Code 3/parametric estimate	Final RFP	RFP Technical Proposal	RFP Post-Award Final Design	Design Charette or Design Submittal	Design Bid Build Final Design	Construction Closeout
General Building and Project Information										
29	For all other products, will/does building include recycled content materials to earn LEED credit MR4.1, Recycled Content, 10 percent?	Yes.								
	If no, indicate why:									
30	Will/does building comply with USDA Biobased Products Preferred Procurement Program requirements?	Yes.								
	If no, indicate why:									
31	For all other products, will/does building include biobased content materials to the maximum extent technically feasible?	Yes.								
	If no, indicate why:									
32	Will/does building include FSC certified wood to the maximum extent technically feasible?	Yes.								
	If no, indicate why:									
33	Will/does building include environmentally preferable products (EPPs) to the maximum extent technically feasible?	Yes.								
	If no, indicate why:									
34	Will/does building include adequate space, equipment and provisions for collection and transport of recyclables generated by occupants?	Yes.								
	If no, indicate why:									
35	Will/does project include minimum 50% diversion of all non-hazardous construction, demolition and land clearing materials (excluding soil)?	Yes.								
	If no, indicate why:									
36	Will/does project eliminate the use of ozone depleting compounds during and after construction where alternative environmentally preferable products are available, consistent with the Montreal Protocol and Title VI of the Clean Air Act amendments of 1990 or equivalent air quality benefits that take into account lifecycle impacts?	Yes.								
	If yes for major renovation, has this been included in project 1391/cost estimate/budget?	NA								
	If no, indicate why:	Not a renovation project.								

SECTION 01 35 26

GOVERNMENTAL SAFETY REQUIREMENTS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING
ENGINEERS (ASHRAE)

ASHRAE 52.2 (2012) Method of Testing General
Ventilation Air-Cleaning Devices for
Removal Efficiency by Particle Size

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ANSI/ASSP A10.34 (2021) Protection of the Public on or
Adjacent to Construction Sites

ANSI/ASSP A10.44 (2020) Control of Energy Sources
(Lockout/Tagout) for Construction and
Demolition Operations

ASTM INTERNATIONAL (ASTM)

ASTM D6245 (2012) Using Indoor Carbon Dioxide
Concentrations to Evaluate Indoor Air
Quality and Ventilation

ASTM D6345 (2010) Standard Guide for Selection of
Methods for Active, Integrative Sampling
of Volatile Organic Compounds in Air

ASTM F855 (2020) Standard Specifications for
Temporary Protective Grounds to Be Used on
De-energized Electric Power Lines and
Equipment

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 1048 (2016) Guide for Protective Grounding of
Power Lines

IEEE C2 (2017; Errata 1-2 2017; INT 1 2017)
National Electrical Safety Code

INTERNATIONAL SAFETY EQUIPMENT ASSOCIATION (ISEA)

ANSI/ISEA Z89.1 (2014; R 2019) American National Standard
for Industrial Head Protection

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 51B	(2024) Standard for Fire Prevention During Welding, Cutting, and Other Hot Work
NFPA 70	(2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA 20-1; TIA 20-2; TIA 20-3; TIA 20-4) National Electrical Code
NFPA 70E	(2018; TIA 18-1; TIA 81-2) Standard for Electrical Safety in the Workplace
NFPA 241	(2019) Standard for Safeguarding Construction, Alteration, and Demolition Operations

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

ANSI/SMACNA 008	(2007) IAQ Guidelines for Occupied Buildings Under Construction, 2nd Edition

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2024) Safety -- Safety and Occupational Health (SOH) Requirements

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

10 CFR 20	Standards for Protection Against Radiation
29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1915	Confined and Enclosed Spaces and Other Dangerous Atmospheres in Shipyard Employment
29 CFR 1926	Safety and Health Regulations for Construction
49 CFR 173	Shippers - General Requirements for Shipments and Packagings
CPL 2.100	(1995) Application of the Permit-Required Confined Spaces (PRCS) Standards, 29 CFR 1910.146

1.2 DEFINITIONS

The following definitions are for the convenience of the reader. If there is a referenced document in the text of this specification section, that is the document that should define terms for that paragraph. If further clarification is needed, contact the Contracting Officer.

1.2.1 Site Safety and Health Officer (SSHO)

A Contractor Employee that is responsible for overseeing and ensuring implementation of the prime Contractor's Safety and Occupational Health (SOH) program according to the Contract, EM 385-1-1, applicable federal,

state, and local requirements.

1.2.1.1 Level One SSHO

A designated employee with full-time SOH responsibility that meets and follows the requirements of EM 385-1-1.

1.2.1.2 Level Two SSHO

A designated employee with Level Two SSHO responsibility that meets and follows the requirements of EM 385-1-1. Level Two SSHOs cannot be assigned to projects that have a residual Risk Assessment Code (RAC) of high or extremely high.

1.2.1.3 Level Three SSHO

A designated Qualified Person or Competent Person with SOH responsibility that meets and follows the requirements of EM 385-1-1. Level 3 SSHOs cannot be assigned to projects that have a residual RAC of high or extremely high.

1.2.1.4 Alternate SSHO

An employee that meets the definition of the contract-required level SSHO, but is not the primary SSHO.

1.2.2 Competent Person (CP)

The CP is a person designated in writing, who, through training, knowledge and experience, is capable of identifying, evaluating, and addressing existing and predictable hazards in the working environment or working conditions that are unsanitary, hazardous, or dangerous to personnel, and who has authorization to take prompt corrective measures to eliminate them.

1.2.3 Qualified Person (QP)

The QP is a person designated in writing, who, by possession of a recognized degree, certificate, or professional standing, or extensive knowledge, training, and experience, has successfully demonstrated their ability to solve or resolve problems related to the subject matter, the work, or the project.

1.3 SUBMITTALS

Government Acceptance or Approval does not remove responsibility from the Contractors for their actions or liability.

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Accident Prevention Plan (APP); G

Radiography Operation Planning Work Sheet

Portable Gauge Operations Planning Worksheet

Final IAQ Management Plan; S

Indoor Air Quality (IAQ) Management Plan; G

SD-06 Test Reports

Accident Reports; G

LHE Inspection Reports

Monthly Exposure Reports; G

SD-07 Certificates

Activity Hazard Analysis (AHA); G

Hot Work Permit

License Certificates

Standard Lift Plan; G

Critical Lift Plan; G

1.4 PUBLIC HEALTH EMERGENCIES

In the event of a declared public health emergency, follow safety precautions as required by the Occupational Safety and Health Administration (OSHA) www.osha.gov, the Centers for Disease Control and Prevention (CDC) www.cdc.gov, and as required by federal, state and local requirements.

1.5 MONTHLY EXPOSURE REPORTS

Provide a Monthly Exposure Report by the fifth day of each month for the previous month. This report is a compilation of employee-hours worked each month for all site workers, both Prime and subcontractor. Failure to submit the report may result in retention of up to 10 percent of the progress payment. Submit the hours via the agency construction management system of record.

1.6 REGULATORY REQUIREMENTS

In addition to the detailed requirements included in the provisions of this Contract, comply with the most recent edition of USACE EM 385-1-1, and the following federal, state, and local laws, ordinances, criteria, rules and regulations at the date of the Solicitation for this Contract. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements govern.

1.7 SITE QUALIFICATIONS, DUTIES, AND MEETINGS

1.7.1 Site Safety and Health Officer (SSHO)

1.7.1.1 Qualifications of SSHO

All SSHOs will have met the training, experience requirements identified in the EM 385-1-1 and this Contract.

1.7.1.2 Duties of SSHO

All SSHOs will carry out the roles and responsibilities as identified in this Contract and the EM 385-1-1. All SSHOs will be designated on an ENG Form 6282, provided by the Contracting Officer. Superintendent, QC Manager, and SSHO are subject to dismissal if their required duties are not being effectively carried out. If either the Superintendent, QC Manager, or SSHO are dismissed, project work will be stopped and will not be allowed to resume until a suitable replacement is approved and the above duties are again being effectively carried out. The SSHO may not serve as the Quality Control Manager. The SSHO may not serve as the Superintendent.

1.7.1.3 Safety Meetings

Conduct safety meetings to review past activities, plan for new or changed operations, review pertinent aspects of appropriate AHA (by trade), establish safe working procedures for anticipated hazards, and provide pertinent Safety and Occupational Health (SOH) training and motivation. Conduct meetings at least once a month for all supervisors at the project location. The SSHO, supervisors, or foremen must conduct meetings at least once a week for the trade workers. Document meeting minutes to include the date, persons in attendance, subjects discussed, and names of individual(s) who conducted the meeting. Maintain documentation on-site and furnish copies to the Contracting Officer on request. Notify the Contracting Officer of all scheduled meetings 7 calendar days in advance.

1.7.2 Roles and Responsibilities of Prime Contractor and SSHO

The Prime Contractor and SSHO must ensure that the requirements of all applicable OSHA and EM 385-1-1 are met for the project. The Prime Contractor must ensure an SSHO or an equally qualified Alternate SSHO(s) is at the worksite at all times to implement and administer the Contractor's safety program and Government accepted Accident Prevention Plan. If the required SSHO has to temporarily (that is, up to 24 hours / 1 day) leave the site of work due to unforeseen or emergency situations, a Level One, Two, or Three SSHO may be used in the interim and must be on the site of work at all times when work is being performed.

If the SSHO must be off-site for a period longer than 24 hours / 1 day, a qualified alternate that meets the contract requirements must be onsite.

a. Prime contractor must ensure all SSHOs will:

- (1) Are designated on an ENG Form 6282.
- (2) Meet minimum training and experience requirements identified in EM 385-1-1.
- (3) Execute roles and responsibilities identified in EM 385-1-1.

1.7.3 Contract Site Safety And Health Officer(s) (SSHOs) Minimum Requirements

Provide a minimum of one Level One SSHO that meets the requirements of EM 385-1-1 for this project.

1.7.4 Competent Person for Confined Space Entry

Provide a CP for Confined Space Entry who meets the requirements of EM 385-1-1 and herein. The CP for Confined Space Entry must supervise the entry into each confined space in accordance with EM 385-1-1.

1.7.5 Preconstruction Conference

- a. Contractor representatives who have a responsibility or significant role in accident prevention on the project must attend the preconstruction conference. This includes the project superintendent, Site Safety and Occupational Health Officer, quality control manager, or any other assigned safety and health professionals who participated in the development of the APP (including the Activity Hazard Analyses (AHAs) and special plans, program and procedures associated with it).
- b. Discuss the details of the submitted APP to include incorporated plans, programs, procedures and a listing of anticipated AHAs that will be developed and implemented during the performance of the Contract. This list of proposed AHAs will be reviewed and an agreement will be reached between the Contractor and the Contracting Officer as to which phases will require an analysis. In addition, establish a schedule for the preparation, submittal, and Government review of AHAs to preclude project delays. The creation of the APP and Schedule will be created after being given Notice to Proceed.
- c. Deficiencies in the submitted APP, identified during the Contracting Officer's review, must be corrected, and the APP re-submitted for review prior to the start of construction. Work is not permitted to begin until an APP is established that is acceptable to the Contracting Officer.

1.8 ACCIDENT PREVENTION PLAN (APP)

1.8.1 Accident Prevention Plan (APP)

Submit the Accident Prevention Plan (APP) for review and acceptance by the Government at least 15 calendar days prior to the start, after being given Notice to Proceed. A competent person must prepare the written site-specific APP. Prepare the APP in accordance with the format and requirements of EM 385-1-1, ENG Form 6293, and herein. The APP must be job-specific and address any unusual or unique aspects of the project or activity for which it is written. The APP must interface with the Contractor's overall safety and occupational health program referenced in the APP in the applicable APP element, and made site-specific. Describe the methods to evaluate past safety performance of potential subcontractors in the selection process. Also, describe innovative methods used to ensure and monitor safe work practices of subcontractors. The Government considers the Prime Contractor to be the "controlling employer" for all worksite safety and health of the subcontractors. Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the Contract and the penalties for

noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out. The APP must be signed in accordance with the APP and ENG Form 6293 Accident Prevention Plan Worksheet. The SSHO must provide and maintain the APP and a log of signatures by each subcontractor foreman, attesting that they have read and understand the APP, and make the APP and log available on-site to the Contracting Officer. If English is not the foreman's primary language, the Prime Contractor must provide an interpreter.

Work cannot proceed without an accepted APP. Once reviewed and accepted by the Contracting Officer, the APP and attachments will be enforced as part of the Contract. Disregarding the provisions of this Contract or the accepted APP is cause for stopping of work, at the discretion of the Contracting Officer, until the matter has been rectified. Continuously review and amend the APP, as necessary, throughout the life of the Contract. Changes to the accepted APP must be made with the knowledge and concurrence of the Contracting Officer, project superintendent, SSHO and Quality Control Manager. Incorporate unusual or high-hazard activities not identified in the original APP as they are discovered. Should any severe hazard exposure (i.e., imminent danger) become evident, stop work in the area, secure the area, and develop a plan to remove the exposure and control the hazard. Notify the Contracting Officer within 24 hours of discovery. Eliminate and remove the hazard. In the interim, take all necessary action to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public (as defined by ANSI/ASSP A10.34), and the environment.

1.8.2 Names and Qualifications

Provide plans in accordance with the requirements outlined in EM 385-1-1, including the following:

- a. Names and qualifications (resumes including education, training, experience and certifications) of site safety and health personnel designated to perform work on this project to include the designated Site Safety and Health Officer and other competent and qualified personnel to be used. Specify the duties of each position.
- b. As a minimum, designate and submit qualifications of Competent Persons (CP) for each of the following major areas: excavation; scaffolding; fall protection; hazardous energy; confined space; health hazard recognition, evaluation and control of chemical, physical and biological agents; and personal protective equipment and clothing to include selection, use and maintenance. Designate and submit qualifications for additional CPs as applicable to the work performed under this Contract.

1.8.3 Plans

Provide plans in the APP in accordance with the requirements outlined in EM 385-1-1, including the following:

1.8.3.1 Site Demolition Plan

Identify the safety and health aspects, and prepare in accordance with Section 02 41 00 DEMOLITION and referenced sources.

1.9 ACTIVITY HAZARD ANALYSIS (AHA)

Before beginning each activity, task or Definable Feature of Work (DFOW) involving a type of work presenting hazards not experienced in previous project operations, or where a new work crew or subcontractor is to perform the work, the Contractor(s) performing that work activity must prepare an AHA. AHAs must be developed by the Prime Contractor, subcontractor, or supplier performing the work, and provided for Prime Contractor review and approval before submitting to the Contracting Officer. AHAs must be signed by the SSHO, Superintendent, QC Manager, and the subcontractor Foreman performing the work. Format the AHA in accordance with EM 385-1-1 or as directed by the Contracting Officer. Submit the AHA for review at least 15 working days prior to the start of each activity task, or DFOW. The Government reserves the right to require the Contractor to revise and resubmit the AHA if it fails to effectively identify the work sequences, specific anticipated hazards, site conditions, equipment, materials, personnel and the control measures to be implemented.

AHAs must identify competent persons required for phases involving high risk activities, including confined entry, crane and rigging, excavations, trenching, electrical work, fall protection, and scaffolding.

1.9.1 AHA Management

Review the AHA list periodically (at least monthly) at the Contractor supervisory safety meeting, and update as necessary when procedures, scheduling, or hazards change. Use the AHA during daily inspections by the SSHO to ensure the implementation and effectiveness of the required safety and health controls for that work activity.

1.9.2 AHA Signature Log

Each employee performing work as part of an activity, task or DFOW must review the AHA for that work and sign a signature log specifically maintained for that AHA prior to starting work on that activity. The SSHO must maintain a signature log on site for every AHA. Provide employees whose primary language is other than English, with an interpreter to ensure a clear understanding of the AHA and its contents.

1.10 SITE SAFETY REFERENCE MATERIALS

Maintain safety-related references applicable to the project, including those listed in paragraph REFERENCES. Maintain applicable equipment manufacturer's manuals.

1.11 EMERGENCY MEDICAL TREATMENT

Contractors must arrange for their own emergency medical treatment in accordance with EM 385-1-1. The Government has no responsibility to provide emergency medical treatment.

1.12 NOTIFICATIONS AND REPORTS

1.12.1 Accident Notification

Notify the Contracting Officer in accordance with the EM 385-1-1 Accident Reporting Timeline.

Table Accident Reporting Required Timeline		
Accident Type	Notify KO or COR	Complete Final Accident Report on ENG 3394 and provide to KO or COR
Fatality, in-patient hospitalization, amputation, eye loss, or property damage over \$600,000.	Immediately, no later than (NLT) 8 Hours	Within 7 Days
All other accidents and near misses	Immediately, no later than (NLT) 24 Hours	Within 7 Days

Within notification include Contractor name; Contract title; type of Contract; name of activity, installation or location where accident occurred; date and time of accident; names of personnel injured; extent of property damage, if any; extent of injury, if known, and brief description of accident (for example, type of construction equipment used and PPE used). Preserve the conditions and evidence on the accident site until the Government investigation team arrives on-site and Government investigation is conducted. Assist and cooperate fully with the Government's investigation(s) of any accident or near miss.

1.12.2 Accident Reports

- a. Conduct an accident investigation for recordable injuries and illnesses, property damage, and near misses as defined in EM 385-1-1, to establish the root cause(s) of the accident. All accidents are reportable, regardless of whether or not it is recordable. Complete the applicable USACE Accident Report, ENG Form 3394, and provide the report to the Contracting Officer within 7 calendar days of the accident. The Contracting Officer will provide copies of any required or special forms. All accidents are reportable, regardless of whether or not it is recordable.
- b. Near Misses: For Army projects, report all "Near Misses" to the Contracting Officer, using local accident reporting procedures, within 24 hours. The Contracting Officer will provide the Contractor the required forms. Near miss reports are considered positive and proactive Contractor safety management actions.

1.12.3 LHE Inspection Reports

Submit LHE inspection reports required in accordance with EM 385-1-1 and as specified herein with Daily Reports of Inspections.

1.12.4 Pre-lift Plan/Checklist for LHE and Rigging

1.12.4.1 Pre-Lift Plans

Develop either a Standard Lift Plan (SLP) or Critical Lift Plan (CLP) as required in accordance with EM 385-1-1. Utilize the Standard Lift Plan ENG Form 6203 for routine crane lifts and use the Critical Lift Plan ENR

Form 6213 for non-routine crane lifts requiring more detailed planning and additional safety precautions, as defined by Section 16-2j of the EM 385-1-1. Submit lift plans to the Contracting Officer for approval within 15 calendar days in advance of planned lift.

1.13 HOT WORK PERMIT

1.13.1 Permit and Personnel Requirements

Submit and obtain a written permit prior to performing "Hot Work" (i.e., welding or cutting) or operating other flame-producing/spark producing devices, from the Safety Explosives Office. A permit is required from the Explosives Safety Office for work in and around where explosives are processed, stored, or handled. Contractors are required to meet all criteria before a permit is issued. Provide at least two 20 pound 4A:20 BC rated extinguishers for normal "Hot Work". The extinguishers must be current inspection tagged, and contain an approved safety pin and tamper resistant seal. It is also mandatory to have a designated FIRE WATCH for any "Hot Work" done at this activity. The Fire Watch must be trained in accordance with NFPA 51B and remain on-site for a minimum of 1 hour after completion of the task or as specified on the hot work permit.

When starting work in the facility, require personnel to familiarize themselves with the location of the nearest fire alarm boxes and place in memory the emergency phone number. Report any fire, no matter how small, to the responsible Fire Division immediately.

1.13.2 Work Around Flammable Materials

Obtain permit approval from a NFPA Certified Marine Chemist, or Certified Industrial Hygienist for "Hot Work" within or around flammable materials (such as fuel systems or welding/cutting on fuel pipes) or confined spaces (such as sewer wet wells, manholes, or vaults) that have the potential for flammable or explosive atmospheres.

Whenever these materials, except beryllium and chromium (VI), are encountered in indoor operations, local mechanical exhaust ventilation systems that are sufficient to reduce and maintain personal exposures to within acceptable limits must be used and maintained in accordance with manufacturer's instruction and supplemented by exceptions noted in EM 385-1-1.

1.14 RADIATION SAFETY REQUIREMENTS

Submit License Certificates, employee training records, and Leak Test Reports for radiation materials and equipment to the Contracting Officer and Radiation Safety Office (RSO) for all specialized and licensed material and equipment proposed for use on the construction project (excludes portable machine sources of ionizing radiation including moisture density and X-Ray Fluorescence (XRF)). Maintain on-site records whenever licensed radiological materials or ionizing equipment are on Government property.

Protect workers from radiation exposure in accordance with 10 CFR 20, ensuring any personnel exposures are maintained As Low As Reasonably Achievable.

1.14.1 Radiography Operation Planning Work Sheet

Submit a Gamma and X-Ray Radiography Operation Planning Work Sheet to Contracting Officer 14 days prior to commencement of operations involving radioactive materials or radiation generating devices. For portable machine sources of ionizing radiation, including moisture density and XRF, use and submit the Portable Gauge Operations Planning Worksheet instead. The Contracting Officer will review the submitted worksheet and provide questions and comments.

Contractors must use primary dosimeters process by a National Voluntary Laboratory Accreditation Program (NVLAP) accredited laboratory.

1.14.2 Site Access and Security

Coordinate site access and security requirements with the Contracting Officer for all radiological materials and equipment containing ionizing radiation that are proposed for use on a government facility. For gamma radiography materials and equipment, a Government escort is required for any travels on the Installation. The Government authorized representative will meet the Contractor at a designated location outside the Installation, ensure safety of the materials being transported, and will escort the Contractor for gamma sources onto the Installation, to the job site, and off the Installation. For portable machine sources of ionizing radiation, including moisture density and XRF, the Government authorized representative will meet the Contractor at the job site.

Provide a copy of all calibration records, and utilization records for radiological operations performed on the site.

1.14.3 Loss or Release and Unplanned Personnel Exposure

Loss or release of radioactive materials, and unplanned personnel exposures must be reported immediately to the Contracting Officer, RSO, and Base Security Department Emergency Number.

1.14.4 Site Demarcation and Barricade

Properly demark and barricade an area surrounding radiological operations to preclude personnel entrance, in accordance with EM 385-1-1, Nuclear Regulatory Commission, and Applicable State regulations and license requirements, and in accordance with requirements established in the accepted Radiography Operation Planning Work Sheet.

Do not close or obstruct streets, walks, and other facilities occupied and used by the Government without written permission from the Contracting Officer.

1.14.5 Security of Material and Equipment

Properly secure the radiological material and ionizing radiation equipment at all times, including keeping the devices in a properly marked and locked container, and secondarily locking the container to a secure point in the Contractor's vehicle or other approved storage location during transportation and while not in use. While in use, maintain a continuous visual observation on the radiological material and ionizing radiation equipment. In instances where radiography is scheduled near or adjacent to buildings or areas having limited access or one-way doors, make no assumptions as to building occupancy. Where necessary, the Contracting

Officer will direct the Contractor to conduct an actual building entry, search, and alert. Where removal of personnel from such a building cannot be accomplished and it is otherwise safe to proceed with the radiography, position a fully instructed employee inside the building or area to prevent exiting while external radiographic operations are in process.

1.14.6 Transportation of Material

Comply with 49 CFR 173 for Transportation of Regulated Amounts of Radioactive Material. Notify Local Fire authorities and the site Radiation Safety Officer (RSO) of any Radioactive Material use.

1.14.7 Schedule for Exposure or Unshielding

Actual exposure of the radiographic film or unshielding the source must not be initiated until after 5 p.m. on weekdays.

1.14.8 Transmitter Requirements

Adhere to the base policy concerning the use of transmitters, such as radios and cell phones. Obey Emissions control (EMCON) restrictions.

1.15 CONFINED SPACE ENTRY REQUIREMENTS

Confined space entry must comply with EM 385-1-1, 29 CFR 1926, 29 CFR 1910, and Directive CPL 2.100. Any potential for a hazard in the confined space requires a permit system to be used.

1.15.1 Rescue Procedures and Coordination with Local Emergency Responders

Develop and implement an on-site rescue and recovery plan and procedures. The rescue plan must not rely on local emergency responders for rescue from a confined space.

1.16 CONSTRUCTION INDOOR AIR QUALITY (IAQ) MANAGEMENT PLAN

Submit an IAQ Management Plan within 15 calendar days after notice to proceed and not less than 10 calendar days before the preconstruction conference. Revise and resubmit Plan as required by the Contracting Officer. Make copies of the final plan available to all workers on site. Include provisions in the Plan to meet the requirements specified below and to ensure safe, healthy air for construction workers and building occupants. Submit Final IAQ Management Plan for inclusion in the Sustainability eNotebook, in accordance with Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING.

1.16.1 Requirements During Construction

Provide for evaluation of indoor Carbon Dioxide concentrations in accordance with ASTM D6245. Provide for evaluation of volatile organic compounds (VOCs) in indoor air in accordance with ASTM D6345. Use filters with a Minimum Efficiency Reporting Value (MERV) of 8 in permanently installed air handlers during construction.

1.16.1.1 Control Measures

Meet or exceed the requirements of ANSI/SMACNA 008 to help minimize contamination of the building from construction activities. The five requirements of this manual which must be adhered to are described below:

- a. HVAC protection: Isolate return side of HVAC system from surrounding environment to prevent construction dust and debris from entering the duct work and spaces.
- b. Source control: Use low emitting paints and other finishes, sealants, adhesives, and other materials as specified. When available, cleaning products must have a low VOC content and be non-toxic to minimize building contamination. Utilize cleaning techniques that minimize dust generation. Cycle equipment off when not needed. Prohibit idling motor vehicles where emissions could be drawn into building. Designate receiving/storage areas for incoming material that minimize IAQ impacts.
- c. Pathway interruption: When pollutants are generated use strategies such as 100 percent outside air ventilation or erection of physical barriers between work and non-work areas to prevent contamination.
- d. Housekeeping: Clean frequently to remove construction dust and debris. Promptly clean up spills. Remove accumulated water and keep work areas dry to discourage the growth of mold and bacteria. Take extra measures when hazardous materials are involved.
- e. Scheduling: Control the sequence of construction to minimize the absorption of VOCs by other building materials.

1.16.1.2 Moisture Contamination

- a. Remove accumulated water and keep work dry.
- b. Use dehumidification to remove moist, humid air from a work area.
- c. Do not use combustion heaters or generators inside the building.
- d. Protect porous materials from exposure to moisture.
- e. Remove and replace items which remain damp for more than a few hours.

1.16.2 Requirements After Construction

After construction ends and prior to occupancy, conduct a building flush-out or test the indoor air contaminant levels. Flush-out must be a minimum 2 weeks with MERV-13 filtration media as determined by ASHRAE 52.2 at 100 percent outside air. Air contamination testing must be consistent with EPA's current Compendium of Methods for the Determination of Air Pollutants in Indoor Air. After building flush-out or testing and prior to occupancy, replace filtration media. Filtration media must have a MERV of 13 as determined by ASHRAE 52.2.

1.17 SEVERE STORM PLAN

In the event of a severe storm warning, the Contractor must comply with the applicable Storm Plan and:

- a. Secure outside equipment and materials and place materials that could be damaged in protected areas.
- b. Check surrounding area, including roof, for loose material, equipment, debris, and other objects that could be blown away or against existing

facilities.

- c. Ensure that temporary erosion controls are adequate.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 CONSTRUCTION AND OTHER WORK

Comply with EM 385-1-1, NFPA 70, NFPA 70E, NFPA 241, the APP, the AHA, Federal and State OSHA regulations, and other related submittals and activity fire and safety regulations. The most stringent standard prevails.

PPE is governed in all areas by the nature of the work the employee is performing. Use personal hearing protection at all times in designated noise hazardous areas or when performing noise hazardous tasks. Safety glasses must be worn or carried/available on each person. Mandatory PPE includes:

- a. Head Protection that meets ANSI/ISEA Z89.1.
- b. Long Pants.
- c. Appropriate Safety Footwear.
- d. Appropriate Class Reflective Vests.

3.1.1 Worksite Communication

Employees working alone in a remote location or away from other workers must be provided an effective means of emergency communications (i.e., cellular phone, two-way radios, land-line telephones or other acceptable means). The selected communication must be readily available (easily within the immediate reach) of the employee and must be tested prior to the start of work to verify that it effectively operates in the area/environment. Develop an employee check-in/check-out communication procedure to ensure employee safety.

3.1.2 Hazardous Material Exclusions

Notwithstanding any other hazardous material used in this Contract, radioactive materials or instruments capable of producing ionizing/non-ionizing radiation (with the exception of radioactive material and devices used in accordance with EM 385-1-1 such as nuclear density meters for compaction testing and laboratory equipment with radioactive sources) as well as materials which contain asbestos, mercury or polychlorinated biphenyls, di-isocyanates, lead-based paint, and hexavalent chromium, are prohibited. The Contracting Officer, upon written request by the Contractor, may consider exceptions to the use of any of the above excluded materials. Low mercury lamps used within fluorescent lighting fixtures are allowed as an exception without further Contracting Officer approval. Notify the Radiation Safety Officer (RSO) prior to excepted items of radioactive material and devices being brought on base.

3.1.3 Unforeseen Hazardous Material

Contract documents identify materials such as PCB, lead paint, and friable and non-friable asbestos and other OSHA regulated chemicals (i.e., 29 CFR Part 1910.1000). If material(s) that can be hazardous to human health upon disturbance are encountered during demolition, repair, renovation, or construction operations, stop portions of work that would disturb the material and notify the Contracting Officer immediately. Within 14 calendar days the Government will determine if the material is hazardous. If material is not hazardous or poses no danger, the Government will direct the Contractor to proceed without change. If material is hazardous and handling of the material is necessary to accomplish the work, the Government will issue a modification.

3.2 UTILITY OUTAGE REQUIREMENTS

Apply for utility outages at least 30 days in advance. At a minimum, the written request must include the location of the outage, utilities being affected, duration of outage, any necessary sketches, and a description of the means to fulfill energy isolation requirements in accordance with EM 385-1-1. In accordance with EM 385-1-1, where outages involve Government or Utility personnel, coordinate with the Government on all activities involving the control of hazardous energy.

These activities include, but are not limited to, a review of Hazardous Energy Control Program (HECP) and HEC procedures, as well as applicable Activity Hazard Analyses (AHAs). In accordance with EM 385-1-1 and NFPA 70E, work on energized electrical circuits must not be performed without prior Government authorization. Government permission is considered through the permit process and submission of a detailed AHA. Energized work permits are considered only when de-energizing introduces additional or increased hazard or when de-energizing is infeasible.

3.3 OUTAGE COORDINATION MEETING

After the utility outage request is approved and prior to beginning work on the utility system requiring shut-down, conduct a pre-outage coordination meeting in accordance with EM 385-1-1. This meeting must include the Prime Contractor, the Prime and subcontractors performing the work, the Contracting Officer, and the Installation representative. All parties must fully coordinate HEC activities with one another. During the coordination meeting, all parties must discuss and coordinate on the scope of work, HEC procedures (specifically, the lock-out/tag-out procedures for worker and utility protection), the AHA, assurance of trade personnel qualifications, identification of competent persons, and compliance with HECP training in accordance with EM 385-1-1. Clarify when personal protective equipment is required during switching operations, inspection, and verification.

3.4 CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)

Provide and operate a Hazardous Energy Control Program (HECP) in accordance with EM 385-1-1, 29 CFR 1910, 29 CFR 1915, ANSI/ASSP A10.44, NFPA 70E.

3.4.1 Safety Preparatory Inspection Coordination Meeting with the Government or Utility

For electrical distribution equipment that is to be operated by Government

or Utility personnel, the Prime Contractor and the subcontractor performing the work must attend the safety preparatory inspection coordination meeting, which will also be attended by the Contracting Officer's Representative, and required by EM 385-1-1. The meeting will occur immediately preceding the start of work and following the completion of the outage coordination meeting. Both the safety preparatory inspection coordination meeting and the outage coordination meeting must occur prior to conducting the outage and commencing with lockout/tagout procedures.

3.4.2 Lockout/Tagout Isolation

Where the Government or Utility performs equipment isolation and lockout/tagout, the Contractor must place their own locks and tags on each energy-isolating device and proceed in accordance with the HECF. Before any work begins, both the Contractor and the Government or Utility must perform energy isolation verification testing while wearing required PPE detailed in the Contractor's AHA and required by EM 385-1-1. Install personal protective grounds, with tags, to eliminate the potential for induced voltage in accordance with EM 385-1-1.

3.4.3 Lockout/Tagout Removal

Upon completion of work, conduct lockout/tagout removal procedure in accordance with the HECF. In accordance with EM 385-1-1, each lock and tag must be removed from each energy isolating device by the authorized individual or systems operator who applied the device. Provide formal notification to the Government (by completing the Government form if provided by Contracting Officer's Representative), confirming that steps of de-energization and lockout/tagout removal procedure have been conducted and certified through inspection and verification. Government or Utility locks and tags used to support the Contractor's work will not be removed until the authorized Government employee receives the formal notification.

3.5 FALL PROTECTION PROGRAM

Establish a fall protection program, for the protection of all employees exposed to fall hazards. Within the program include company policy, identify roles and responsibilities, education and training requirements, fall hazard identification, prevention and control measures, inspection, storage, care and maintenance of fall protection equipment and rescue and evacuation procedures in accordance with EM 385-1-1.

3.5.1 Fall Protection Equipment and Systems

Enforce use of personal fall protection equipment and systems designated (to include fall arrest, restraint, and positioning) for each specific work activity in the Site Specific Fall Protection and Prevention Plan and AHA at all times when an employee is exposed to a fall hazard. Protect employees from fall hazards as specified in EM 385-1-1.

Provide personal fall protection equipment, systems, subsystems, and components that comply with EM 385-1-1 and 29 CFR 1926.

3.5.1.1 Additional Personal Fall Protection Measures

In addition to the required fall protection systems, other protective measures such as safety skiffs, personal floatation devices, and life

rings, are required when working above or next to water in accordance with EM 385-1-1. Personal fall protection systems and equipment are required when working from an articulating or extendible boom, swing stages, or suspended platform. In addition, personal fall protection systems are required when operating other equipment such as scissor lifts. The need for tying-off in such equipment is to prevent ejection of the employee from the equipment during raising, lowering, travel, or while performing work.

3.5.1.2 Personal Fall Protection Equipment

Only a full-body harness with a shock-absorbing lanyard or self-retracting lanyard is an acceptable personal fall arrest body support device. The use of body belts is not acceptable. Harnesses must have a fall arrest attachment affixed to the body support (usually a Dorsal D-ring) and specifically designated for attachment to the rest of the system. Snap hooks and carabineers must be self-closing and self-locking, capable of being opened only by at least two consecutive deliberate actions and have a minimum gate strength of 3,600 lbs in all directions. Use webbing, straps, and ropes made of synthetic fiber. The maximum free fall distance when using fall arrest equipment must not exceed 6 feet, unless the proper energy absorbing lanyard is used. Always take into consideration the total fall distance and any swinging of the worker (pendulum-like motion), that can occur during a fall, when attaching a person to a fall arrest system. Equip all full body harnesses with Suspension Trauma Preventers such as stirrups, relief steps, or similar in order to provide short-term relief from the effects of orthostatic intolerance in accordance with EM 385-1-1.

3.6 USE OF EXPLOSIVES

Explosives must not be used or brought to the project site without prior written approval from the Contracting Officer. Such approval does not relieve the Contractor of responsibility for injury to persons or for damage to property due to blasting operations.

Storage of explosives, when permitted on Government property, must be only where directed and in approved storage facilities. These facilities must be kept locked at all times except for inspection, delivery, and withdrawal of explosives.

3.7 ELECTRICAL

Perform electrical work in accordance with EM 385-1-1.

3.7.1 Electrical Work

As described in EM 385-1-1, electrical work is to be conducted in a de-energized state unless there is no alternative method for accomplishing the work. In those cases obtain an energized work permit from the Contracting Officer. The energized work permit application must be accompanied by the AHA and a summary of why the equipment/circuit needs to be worked energized. Underground electrical spaces must be certified safe for entry before entering to conduct work. Cables that will be cut must be positively identified and de-energized prior to performing each cut. Attach temporary grounds in accordance with ASTM F855 and IEEE 1048. Perform all high voltage cable cutting remotely using hydraulic cutting tool. When racking in or live switching of circuit breakers, no additional person other than the switch operator is allowed in the space

during the actual operation. Plan so that work near energized parts is minimized to the fullest extent possible. Use of electrical outages clear of any energized electrical sources is the preferred method.

When working in energized substations, only qualified electrical workers are permitted to enter. When work requires work near energized circuits as defined by NFPA 70, high voltage personnel must use personal protective equipment that includes, as a minimum, electrical hard hat, safety footwear, insulating gloves and electrical arc flash protection for personnel as required by NFPA 70E. Insulating blankets, hearing protection, and switching suits may also be required, depending on the specific job and as delineated in the Contractor's AHA. Ensure that each employee is familiar with and complies with these procedures and 29 CFR 1910.

3.7.2 Qualifications

Electrical work must be performed by QP with verifiable credentials who are familiar with applicable code requirements. Verifiable credentials consist of State, National and Local Certifications or Licenses that a Master or Journeyman Electrician may hold, depending on work being performed, and must be identified in the appropriate AHA. Journeyman/Apprentice ratio must be in accordance with State and Local requirements applicable to where work is being performed.

3.7.3 Arc Flash

Conduct a hazard analysis/arc flash hazard analysis whenever work on or near energized parts greater than 50 volts is necessary, in accordance with NFPA 70E.

All personnel entering the identified arc flash protection boundary must be QPs and properly trained in NFPA 70E requirements and procedures. Unless permitted by NFPA 70E, no Unqualified Person is permitted to approach nearer than the Limited Approach Boundary of energized conductors and circuit parts. Training must be administered by an electrically qualified source and documented.

3.7.4 Grounding

Ground electrical circuits, equipment and enclosures in accordance with NFPA 70 and IEEE C2 to provide a permanent, continuous and effective path to ground unless otherwise noted by EM 385-1-1.

3.7.5 Testing

Temporary electrical distribution systems and devices must be inspected, tested and found acceptable for Ground-Fault Circuit Interrupter (GFCI) protection, polarity, ground continuity, and ground resistance before initial use, before use after modification and at least monthly. Monthly inspections and tests must be maintained for each temporary electrical distribution system, and signed by the electrical CP or QP.

-- End of Section --

SECTION 01 42 00

SOURCES FOR REFERENCE PUBLICATIONS

PART 1 GENERAL

1.1 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the standards producing organization (e.g., ASTM B564 Standard Specification for Nickel Alloy Forgings). However, when the standards producing organization has not assigned a number to a document, an identifying number has been assigned for reference purposes.

1.2 ORDERING INFORMATION

The addresses of the standards publishing organizations whose documents are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided.

AACE INTERNATIONAL (AACE)
1265 Suncrest Towne Centre Drive
Morgantown, WV 26505-1876 USA
Ph: 304-296-8444
Fax: 304-291-5728
Internet: <https://web.aacei.org/>

ACOUSTICAL SOCIETY OF AMERICA (ASA)
1305 Walt Whitman Road, Suite 300
Melville, NY 11747-4300
Ph: 516-576-2360
Fax: 631-923-2875
E-mail: asa@acousticalsociety.org
Internet: <https://acousticalsociety.org/>

AIR BARRIER ASSOCIATION OF AMERICA (ABAA)
1600 Boston-Providence Hwy
Walpole, MA 02081
Ph: 1-866-956-5888
Fax: 1-866-956-5819
Internet: <https://www.airbarrier.org/>

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC. (AMCA)
30 West University Drive
Arlington Heights, IL 60004-1893
Ph: 847-394-0150
Fax: 847-253-0088
E-mail: communications@amca.org
Internet: <http://www.amca.org>

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)
2111 Wilson Blvd, Suite 400

Arlington, VA 22201
Ph: 703-524-8800
Internet: <http://www.ahrinet.org>

ALUMINUM ASSOCIATION (AA)
1400 Crystal Drive
Suite 430
Arlington, VA 22202
Ph: 703-358-2960
E-Mail: info@aluminum.org
Internet: <https://www.aluminum.org/>

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)
1900 E Golf Rd, Suite 1250
Schaumburg, IL 60173
Ph: 847-303-5664
E-mail: customerservice@aamanet.org
Internet: <https://aamanet.org/>

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)
444 North Capital Street, NW, Suite 249
Washington, DC 20001
Ph: 202-624-5800
Fax: 202-624-5806
E-Mail: info@aaashto.org
Internet: <https://www.transportation.org/>

AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABMA)
330 N. Wabash Ave., Suite 2000
Chicago, IL 60611
Ph: 202-367-1155
E-mail: info@americanbearings.org
Internet: <https://www.americanbearings.org/>

AMERICAN CONCRETE INSTITUTE (ACI)
38800 Country Club Drive
Farmington Hills, MI 48331-3439
Ph: 248-848-3700
Fax: 248-848-3701
Internet: <https://www.concrete.org/>

AMERICAN CONCRETE PIPE ASSOCIATION (ACPA)
8445 Freeport Parkway, Suite 350
Irving, TX 75063-2595
Ph: 972-506-7216
Fax: 972-506-7682
E-mail: info@concrete-pipe.org
Internet: <https://www.concretepipe.org/>

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)
1330 Kemper Meadow Drive
Cincinnati, OH 45240
Ph: 513-742-2020
Fax: 513-742-3355
Internet: <https://www.acgih.org/>

AMERICAN FOREST FOUNDATION (AFF)
American Tree Farm System

2000 M Street, NW, Suite 550
Washington, DC 20036
Ph: 202-765-3660
Fax: 202-827-7924
Email: info@forestfoundation.org
Internet: <https://www.treefarmssystem.org>

AMERICAN GAS ASSOCIATION (AGA)
400 North Capitol Street, NW
Suite 450
Washington, D.C. 20001
Ph: 202-824-7000
Internet: <https://www.aga.org/>

AMERICAN HARDBOARD ASSOCIATION (AHA)
1210 West Northwest Highway
Palatine, IL 60067
Ph: 847-934-8800
Fax: 847-934-8803
E-mail: aha@hardboard.org
Internet: <http://domensino.com/AHA/>

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)
130 East Randolph, Suite 2000
Chicago, IL 60601
Ph: 312-670-5444
Fax: 312-670-5403
Steel Solutions Center: 866-275-2472
E-mail: solutions@aisc.org
Internet: <https://www.aisc.org/>

AMERICAN IRON AND STEEL INSTITUTE (AISI)
25 Massachusetts Avenue, NW Suite 800
Washington, DC 20001
Ph: 202-452-7100
Internet: <https://www.steel.org/>

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)
7470 New Technology Way, Suite F
Frederick, MD 21703
Ph: 301-972-1700
Fax: 301-540-8004
E-mail: alsc@alsc.org
Internet: <http://www.alsc.org>

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
1899 L Street, NW, 11th Floor
Washington, DC 20036
Ph: 202-293-8020
Fax: 202-293-9287
E-mail: storemanager@ansi.org
Internet: <https://www.ansi.org/>

AMERICAN PETROLEUM INSTITUTE (API)
1220 L Street, NW
Washington, DC 20005-4070
Ph: 202-682-8000
Internet: <https://www.api.org/>

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION
(AREMA)
4501 Forbes Blvd., Suite 130
Lanham, MD 20706
Ph: 301-459-3200
E-mail: info@arema.org
Internet: <https://www.arema.org>

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)
P.O. Box 28518
1711 Arlingate Lane
Columbus, OH 43228-0518
Ph: 800-222-2768 or 614-274-6003
Fax: 614-274-6899
E-mail: tjones@asnt.org
Internet: <https://www.asnt.org/>

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)
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Ph: 800-548-2723; 703-295-6300
Internet: <https://www.asce.org/>

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING
ENGINEERS (ASHRAE)
1791 Tullie Circle, NE
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Ph: 404-636-8400 or 800-527-4723
Fax: 404-321-5478
E-mail: ashrae@ashrae.org
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AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
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New York, NY 10016-5990
Ph: 800-843-2763
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E-mail: customercare@asme.org
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AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)
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Park Ridge, IL 60068
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E-mail: customerservice@assp.org
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AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)
18927 Hickory Creek Drive, Suite 220
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Fax: 708-479-6139
Internet: <http://www.asse-plumbing.org>

AMERICAN WATER WORKS ASSOCIATION (AWWA)
6666 W. Quincy Avenue
Denver, CO 80235 USA
Ph: 303-794-7711 or 800-926-7337
Fax: 303-347-0804

Internet: <https://www.awwa.org/>

AMERICAN WELDING SOCIETY (AWS)
8669 NW 36 Street, #130
Miami, FL 33166-6672
Ph: 800-443-9353
Internet: <https://www.aws.org/>

AMERICAN WOOD COUNCIL (AWC)
222 Catoctin Circle SE, Suite 201
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AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)
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APA - THE ENGINEERED WOOD ASSOCIATION (APA)
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ASSOCIATION FOR THE ADVANCEMENT OF MEDICAL INSTRUMENTATION (AAMI)
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BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)
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Internet: <https://www.buildershardware.com/>

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Ph: 916-558-1784
Internet: <https://www.cdph.ca.gov/>

CARPET AND RUG INSTITUTE (CRI)
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Fax: 706-278-8835
Internet: <https://carpet-rug.org/>

CAST IRON SOIL PIPE INSTITUTE (CISPI)
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Internet: <https://www.cispi.org/>

CENTERS FOR DISEASE CONTROL AND PREVENTION (CDC)
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COMPOSITE PANEL ASSOCIATION (CPA)
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Internet: <http://www.crsi.org/>

COPPER DEVELOPMENT ASSOCIATION (CDA)
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COUNCIL ON ENVIRONMENTAL QUALITY (CEQ) (WHITE HOUSE)
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FOREST STEWARDSHIP COUNCIL (FSC)
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Internet: <https://www.ies.org/>

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E-mail: onlinesupport@ieee.org
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Internet: <https://www.icri.org/>

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Internet: <https://www.netaworld.org/>

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Internet: <https://safetyequipment.org/>

INTERNET ENGINEERING TASK FORCE (IETF)
c/o Association Management Solutions, LLC (AMS)
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MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS
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Internet: <https://www.mbma.com/>

METAL FRAMING MANUFACTURERS ASSOCIATION (MFMA)
330 N. Wabash Avenue
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E-mail: MFMAstats@smithbucklin.com
Internet: <http://www.metalframingmfg.org/>

MIDWEST INSULATION CONTRACTORS ASSOCIATION (MICA)
16712 Elm Circle
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NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)
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NATIONAL COUNCIL ON RADIATION PROTECTION AND MEASUREMENTS (NCRP)
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NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION (NECA)
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Internet: <https://www.necanet.org/>

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
1300 North 17th Street, Suite 900
Arlington, VA 22209
Ph: 703-841-3200
Internet: <https://www.nema.org>

NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)
8575 Grovemont Circle
Gaithersburg, MD 20877
Ph: 301-977-3698
Fax: 301-977-9589
Internet: <http://www.nebb.org>

NATIONAL FENESTRATION RATING COUNCIL (NFRC)
6305 Ivy Lane, Suite 140
Greenbelt, MD 20770
Ph: 301-589-1776
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E-Mail: info@nfrc.org
Internet: <http://www.nfrc.org>

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
1 Batterymarch Park
Quincy, MA 02169-7471
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Internet: <https://www.nfpa.org>

NATIONAL HARDWOOD LUMBER ASSOCIATION (NHLA)
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NATIONAL INSTITUTE FOR CERTIFICATION IN ENGINEERING TECHNOLOGIES
(NICET)
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NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)
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NATIONAL PRECAST CONCRETE ASSOCIATION (NPCA)
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Ph: 800-405-8873 or 847-649-5555
Fax: 847-649-5678
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registration required
Obtain Unified Facilities Criteria (UFC) from:
Whole Building Design Guide (WBDG)
National Institute of Building Sciences (NIBS)
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Ph: 202-289-7800
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Internet:
<https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc>

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Washington, D.C. 20585
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E-mail: The.Secretary@hq.doe.gov
Internet: <https://www.energy.gov/>

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Obtain documents from:
Acquisition Streamlining and Standardization Information System
(ASSIST)
Internet: <https://assist.dla.mil/online/start/>; account
registration required

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Internet: <https://new.usgbc.org/>

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E-mail: environment@ul.com
Internet: <https://industries.ul.com/environment/>

UL SOLUTIONS (UL)
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Camas, WA 98607-8542
Ph: 877-854-3577 or 360-817-5500
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Corporate Headquarters
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Fax: 972-243-3907
E-mail: info@uni-bell.org
Internet: <https://www.uni-bell.org/>

VIBRATION ISOLATION AND SEISMIC CONTROL MANUFACTURERS ASSOCIATION
(VISCMA)
994 Old Eagle School Road
Suite 1019
Wayne, PA 19087-1866
Ph: 610-971-4850
E-mail: info@viscma.com
Internet: <http://www.viscma.com>

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)
6980 S.W. Varns
Tigard, OR 97223
Ph: 503-639-0651
Fax: 503-684-8928
E-mail: info@wclib.org
Internet: <http://www.wclib.org>

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)
1500 SW First Ave., Suite 870
Portland, OR 97201
Ph: 503-224-3930
E-mail: info@wwpa.org
Internet: <http://www.wwpa.org>

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)
2025 M Street, NW, Suite 800
Washington, DC 20036-3309
Ph: 202-367-1157
or
330 N Wabash Avenue, Suite 2000
Chicago, IL 60611
Ph: 312-321-6802
E-mail: membersupport@wdma.com
Internet: <https://www.wdma.com/>

WOODWORK INSTITUTE (WI)
3188 Industrial Blvd.
West Sacramento, CA 95691
Ph: 916-372-9943
Fax: 916-372-9950
E-mail: info@woodinst.com
Internet: <https://woodworkinstitute.com>

PART 2 PRODUCTS

Not used

SOF Military Working Dog Kennel
Hunter Army Airfield, Georgia

PN 69262

PART 3 EXECUTION

Not used

-- End of Section --

SECTION 01 45 00.00 10

QUALITY CONTROL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D3740 (2019) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

ASTM E329 (2021) Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

1.2 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program. Include all associated costs in the applicable Bid Schedule item.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Contractor Quality Control (CQC) Plan; G

SD-06 Test Reports

Verification Statement

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

Establish and maintain an effective quality control (QC) system that complies with FAR 52.246-12 Inspection of Construction. QC consist of

plans, procedures, and organization necessary to produce an end product which complies with the Contract requirements. The QC system covers all construction operations, both onsite and offsite, and be keyed to the proposed construction sequence. The project superintendent will be held responsible for the quality of work and is subject to removal by the Contracting Officer for non-compliance with the quality requirements specified in the Contract. In this context the highest level manager responsible for the overall construction activities at the site, including quality and production is the project superintendent. The project superintendent maintains a physical presence at the site at all times and is responsible for all construction and related activities at the site, except as otherwise acceptable to the Contracting Officer.

3.2 CONTRACTOR QUALITY CONTROL (CQC) PLAN

Submit no later than 30 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements FAR 52.246-12 Inspection of Construction. The Government will consider an interim plan for the first 5 days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional work.

3.2.1 Content of the CQC Plan

Include, as a minimum, the following to cover all construction-operations, both onsite and offsite, including work by subcontractors fabricators, suppliers and purchasing agents:

- a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff will implement the three phase control system for all aspects of the work specified. Include a CQC System Manager that reports to the project superintendent.
- b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.
- c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the Contract. Letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities will be issued by the CQC System Manager. Furnish copies of these letters to the Contracting Officer.
- d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents. These procedures must be in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.
- e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities approved by the Contracting Officer are required to be used.)

- f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.
- g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. Establish verification procedures that identified deficiencies have been corrected.
- h. Reporting procedures, including proposed reporting formats.
- i. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks, has separate control requirements, and is identified by different trades or disciplines, or it is work by the same trade in a different environment. Although each section of the specifications can generally be considered as a definable feature of work, there are frequently more than one definable features under a particular section. This list will be agreed upon during the coordination meeting.
- j. Coordinate scheduled work with Special Inspections required by Section 01 45 35 SPECIAL INSPECTIONS, the Statement of Special Inspections and the Schedule of Special Inspections. Where the applicable Code issue by the International Code Council (ICC) calls for inspections by the Building Official, the Contractor must include the inspections in the Quality Control Plan and must perform the inspections required by the applicable ICC. The Contractor must perform these inspections using independent qualified inspectors. Include the Special Inspection Plan requirements in the QC Plan.

3.2.2 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in the Contractor Quality Control (CQC) Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.2.3 Notification of Changes

After acceptance of the CQC Plan, notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the CQC Plan, meet with the Contracting Officer and discuss the Contractor's quality control system. Submit the CQC Plan a minimum of 14 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details must be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting will be prepared by the Government, signed by both the Contractor and the Contracting Officer and will become

a part of the contract file. There can be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings or address deficiencies in the CQC system or procedures which can require corrective action by the Contractor.

3.4 QUALITY CONTROL ORGANIZATION

3.4.1 Personnel Requirements

The requirements for the CQC organization are a Safety and Health Manager, CQC System Manager, and sufficient number of additional qualified personnel to ensure safety and Contract compliance. The Safety and Health Manager reports directly to a senior project (or corporate) official independent from the CQC System Manager. The Safety and Health Manager will also serve as a member of the CQC Staff. Personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly will also be included as part of the CQC organization. The Contractor's CQC staff maintains a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure Contract compliance. The CQC staff will be subject to acceptance by the Contracting Officer. Provide adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Promptly complete and furnish all letters, material submittals, shop drawing submittals, schedules and all other project documentation to the CQC organization. The CQC organization is responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Contracting Officer.

3.4.2 CQC System Manager

Identify as CQC System Manager an individual within the onsite work organization that is responsible for overall management of CQC and has the authority to act in all CQC matters for the Contractor. The CQC System Manager is required to be a construction person with a minimum of 10 years in related work. This CQC System Manager is on the site at all times during construction and is employed by the prime Contractor. The CQC System Manager is assigned no other duties. Identify in the plan an alternate to serve in the event of the CQC System Manager's absence. The requirements for the alternate are the same as the CQC System Manager.

3.4.3 CQC Personnel

In addition to CQC personnel specified elsewhere in the contract, provide as part of the CQC organization specialized personnel to assist the CQC System Manager for the following areas: Electrical, mechanical. These individuals or specialized technical companies are employees of the prime or subcontractor; be responsible to the CQC System Manager; be physically present at the construction site during work on the specialized personnel's areas of responsibility; have the necessary education or experience in accordance with the experience matrix listed herein. These individuals have no other duties other than quality control. A single person can cover more than one area provided that the single person is qualified to perform quality control activities in each designated and that workload allows.

Experience Matrix	
Area	Qualifications
Mechanical	Graduate Mechanical Engineer with 2 yrs experience or person with 5 years of experience supervising mechanical features of work in the field with a construction company
Electrical	Graduate Electrical Engineer with 2 years related experience or person 5 years of experience supervising electrical features of work in the field with a construction company

3.4.4 Additional Requirement

In addition to the above experience and education requirements, the Contractor Quality Control (CQC) System Manager and Alternate CQC System Manager are required to have completed the Construction Quality Management (CQM) for Contractors course. If the CQC System Manager does not have a current certification, obtain the CQM for Contractors course certification within 90 days of award. This course is periodically offered by the Naval Facilities Engineering Command and the Army Corps of Engineers. Contact the Contracting Officer for information on the next scheduled class.

The Construction Quality Management Training certificate expires after 5 years. If the CQC System Manager's certificate has expired, retake the course to remain current.

3.4.5 Organizational Changes

Maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

3.5 SUBMITTALS AND DELIVERABLES

Submittals, if needed, have to comply with the requirements in Section 01 33 00 SUBMITTAL PROCEDURES. The CQC organization is responsible for certifying that all submittals and deliverables are in compliance with the contract requirements. When Section 01 91 00.15 10 TOTAL BUILDING COMMISSIONING are included in the contract, the submittals required by those sections have to be coordinated with Section 01 33 00 SUBMITTAL PROCEDURES to ensure adequate time is allowed for each type of submittal required.

3.6 CONTROL

CQC is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control are required to be conducted by the CQC System Manager for each definable feature of the construction work as follows:

3.6.1 Preparatory Phase

This phase is performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase includes:

- a. A review of each paragraph of applicable specifications, reference codes, and standards. Make available during the preparatory inspection a copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field. Maintain and make available in the field for use by Government personnel until final acceptance of the work.
- b. Review of the Contract drawings.
- c. Check to assure that all materials and equipment have been tested, submitted, and approved.
- d. Review of provisions that have been made to provide required control inspection and testing.
- e. Review Special Inspections required by Section 01 45 35 SPECIAL INSPECTIONS, the Statement of Special Inspections and the Schedule of Special Inspections.
- f. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the Contract.
- g. Examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
- h. Review of the appropriate activity hazard analysis to assure safety requirements are met.
- i. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.
- j. Check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
- k. Discussion of the initial control phase.
- l. The Government needs to be notified at least 24 hours in advance of beginning the preparatory control phase. Include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. Document the results of the preparatory phase actions by separate minutes prepared by the CQC System Manager and attach to the daily CQC report. Instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.6.2 Initial Phase

This phase is accomplished at the beginning of a definable feature of work. Accomplish the following:

- a. Check work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.
- b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing are in compliance with the contract.
- c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.
- d. Resolve all differences.
- e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.
- f. The Government needs to be notified at least 24 hours in advance of beginning the initial phase for definable feature of work. Prepare separate minutes of this phase by the CQC System Manager and attach to the daily CQC report. Indicate the exact location of initial phase for definable feature of work for future reference and comparison with follow-up phases.
- g. The initial phase for each definable feature of work is repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.
- h. Coordinate scheduled work with Special Inspections required by Section 01 45 35 SPECIAL INSPECTIONS, the Statement of Special Inspections and the Schedule of Special Inspections.

3.6.3 Follow-up Phase

Perform daily checks to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. Record the checks in the CQC documentation. Conduct final follow-up checks and correct all deficiencies prior to the start of additional features of work which may be affected by the deficient work. Do not build upon nor conceal non-conforming work. Coordinate scheduled work with Special Inspections required by Section 01 45 35 SPECIAL INSPECTIONS, the Statement of Special Inspections and the Schedule of Special Inspections.

3.6.4 Additional Preparatory and Initial Phases

Conduct additional preparatory and initial phases on the same definable features of work if: The quality of on-going work is unacceptable; if there are changes in the applicable CQC staff, onsite production supervision or work crew; if work on a definable feature is resumed after a substantial period of inactivity; or if other problems develop.

3.7 TESTS

3.7.1 Testing Procedure

Perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements.

Upon request, furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and acceptance tests when specified. Procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site. Perform the following activities and record and provide the following data:

- a. Verify that testing procedures comply with contract requirements.
- b. Verify that facilities and testing equipment are available and comply with testing standards.
- c. Check test instrument calibration data against certified standards.
- d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
- e. Record results of all tests taken, both passing and failing on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test. If approved by the Contracting Officer, actual test reports are submitted later with a reference to the test number and date taken. Provide an information copy of tests performed by an offsite or commercial test facility directly to the Contracting Officer. Failure to submit timely test reports as stated results in nonpayment for related work performed and disapproval of the test facility for this Contract.

3.7.2 Testing Laboratories

All testing laboratories must be validated by the USACE Material Testing Center (MTC) for the tests to be performed. Information on the USACE MTC with web-links to both a list of validated testing laboratories and for the laboratory inspection request for can be found at:
<https://mtc.erdcdren.mil/>.

3.7.2.1 Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel is required to meet criteria detailed in ASTM D3740 and ASTM E329.

3.7.2.2 Capability Recheck

If the selected laboratory fails the capability check, the Contractor will be assessed a charge of \$500 to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the Contract amount due the Contractor.

3.7.3 Onsite Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests, and to check the Contractor's testing procedures, techniques, and test results at no

additional cost to the Government.

3.8 COMPLETION INSPECTION

3.8.1 Punch-Out Inspection

Conduct an inspection of the work by the CQC System Manager near the end of the work, or any increment of the work established by a time stated in FAR 52.211-10 Commencement, Prosecution, and Completion of Work, or by the specifications. Prepare and include in the CQC documentation a punch list of items which do not conform to the approved drawings and specifications, as required by paragraph DOCUMENTATION. Include within the list of deficiencies the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, notify the Government that the facility is ready for the Government Pre-Final inspection.

3.8.2 Pre-Final Inspection

The Government will perform the pre-final inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. Ensure that all items on this list have been corrected before notifying the Government, so that a Final inspection with the customer can be scheduled. Correct any items noted on the Pre-Final inspection in a timely manner. These inspections and any deficiency corrections required by this paragraph need to be accomplished within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate completion dates.

3.8.3 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative is required to be in attendance at the final acceptance inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups, and major commands can also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final inspection. Notify the Contracting Officer at least 14 days prior to the final acceptance inspection and include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the Contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance FAR 52.246-12 Inspection of Construction.

3.9 DOCUMENTATION

3.9.1 Quality Control Activities

Maintain current records providing factual evidence that required quality control activities and tests have been performed. Include in these records the work of subcontractors and suppliers on an acceptable form that includes, as a minimum, the following information:

- a. The name and area of responsibility of the Contractor/Subcontractor.
- b. Operating plant/equipment with hours worked, idle, or down for repair.
- c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.
- d. Test and control activities performed with results and references to specifications/drawings requirements. Identify the control phase (Preparatory, Initial, Follow-up). List of deficiencies noted, along with corrective action.
- e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.
- f. Submittals and deliverables reviewed, with Contract reference, by whom, and action taken.
- g. Offsite surveillance activities, including actions taken.
- h. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
- i. Instructions given/received and conflicts in plans and specifications.

3.9.2 Verification Statement

Indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. Cover both conforming and deficient features and include a statement that equipment and materials incorporated in the work and workmanship comply with the Contract. Furnish the original and one copy of these records in report form to the Government daily within 24 hours after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, prepare and submit one report for every 7 days of no work and on the last day of a no work period. All calendar days need to be accounted for throughout the life of the contract. The first report following a day of no work will be for that day only. Reports need to be signed and dated by the Contractor Quality Control (CQC) System Manager. Include copies of test reports and copies of reports prepared by all subordinate quality control personnel within the CQC System Manager Report.

3.10 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. Take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, will be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the

Contracting Officer can issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders will be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

-- End of Section --

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SECTION 01 45 00.15 10

RESIDENT MANAGEMENT SYSTEM CONTRACTOR MODE (RMS CM)

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this section to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2024) Safety -- Safety and Occupational
Health (SOH) Requirements

1.2 MEASUREMENT AND PAYMENT

The work of this section is not measured for payment. The Contractor is responsible for the work of this section, without any direct compensation other than the payment received for contract items.

1.3 CONTRACT ADMINISTRATION

The Government will use the Resident Management System (RMS) to assist in its monitoring and administration of this contract. The Government accesses the system using the Government Mode of RMS (RMS GM) and the Contractor accesses the system using the Contractor Mode (RMS CM). The term RMS will be used in the remainder of this section for both RMS GM and RMS CM. The joint Government-Contractor use of RMS facilitates electronic exchange of information and overall management of the contract. The Contractor accesses RMS to record, maintain, input, track, and electronically share information with the Government throughout the contract period in the following areas:

Administration
Finances
Quality Control
Submittal Monitoring
Scheduling
Closeout
Import/Export of Data

1.3.1 Correspondence and Electronic Communications

For ease and speed of communications, exchange correspondence and other documents in electronic format to the maximum extent feasible. Some correspondence, including pay requests and payrolls, are also to be provided in paper format with original signatures. Paper documents will govern, in the event of discrepancy with the electronic version.

1.3.2 Other Factors

Other portions of this document have a direct relationship to the reporting accomplished through RMS. Particular attention is directed to

FAR 52.236-15 Schedules for Construction Contracts; FAR 52.232-27 Prompt Payment for Construction Contracts; FAR 52.232-5 Payments Under Fixed-Priced Construction Contracts; Section 01 32 01.00 10 PROJECT SCHEDULE; Section 01 33 00 SUBMITTAL PROCEDURES; Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS; and Section 01 45 00.00 10 QUALITY CONTROL.

1.4 RMS SOFTWARE

RMS is a web based application. Download, install and be able to utilize the latest version of RMS within 7 calendar days of receipt of the Notice to Proceed. RMS software, user manuals, access and installation instructions, program updates and training information are available from the RMS website (<https://rms.usace.army.mil>). The Government and the Contractor will have different access authorities to the same contract database through RMS. The common database will be updated automatically each time a user finalizes an entry or change.

1.5 CONTRACT DATABASE - GOVERNMENT

The Government will enter the basic contract award data in RMS prior to granting the Contractor access. The Government entries into RMS will generally be related to submittal reviews, correspondence status, and Quality Assurance (QA) comments, as well as other miscellaneous administrative information.

1.6 CONTRACT DATABASE - CONTRACTOR

Contractor entries into RMS establish, maintain, and update data throughout the duration of the contract. Contractor entries generally include prime and subcontractor information, daily reports, submittals, RFI's, schedule updates and payment requests. RMS includes the ability to import attachments and export reports in many of the modules, including submittals. The Contractor responsibilities for entries in RMS typically include the following items:

1.6.1 Administration

1.6.1.1 Contractor Information

Enter all current Contractor administrative data and information into RMS within 7 calendar days of receiving access to the contract in RMS. This includes, but is not limited to, Contractor's name, address, telephone numbers, management staff, and other required items.

1.6.1.2 Subcontractor Information

Enter all missing subcontractor administrative data and information into RMS CM within 7 calendar days of receiving access to the contract in RMS or within 7 calendar days of the signing of the subcontractor agreement for agreements signed at a later date. This includes name, trade, address, phone numbers, and other required information for all subcontractors. A subcontractor is listed separately for each trade to be performed.

1.6.1.3 Correspondence

Identify all Contractor correspondence to the Government with a serial number. Prefix correspondence initiated by the Contractor's site office

with "S". Prefix letters initiated by the Contractor's home (main) office with "H". Letters are numbered starting from 0001. (e.g., H-0001 or S-0001). The Government's letters to the Contractor will be prefixed with "C" or "RFP".

1.6.1.4 Equipment

Enter and maintain a current list of equipment planned for use or being used on the job site, including the most recent and planned equipment inspection dates.

1.6.1.5 Reports

Track the status of the project utilizing the reports available in RMS. The value of these reports is reflective of the quality of the data input. These reports include the Progress Payment Request worksheet, Quality Control (QC) comments, Submittal Register Status, and Three-Phase Control worksheets.

1.6.1.6 Request For Information (RFI)

Create and track all Requests For Information (RFI) in the RMS Administration Module for Government review and response.

1.6.2 Finances

1.6.2.1 Pay Activity Data

Develop and enter a list of pay activities in conjunction with the project schedule. The sum of pay activities equals the total contract amount, including modifications. Each pay activity must be assigned to a Contract Line Item Number (CLIN). The sum of the activities assigned to a CLIN equals the amount of each CLIN.

1.6.2.2 Payment Requests

Prepare all progress payment requests using RMS. Update the work completed under the contract at least monthly, measured as percent or as specific quantities. After the update, generate a payment request and prompt payment certification using RMS. Submit the signed prompt payment certification and payment request as well as supporting data either electronically or by hard copy. Unless waived by the Contracting Officer, a signed paper copy of the approved payment certification and request is also required and will govern in the event of discrepancy with the electronic version.

1.6.3 Quality Control (QC)

Enter and track implementation of the 3-phase QC Control System, QC testing, transferred and installed property and warranties in RMS. Prepare daily reports, identify and track deficiencies, document progress of work, and support other Contractor QC requirements in RMS. Maintain all data on a daily basis. Ensure that RMS reflects all quality control methods, tests and actions contained within the Contractor Quality Control (CQC) Plan and Government review comments of same within 7 calendar days of Government acceptance of the CQC Plan.

1.6.3.1 Quality Control (QC) Reports

The Contractor's Quality Control (QC) Daily Report in RMS is the official report. The Contractor can use other supplemental formats to record QC data, but information from any supplemental formats are to be consolidated and entered into the RMS QC Daily Report. Any supplemental information may be entered into RMS as an attachment to the report. QC Daily Reports must be finalized and signed in RMS within 24 hours after the date covered by the report. Provide the Government a printed signed copy of the QC Daily Report, unless waived by the Contracting Officer.

1.6.3.2 Deficiency Tracking.

Use the QC Daily Report Module to enter and track deficiencies. Deficiencies identified and entered into RMS by the Contractor or the Government will be sequentially numbered with a QC or QA prefix for tracking purposes. Enter each deficiency into RMS the same day that the deficiency is identified. Monitor, track and resolve all QC and QA entered deficiencies. A deficiency is not considered to be corrected until the Government indicates concurrence in RMS.

1.6.3.3 Three-Phase Control Meetings

Maintain scheduled and actual dates and times of preparatory and initial control meetings in RMS. Worksheets for the three-phase control meetings are generated within RMS.

1.6.3.4 Labor and Equipment Hours

Enter labor and equipment exposure hours on a daily basis. Roll up the labor and equipment exposure data into a monthly exposure report.

1.6.3.5 Accident/Safety Reporting

Both the Contractor and the Government enter safety related comments in RMS as a deficiency. The Contractor must monitor, track and show resolution for safety issues in the QC Daily Report area of the RMS QC Module. In addition, follow all reporting requirements for accidents and incidents as required in EM 385-1-1, Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS and as required by any other applicable Federal, State or local agencies.

1.6.3.6 Definable Features of Work

Enter each feature of work, as defined in the approved CQC Plan, into the RMS QC Module. A feature of work may be associated with a single or multiple pay activities, however a pay activity is only to be linked to a single feature of work.

1.6.3.7 Activity Hazard Analysis

Import activity hazard analysis electronic document files into the RMS QC Module utilizing the document package manager.

1.6.4 Submittal Management

Enter all current submittal register data and information into RMS within 7 calendar days of receiving access to the contract in RMS. The information shown on the submittal register following the specification

Section 01 33 00 SUBMITTAL PROCEDURES will already be entered into the RMS database when access is granted. Group electronic submittal documents into transmittal packages to send to the Government, except very large electronic files, samples, spare parts, mock ups, color boards, or where hard copies are specifically required. Track transmittals and update the submittal register in RMS on a daily basis throughout the duration of the contract. Submit hard copies of all submittals unless waived by the Contracting Officer.

1.6.5 Schedule

Enter and update the contract project schedule in RMS by either manually entering all schedule data or by importing the Standard Data Exchange Format (SDEF) file, based on the requirements in Section 01 32 01.00 13 PROJECT SCHEDULE.

1.6.6 Closeout

Closeout documents, processes and forms are managed and tracked in RMS by both the Contractor and the Government. Ensure that all closeout documents are entered, completed and documented within RMS.

1.7 IMPLEMENTATION

Use of RMS as described in the preceding paragraphs is mandatory. Ensure that sufficient resources are available to maintain contract data within the RMS system. RMS is an integral part of the Contractor's required management of quality control.

1.8 NOTIFICATION OF NONCOMPLIANCE

Take corrective action within 7 calendar days after receipt of notice of RMS non-compliance by the Contracting Officer.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

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SECTION 01 45 35

SPECIAL INSPECTIONS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC (2018) International Building Code

1.2 GENERAL REQUIREMENTS

Perform Special Inspections in accordance with the Statement of Special Inspections, Schedule of Special Inspections and Chapter 17 of ICC IBC. The Statement of Special Inspections and Schedule of Special Inspections are included as an attachment to this specification. Special Inspections are to be performed by an independent third party and are intended to ensure that the work of the Prime Contractor is in accordance with the Contract Documents and applicable building codes. Special inspections do not take the place of the three phases of control inspections performed by the Contractor's QC Manager or any testing and inspections required by other sections of the specifications.

1.3 DEFINITIONS

1.3.1 Continuous Special Inspections

Continuous Special Inspections is the constant monitoring of specific tasks by a special inspector. These inspections must be carried out continuously over the duration of the particular tasks.

1.3.2 Perform

Perform these Special Inspections tasks for each welded joint or member.

1.3.3 Observe

Observe these Special Inspections items on a periodic daily basis. Operations need not be delayed pending these inspections.

1.3.4 Special Inspector (SI)

A qualified person retained by the Contractor and approved by the Contracting Officer as having the competence necessary to inspect a particular type of construction requiring Special Inspections. The SI must be an independent third party hired directly by the Prime Contractor.

1.3.5 Associate Special Inspector (ASI)

A qualified person who assists the SI in performing Special Inspections but must perform inspection under the direct supervision of the SI and

cannot perform inspections without the SI on site.

1.3.6 Third Party

A Special inspector must not be an employee of the Contractor or of any Sub-Contractor performing the work to be inspected.

1.3.7 Contracting Officer

The Government official having overall authority for administrative contracting actions. Certain contracting actions may be delegated to the Contracting Officer's Representative (COR).

1.3.8 Contractor's Quality Control (QC) Manager

An individual retained by the Prime Contractor and qualified in accordance with the Section 01 45 00.00 10 QUALITY CONTROL having the overall responsibility for the Contractor's QC organization.

1.3.9 Structural Engineer of Record (SER)

Employed by the Government responsible for the overall design and review of submittal documents prepared by others. The SER is registered or licensed to practice their respective design profession as defined by the statutory requirements of the professional registration laws in the state in which the design professional works. The SER is also referred to as the Engineer of Record (EOR) in design code documents.

1.3.10 Statement of Special Inspections (SSI)

A document developed by the SER identifying the material, systems, components and work required to have Special Inspections. This statement is included at the end of this specification.

1.3.11 Schedule of Special Inspections (SSI)

A schedule which lists each of the required Special Inspections, the extent to which each Special Inspection is to be performed, and the required frequency for each in accordance with ICC IBC Chapter 17. This schedule is included at the end of this specification.

1.3.12 Definable Feature of Work (DFOW)

An inspection group that is separate and distinct from other inspection groups, having inspection requirements or inspectors that are unique.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Special Inspections Agency's Written NDT Practices with method and evidence of regular equipment calibration where applicable

SD-06 Test Reports

Special Inspections Daily Reports

Special Inspections Biweekly Reports

SD-07 Certificates

AISC Certified Steel Fabricator

AC472 Accreditation

Certificate of Compliance

Special Inspector Qualifications; G RO

Qualification Records for NDT technicians

SD-11 Closeout Submittals

Comprehensive Final Report of Special Inspections; G RO

1.5 SPECIAL INSPECTOR QUALIFICATIONS

Submit qualifications for each special inspector.

1.5.1 Steel Construction and High Strength Bolting

1.5.1.1 Special Inspector

- a. ICC Structural Steel and Bolting Special Inspector certificate with one year of related experience, or
- b. Registered Professional Engineer with three years of related experience

1.5.1.2 Associate Special Inspector

Engineer-In-Training with one year of related experience.

1.5.2 Welding Structural Steel

1.5.2.1 Special Inspector

- a. AWS Certified Welding Inspector

1.5.2.2 Associate Special Inspector

AWS Certified Associate Welding Inspector

1.5.3 Nondestructive Testing of Welds

1.5.3.1 Special Inspector

NDT Level III Certificate

1.5.3.2 Associate Special Inspector

NDT Level II Certificate plus one year of related experience

1.5.4 Cold Formed Steel Framing

1.5.4.1 Special Inspector

- a. ICC Commercial Building Inspector with one year of experience, or
- b. ICC Residential Building Inspector with one year of experience, or
- c. Registered Professional Engineer with three years related experience

1.5.4.2 Associate Special Inspector

Engineer-In-Training with one year of related experience.

1.5.5 Concrete Construction

1.5.5.1 Special Inspector

- a. ICC Reinforced Concrete Special Inspector Certificate with one year of related experience, or
- b. ACI Concrete Construction Special Inspector, or
- c. Registered Professional Engineer with three years of related experience

1.5.5.2 Associate Special Inspector

- a. ACI Concrete Construction Special Inspector in Training, or
- b. Engineer-In-Training with one year of related experience

1.5.6 Masonry Construction

1.5.6.1 Special Inspector

- a. ICC Structural Masonry Special Inspector Certificate with one year of related experience, or
- b. Registered Professional Engineer with three years of related experience

1.5.6.2 Associate Special Inspector

Engineer-In-Training with one year of related experience.

1.5.7 Verification of Site Soil Condition, Fill Placement and Load-Bearing Requirements

1.5.7.1 Special Inspector

- a. ICC Soils Special Inspector Certificate with one year of related experience, or
- b. NICET Soils Technician Level II Certificate in Construction Material Testing, or
- c. Geologist-In-Training with three years of related experience, or
- d. Registered Professional Engineer with three years of related experience

1.5.7.2 Associate Special Inspector

- a. NICET Soils Technician Level I Certificate in Construction Material Testing with one year of related experience, or
- b. Engineer-In-Training with one year of related experience

1.5.8 Fire-Resistant Penetrations and Joints

1.5.8.1 Special Inspector

- a. Passed the UL Firestop Exam with one year of related experience, or
- b. Passed the FM Firestop Exam with one year of related experience, or
- c. Registered Professional Engineer with related experience

1.5.8.2 Associate Special Inspector

Engineer-In-Training with one year of related experience.

1.5.9 Smoke Control

1.5.9.1 Special Inspector

- a. AABC Technician Certification with one year of related experience, or
- b. Registered Professional Engineer with related experience

1.5.9.2 Associate Special Inspector

Engineer-In-Training with one year of related experience.

PART 2 PRODUCTS

2.1 FABRICATOR SPECIAL INSPECTIONS

Special Inspections of fabricator's work performed in the fabricator's shop is required to be inspected in accordance with the Statement of Special Inspections and the Schedule of Special Inspections unless the fabricator is certified by the approved agency to perform such work without Special Inspections. Submit the following certifications to the Contracting Officer for information to allow work performed in the fabricator's shop to not be subjected to Special Inspections.

AISC Certified Steel Fabricator.

International Accreditation Service, AC472 Accreditation

At the completion of fabrication, submit a certificate of compliance, to be included with the comprehensive final report of Special Inspections, stating that the materials supplied and work performed by the fabricator are in accordance with the construction documents.

PART 3 EXECUTION

3.1 RESPONSIBILITIES

3.1.1 Quality Control Manager

- a. Supervise all Special Inspectors required by the Contract Documents and the IBC.
- b. Verify the qualifications of all of the Special Inspectors.
- c. Verify the qualifications of fabricators.
- d. Maintain a 3-ring binder for the Special Inspector's daily and biweekly reports. This file must be located in a conspicuous place in the project trailer/office to allow review by the Contracting Officer and the SER.
- e. Maintain a rework items list that includes discrepancies noted on the Special Inspectors daily report.

3.1.2 Special Inspectors

- a. Inspect all elements of the project for which the special inspector is qualified to inspect and are identified in the Schedule of Special Inspections.
- b. Attend preparatory phase meetings related to the Definable Feature of Work (DFOW) for which the special inspector is qualified to inspect.
- c. Submit Special Inspections agency's written NDT practices for the monitoring and control of the agency's operations to include the following:
 - (1) The agency's procedures for the selection and administration of inspection personnel, describing the training, experience and examination requirements for qualifications and certification of inspection personnel.
 - (2) The agency's inspection procedures, including general inspection, material controls, and visual welding inspection.
- d. Submit qualification records for nondestructive testing (NDT) technicians designated for the project.
- e. Submit NDT procedures and equipment calibration records for NDT to be performed and equipment to be used for the project.
- f. Submit a copy of the daily reports to the QC Manager.
- g. Report discrepancies that are observed during Special Inspections to the QC Manager for correction. If discrepancies are not corrected before the special inspector leaves the site the observed discrepancies must be documented in the daily report.
- h. Submit a biweekly Special Inspection Report until all inspections are complete. A report is required for each biweekly period in which Special Inspections activity occurs, and must include the following:

- (1) A brief summary of the work performed during the reporting time frame.
 - (2) Changes and discrepancies with the drawings, specifications and mechanical or electrical component certification, that were observed during the reporting period.
 - (3) Discrepancies which were resolved or corrected.
 - (4) A list of nonconforming items requiring resolution.
 - (5) All applicable test result including nondestructive testing reports.
- i. At the completion of the project submit a comprehensive final report of Special Inspections that documents the Special Inspections completed for the project and corrections of all discrepancies noted in the daily reports. The comprehensive final report of Special Inspections must be signed, dated and indicate the certification of the special inspector qualifying them to conduct the inspection.

3.2 DEFECTIVE WORK

Check work as it progresses, but failure to detect any defective work or materials must in no way prevent later rejection if defective work or materials are discovered, nor obligate the Contracting Officer to accept such work.

-- End of Section --

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Project: Hunter MWD
 Location: Savannah, GA
 Project #: BMcD #189618
 Date: 12/10/2025



STATEMENT OF SPECIAL INSPECTIONS

Project Seismic Design Category: C
 Project Risk Category: II
 Project Design Wind Speed (mph): 134
 Number of Stories: 1
 Structure Height Above Grade (ft): 19
 Hazardous Occupancy or attached to such? No Group H Occupancies

Special Inspector of Record (SIOR)

A Special Inspector of Record (SIOR) IS NOT required (per UFGS 01 45 35, Section 1.3.8)

Lateral Force Resisting System (LFRS)

2018 IBC 1704.3.2 and 1704.3.3

Following is a listing of critical main wind/seismic force resisting systems for this structure. Carefully inspect these elements as part of the roles and responsibilities of the Special Inspector (reference the Schedule of Special Inspections for inspection checklists).

Vertical LFRS Elements	Notes
Ordinary Concentric Braced Frames (Assumed)	See Storage Building
Ordinary Steel Moment resisting Frames (SMRF) (Assumed)	Both orthogonal Directions, See plan for call out
Horizontal LFRS Elements	Notes
Collector Elements	See delegated pre-engineered design
Metal Roof Deck & Related Fastening System	See delegated pre-engineered design
Diaphragm Cross Rod Bracing	See delegated pre-engineered design

Project: Hunter MWD
Location: Savannah, GA
Project #: BMcD #189618
Date: 12/10/2025

Designated Seismic Systems (DSS)

(2018 IBC 1705.13.3) (ASCE 7-22, 13.2, C13.2) (UFC 3-301-1, 2-5.3)

Non-structural 'Designated Seismic Systems' (DSS) must remain operable and contain hazardous substances following a design earthquake. Accordingly, all Designated Seismic Systems must be listed below and must be certified by the manufacturer to remain both operable and/or to contain hazardous substances after a design earthquake per UFC 3-301-01, Section 3-6.2. Submit said Certificates of Compliance to the Contracting Officer for each DSS after they have been reviewed and accepted by the EOR/DOR.

Additionally, the below listed Designated Seismic Systems must be carefully inspected by the Special Inspector according to the requirements noted in the Schedule of Special Inspections, Section AA.

ELECTRICAL Designated Seismic Systems (DSS) Requiring a Certificate of Compliance

1.	DSS Emergency or Standby Power System
2.	DSS Emergency lighting and existing systems
3.	DSS Power and distribution equipment
4.	
5.	

If additional space is required, append an additional sheet listing the remaining DSS

MECHANICAL/PLUMBING Designated Seismic Systems (DSS) Requiring a Certificate of Compliance

1.	DSS Gas lines and associated fittings, anchorage, & flexible Connections
2.	DSS suspended Smoke Exhaust Fans and associated smoke exhaust ductwork
3.	
4.	
5.	
6.	

If additional space is required, append an additional sheet listing the remaining DSS

OTHER Designated Seismic Systems (DSS) Requiring a Certificate of Compliance

1.	DSS Building fire suppression systems
2.	
3.	
4.	
5.	
6.	

Final Walk Down Inspection and Report

(UFC 3 301 01 SECTION 2-5.4)

Designated Seismic Systems shall receive a final walk-down inspection by the Registered Design Professional in Responsible Charge

Final Walk Down Report, Prepared by the Registered Design Professional in Responsible Charge, Must Include:

1. Record observations of Final Walk Down Inspection
2. Document that Inspections were performed in accordance with the Schedule of Special Inspections
3. Document that all Designated Seismic Systems are installed according to construction/manufacture document requirements, and that Compliance Certificates have been collected (UFC 03 301 01, 3-6.2, 13.2.2.2).

SCHEDULE OF SPECIAL INSPECTIONS

Reference UFGS 01 45 35 for all requirements not noted as part of this schedule.

INSPECTION DEFINITIONS:

- PERFORM:** Perform these tasks for each weld, fastener or bolted connection, and noted verification.
- OBSERVE:** Observe these items randomly during the course of each work day to ensure that applicable requirements are being met. Operations need not be delayed pending these inspections at contractor's risk.
- DOCUMENT:** Document, with a report, that the work has been performed in accordance with the contract documents. This is in addition to any other reports required in the Special Inspections guide specification.
- CONTINUOUS:** Constant monitoring of identified tasks by a special inspector over the duration of performance of said tasks.

The Seismic Design Category for this project is: ☐ A, ☐ B, ☒ C, ☐ D, ☐ E, ☐ F (check appropriate box)

STRUCTURAL - STEEL – WELDING SECTION**ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

STEEL INSPECTION <u>PRIOR TO WELDING</u> – VERIFY THE FOLLOWING ARE IN COMPLIANCE 2018 IBC 1705.2.1, AISC 360-16: Table C-N5.4-1		
TASK	INSPECTION TYPE ¹	DESCRIPTION
1. Verify that the welding procedures specification (WPS) is available	PERFORM	
2. Verify manufacturer certifications for welding consumables are available	PERFORM	
3. Verify material identification	PERFORM	Type and grade.
4. Welder Identification System	PERFORM	The fabricator or erector, as applicable, shall maintain a system by which a welder who has welded a joint or member can be identified. Stamps, if used, shall be the low-stress type.
5. Fit-up of groove welds (including joint geometry)	OBSERVE	✓ Joint preparation ✓ Dimensions (alignment, root opening, root face, bevel) ✓ Cleanliness (condition of steel surfaces) ✓ Tacking (tack weld quality and location) ✓ Backing type and fit (if applicable)
6. Configuration and finish of access holes	OBSERVE	
7. Fit-up of fillet welds	OBSERVE	✓ Dimensions (alignment, gaps at root) ✓ Cleanliness (condition of steel surfaces) ✓ Tacking (tack weld quality and location)
STEEL INSPECTION <u>DURING WELDING</u> – VERIFY THE FOLLOWING ARE IN COMPLIANCE 2018 IBC 1705.2.1, AISC 360-16: Table C-N5.4-2		
TASK	INSPECTION TYPE	DESCRIPTION
8. Use of qualified welders	PERFORM	Welding by welders, welding operators, and tack welders who are qualified in conformance with requirements.
9. Control and handling of welding consumables	OBSERVE	✓ Packaging ✓ Electrode atmospheric exposure control
10. No welding over cracked tack welds	OBSERVE	
11. Environmental conditions	OBSERVE	✓ Wind speed within limits ✓ Precipitation and temperature
12. Welding Procedures Specification followed	OBSERVE	✓ Settings on welding equipment ✓ Travel speed ✓ Selected welding materials ✓ Shielding gas type/flow rate ✓ Preheat applied ✓ Interpass temperature maintained (min./max.) ✓ Proper position (F, V, H, OH) ✓ Intermix of filler metals avoided
13. Welding techniques	OBSERVE	✓ Interpass and final cleaning ✓ Each pass within profile limitations ✓ Each pass meets quality requirements

¹ **PERFORM:** Perform these tasks for each weld, fastener or bolted connection, and required verification.

OBSERVE: Observe these items on a random sampling basis daily to ensure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.

STRUCTURAL - STEEL – WELDING SECTION (CONTINUED)

STEEL INSPECTION AFTER WELDING – VERIFY THE FOLLOWING ARE IN COMPLIANCE 2018 IBC 1705.2.1, AISC 360-16: Table C-N5.4-3		
TASK	INSPECTION TYPE ¹	DESCRIPTION
14. Welds cleaned	OBSERVE	
15. Size, length, and location of all welds	PERFORM	Size, length, and location of all welds conform to the requirements of the detail drawings.
16. Welds meet visual acceptance criteria	PERFORM AND DOCUMENT	✓ Crack prohibition ✓ Weld/base-metal fusion ✓ Crater cross section ✓ Weld profiles ✓ Weld size ✓ Undercut ✓ Porosity
17. Arc strikes	PERFORM	
18. k-area	PERFORM	When welding of doubler plates, continuity plates or stiffeners has been performed in the k-area, visually inspect the web k-area for cracks.
19. Backing removed, weld tabs removed and finished, and fillet welds added where required	PERFORM	
20. Repair activities	PERFORM AND DOCUMENT	
21. Document acceptance or rejection of welded joint or member	PERFORM	

END SECTION

¹ **PERFORM:** Perform these tasks for each weld, fastener or bolted connection, and required verification.
DOCUMENT: Document in a report that the work has been performed as required. This is in addition to all other required reports.

STRUCTURAL - STEEL – BOLTING SECTION**ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

STEEL INSPECTION TASKS PRIOR TO BOLTING – VERIFY THE FOLLOWING ARE IN COMPLIANCE 2018 IBC 1705.2.1, AISC 360-22: Table C-N5.6-1		
TASK	INSPECTION TYPE ¹	DESCRIPTION
1. Manufacture's certifications available for fastener materials	PERFORM	
2. Fasteners marked in accordance with ASTM requirements	OBSERVE	
3. Proper fasteners selected for joint detail (grade, type, bolt length if threads are to be excluded from shear plane)	OBSERVE	
4. Proper bolting procedure selected for joint detail	OBSERVE	
5. Connecting elements, including appropriate faying surface condition and hole preparation, if specified, meet applicable requirements	OBSERVE	
6. Proper storage provided for bolts, nuts, washers, and other fastener components	OBSERVE	
STEEL INSPECTION TASKS DURING BOLTING – VERIFY THE FOLLOWING ARE IN COMPLIANCE 2018 IBC 1705.2.1, AISC 360-22: Table C-N5.6-2		
TASK	INSPECTION TYPE ¹	DESCRIPTION
7. Fastener assemblies of suitable condition, placed in all holes and washers (if required) are positioned as required	OBSERVE	
8. Joint brought to the snug-tight condition prior to pretensioning operation	OBSERVE	
9. Fastener component not turned by the wrench prevented from rotating	OBSERVE	
10. Bolts are pretensioned in accordance with RCSC Specification, progressing systematically from the most rigid point toward the free edges	OBSERVE	
STEEL INSPECTION TASKS AFTER BOLTING – VERIFY THE FOLLOWING ARE IN COMPLIANCE IBC 1705.2.1, AISC 360-22: Table C-N5.6-3		
TASK	INSPECTION TYPE ¹	DESCRIPTION
11. Document acceptance or rejection of all bolted connections	DOCUMENT	

END SECTION

¹ **PERFORM:** Perform these tasks for each weld, fastener or bolted connection, and required verification.
OBSERVE: Observe these items on a random sampling basis daily to ensure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.
DOCUMENT: Document in a report that the work has been performed as required. This is in addition to all other required reports.

STRUCTURAL - STEEL - NON-DESTRUCTIVE TESTING SECTION**ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

NONDESTRUCTIVE TESTING OF WELDED JOINTS – VERIFY THE FOLLOWING ARE IN COMPLIANCE 2018 IBC 1705.2.1, AISC 360-22: Section N5.5		
TASK	INSPECTION TYPE ¹	DESCRIPTION
1. Use of qualified nondestructive testing personnel	PERFORM	Visual weld inspection and nondestructive testing (NDT) shall be conducted by personnel qualified in accordance with AWS D1.8 clause 7.2
2. Welded joints subject to fatigue	OBSERVE	Dye penetrant testing (DT) and Ultrasonic testing (UT) shall be performed on 100% of welded joints identified on contract drawings as being subject to fatigue.
3. Weld tab removal sites	OBSERVE	At the end of welds where weld tabs have been removed, magnetic particle testing shall be performed on the same beam-to-column joints receiving UT

END SECTION

¹ **PERFORM:** Perform these tasks for each weld, fastener or bolted connection, and required verification.
OBSERVE: Observe these items on a random sampling basis daily to ensure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.

STRUCTURAL - STEEL – AISC 341 REQUIREMENTS (SEISMIC PROVISIONS) SECTION**ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

NONDESTRUCTIVE TESTING OF WELDED JOINTS – VERIFY THE FOLLOWING ARE IN COMPLIANCE 2018 IBC 1705.2.1, AISC 341-16: Section J6.2		
TASK	INSPECTION TYPE ¹	DESCRIPTION
4. CJP groove welds	OBSERVE	Dye penetrant testing (DT) and ultrasonic testing (UT) shall be performed on 100% of CJP groove welds for materials greater than 5/16" thick (8mm).
5. Beam cope and access hole.	OBSERVE	At welded splices and connections, thermally cut surfaces of beam copes and access holes shall be tested using magnetic particle testing (MT) or dye penetrant testing (DT), when the flange thickness exceeds 1 1/2 in. for rolled shapes, or when the web thickness exceeds 1 1/2 in. for built-up shapes.
6. K-area NDT (AISC 341)	PERFORM	Where welding of doubler plates, continuity plates or stiffeners has been performed in the k-area, the web shall be tested for cracks using magnetic particle testing (MT). The MT inspection area shall include the k-area base metal within 3-inches of the weld. The MT shall be performed no sooner than 48 hours following completion of the welding.
7. Placement of reinforcing or contouring fillet welds	DOCUMENT	

END SECTION

¹ **PERFORM:** Perform these tasks for each weld, fastener or bolted connection, and required verification.
OBSERVE: Observe these items on a random sampling basis daily to ensure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.
DOCUMENT: Document in a report that the work has been performed as required. This is in addition to all other required reports.

STRUCTURAL - STEEL - COMPOSITE CONSTRUCTION ¹**ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☐**

COMPOSITE CONSTRUCTION PRIOR TO PLACING CONCRETE – VERIFY THE FOLLOWING ARE IN COMPLIANCE 2018 IBC 1705.2.1, AISC 360-16: Table N6.1, AISC 341-16: Table J9.1		
TASK	INSPECTION TYPE ²	DESCRIPTION
1. Placement and installation of steel headed stud anchors	PERFORM	
2. Material identification of reinforcing steel (Type/Grade)	OBSERVE	
3. Determination of carbon equivalent for reinforcing steel other than ASTM A706	OBSERVE	
4. Proper reinforcing steel size, spacing, clearances, support, and orientation	OBSERVE	
5. Reinforcing steel has not been re-bent in the field	OBSERVE	
6. Reinforcing clearances have been provided	OBSERVE	
7. Reinforcing steel has been tied and supported as required	OBSERVE	
8. Composite member has required size	OBSERVE	

END SECTION**STRUCTURAL - STEEL - OTHER INSPECTIONS****ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

OTHER STEEL INSPECTIONS – VERIFY THE FOLLOWING ARE IN COMPLIANCE 2018 IBC 1705.2.1, AISC 341-16: Tables J8.1 & J10.1		
TASK	INSPECTION TYPE ²	DESCRIPTION
1. Anchor rods and other embedments supporting structural steel	PERFORM	Verify the diameter, grade, type, and length of the anchor rod or embedded item, and the extent or depth of embedment prior to placement of concrete.
2. Fabricated steel or erected steel frame	OBSERVE	Verify compliance with the details shown on the construction documents, such as braces, stiffeners, member locations and proper application of joint details at each connection.
3. Reduced beam sections (RBS) where/if occurs	DOCUMENT	✓ Contour and finish ✓ Dimensional tolerances
4. Protected zones	DOCUMENT	No holes or unapproved attachments made by fabricator or erector
5. H-piles where/if occurs	DOCUMENT	No holes or unapproved attachments made by the responsible contractor

END SECTION¹ See Concrete Construction Section for all concrete related inspection of composite steel construction.

² **PERFORM:** Perform these tasks for each weld, fastener or bolted connection, and required verification.
OBSERVE: Observe these items on a random sampling basis daily to ensure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.
DOCUMENT: Document in a report that the work has been performed as required. This is in addition to all other required reports.

STRUCTURAL - COLD-FORMED METAL DECK - PLACEMENT SECTION**ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

METAL DECK INSPECTION <u>PRIOR TO</u> DECK PLACEMENT – VERIFY THE FOLLOWING ARE IN COMPLIANCE SDI QA/QC-2011, Appendix 1, Table 1.1		
TASK	INSPECTION TYPE ¹	DESCRIPTION
1. Verify compliance of materials (deck and all deck accessories) with construction documents, including profiles, material properties, and base metal thickness	PERFORM	
2. Document acceptance or rejection of deck and deck accessories	DOCUMENT	
METAL DECK INSPECTION <u>DURING</u> DECK PLACEMENT – VERIFY THE FOLLOWING ARE IN COMPLIANCE SDI QA/QC-2011, Appendix 1, Table 1.2		
TASK	INSPECTION TYPE ¹	DESCRIPTION
3. Verify compliance of deck and all deck accessories installation with construction documents	PERFORM	
4. Verify deck materials are represented by the mill certifications that comply with the construction documents	PERFORM	
5. Document acceptance or rejection of installation of deck and deck accessories	DOCUMENT	
METAL DECK INSPECTION <u>AFTER</u> DECK PLACEMENT – VERIFY THE FOLLOWING ARE IN COMPLIANCE SDI QA/QC-2011, Appendix 1, Table 1.3		
TASK	INSPECTION TYPE ¹	DESCRIPTION
6. Welding procedure specification (WPS) available	PERFORM	
7. Manufactures certifications for welding consumables available	OBSERVE	
8. Material identification (type/grade)	OBSERVE	
9. Check welding equipment	OBSERVE	

END SECTION

¹ **PERFORM:** Perform these tasks for each weld, fastener or bolted connection, and required verification.
OBSERVE: Observe these items on a random sampling basis daily to ensure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.
DOCUMENT: Document in a report that the work has been performed as required. This is in addition to all other required reports.

STRUCTURAL - COLD-FORMED METAL DECK – WELDING SECTION**ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

METAL DECK INSPECTION <u>DURING</u> WELDING – VERIFY THE FOLLOWING ARE IN COMPLIANCE SDI QA/QC-2011, Appendix 1, Table 1.4		
TASK	INSPECTION TYPE ¹	DESCRIPTION
1. Use of qualified welders	OBSERVE	
2. Control and handling of welding consumables	OBSERVE	
3. Environmental conditions (wind speed, moisture, temperature)	OBSERVE	
4. WPS followed	OBSERVE	
METAL DECK INSPECTION <u>AFTER</u> WELDING – VERIFY THE FOLLOWING ARE IN COMPLIANCE SDI QA/QC-2011, Appendix 1, Table 1.5		
TASK	INSPECTION TYPE ¹	DESCRIPTION
5. Verify size and location of welds, including support, sidelap, and perimeter welds.	PERFORM	
6. Welds meet visual acceptance criteria	PERFORM	
7. Verify repair activities	PERFORM	
8. Document acceptance or rejection of welds	DOCUMENT	

END SECTION

¹ **PERFORM:** Perform these tasks for each weld, fastener or bolted connection, and required verification.
OBSERVE: Observe these items on a random sampling basis daily to ensure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.
DOCUMENT: Document in a report that the work has been performed as required. This is in addition to all other required reports.

STRUCTURAL - COLD-FORMED METAL DECK – FASTENING SECTION**ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

METAL DECK INSPECTION <u>BEFORE</u> MECHANICAL FASTENING – VERIFY THE FOLLOWING ARE IN COMPLIANCE SDI QA/QC-2011, Appendix 1, Table 1.6		
TASK	INSPECTION TYPE ¹	DESCRIPTION
1. Manufacturer installation instructions available for mechanical fasteners	OBSERVE	
2. Proper tools available for fastener installation	OBSERVE	
METAL DECK INSPECTION <u>DURING</u> MECHANICAL FASTENING – VERIFY THE FOLLOWING ARE IN COMPLIANCE SDI QA/QC-2011, Appendix 1, Table 1.7		
TASK	INSPECTION TYPE ¹	DESCRIPTION
3. Fasteners are positioned as required	OBSERVE	
4. Fasteners are installed in accordance with manufacturer's instructions	OBSERVE	
METAL DECK INSPECTION <u>AFTER</u> MECHANICAL FASTENING – VERIFY THE FOLLOWING ARE IN COMPLIANCE SDI QA/QC-2011, Appendix 1, Table 1.8		
TASK	INSPECTION TYPE ¹	DESCRIPTION
5. Check spacing, type, and installation of support fasteners	PERFORM	
6. Check spacing, type, and installation of sidelap fasteners	PERFORM	
7. Check spacing, type, and installation of perimeter fasteners	PERFORM	
8. Verify repair activities	PERFORM	
9. Document acceptance or rejection of mechanical fasteners	DOCUMENT	

END SECTION

¹ **PERFORM:** Perform these tasks for each weld, fastener or bolted connection, and required verification.
OBSERVE: Observe these items on a random sampling basis daily to ensure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.
DOCUMENT: Document in a report that the work has been performed as required. This is in addition to all other required reports.

STRUCTURAL - LIGHT GAUGE STEEL FRAMING AND/OR LIGHT GAUGE TRUSSES SECTIONALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☐

LIGHT GAUGE STEEL CONSTRUCTION AND CONNECTIONS – VERIFY THE FOLLOWING ARE IN COMPLIANCE IBC 1705.2.2, 1705.11.2, 1705.11.3, UFC 4 023 03		
TASK	INSPECTION TYPE ¹	DESCRIPTION
1. Trusses spanning 60-feet or greater where/if applies	PERFORM	Verify that temporary and permanent truss restraint/bracing is installed in accordance with approved truss submittal package.
2. Welded connections (seismic and/or wind resisting system)	OBSERVE	Visually inspect all welds composing part of the main wind or seismic force resisting system, including shearwalls, braces, collectors (drag struts), and hold-downs.
3. Connections (seismic and/or wind resisting system)	OBSERVE	Visually inspect all screw attachment, bolting, anchoring and other fastening of components within the main wind or seismic force resisting system, including roof deck, roof framing, exterior wall covering, wall to roof/floor connections, braces, collectors (drag struts) and hold-downs.
4. Cold-formed steel (progressive collapse resisting system where/if applies)	OBSERVE	Verify proper welding operations, screw attachment, bolting, anchoring and other fastening of components within the progressive collapse resisting system, including horizontal tie force elements, vertical tie force elements and bridging elements (UFC 4 023 03).

END SECTION**STRUCTURAL - OPEN-WEB STEEL JOISTS SECTION**ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☐

OPEN-WEB STEEL JOISTS AND JOIST GIRDERS – VERIFY THE FOLLOWING ARE IN COMPLIANCE IBC TABLE 1705.2.3		
TASK	INSPECTION TYPE ¹	DESCRIPTION
1. Installation of open-web steel joists and joist girders	OBSERVE	✓ End connections – welded or bolted ✓ Bridging – horizontal and diagonal

END SECTION

¹ **PERFORM:** Perform these tasks for each weld, fastener or bolted connection, and required verification.

OBSERVE: Observe these items on a random sampling basis daily to ensure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.

STRUCTURAL - CONCRETE CONSTRUCTION SECTION**ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

CONCRETE CONSTRUCTION, INCLUDING COMPOSITE DECK – VERIFY THE FOLLOWING ARE IN COMPLIANCE IBC TABLE 1705.3 (ACI 318 REFERENCES NOTED IN IBC TABLE)		
TASK	INSPECTION TYPE ¹	DESCRIPTION
1. Inspect reinforcement, including prestressing tendons, and verify placement.	OBSERVE	Verify prior to placing concrete that reinforcing is of specified type, grade and size; that it is free of oil, dirt and unacceptable rust; that it is located and spaced properly; that hooks, bends, ties, stirrups and supplemental reinforcement are placed correctly; that lap lengths, stagger and offsets are provided; and that all mechanical connections are installed per the manufacturer's instructions and/or evaluation report.
2. Reinforcing bar welding	OBSERVE	✓ Verify weldability of reinforcing bars other than ASTM A 706 ✓ Inspect single-pass fillet welds, maximum 5/16" in accordance with AWS D1.4
3. All other welding	CONTINUOUS	Visually inspect all welds in accordance with AWS D1.4
4. Cast in place anchors and post installed drilled anchors (downward inclined)	OBSERVE	Verify prior to placing concrete that cast in place anchors and post installed drilled anchors have proper embedment, spacing and edge distance.
5. Post-installed adhesive anchors in horizontal or upward inclined orientations	CONTINUOUS AND DOCUMENT	✓ Inspect as required per approved ICC-ES report ✓ Verify that installer is certified for installation of horizontal and overhead installation applications ✓ Inspect proof loading as required by the contract documents
6. Verify use of required mix design	OBSERVE	Verify that all mixes used comply with the approved construction documents
7. Prior to concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete	CONTINUOUS	At the time fresh concrete is sampled to fabricate specimens for strength test verify these tests are performed by qualified technicians.
8. Inspect concrete and/or shotcrete placement for proper application techniques	CONTINUOUS	Verify proper application techniques are used during concrete conveyance and depositing avoids segregation or contamination. Verify that concrete is properly consolidated.
9. Verify maintenance of specified curing temperature and technique	OBSERVE	Inspect curing, cold weather protection, and hot weather protection procedures.
10. Pre-stressed concrete	CONTINUOUS	Verify application of prestressing forces and grouting of bonded prestressing tendons.

CONTINUED ON FOLLOWING PAGE

¹ **OBSERVE:** Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.

DOCUMENT: Document in a report that the work has been performed as required. This is in addition to all other required reports.

CONTINUOUS: Constant monitoring of identified tasks by a special inspector over the duration of performance of said tasks.

STRUCTURAL - CONCRETE CONSTRUCTION (CONTINUED)

CONCRETE CONSTRUCTION, INCLUDING COMPOSITE DECK – VERIFY THE FOLLOWING ARE IN COMPLIANCE IBC TABLE 1705.3 (ACI 318 REFERENCES NOTED IN IBC TABLE)		
TASK	INSPECTION TYPE ¹	DESCRIPTION
11. Inspect erection of precast concrete members	OBSERVE	
12. Verify in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs.	OBSERVE	
13. Inspect formwork for shape, location and dimensions of the concrete member being formed.	OBSERVE	

END SECTION

¹ **OBSERVE:** Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.

DOCUMENT: Document in a report that the work has been performed as required. This is in addition to all other required reports.

CONTINUOUS: Constant monitoring of identified tasks by a special inspector over the duration of performance of said tasks.

STRUCTURAL - MASONRY CONSTRUCTION SECTION (ALL RISK CATEGORIES)**ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

MASONRY CONSTRUCTION – VERIFY THE FOLLOWING ARE IN COMPLIANCE <u>AT START</u> OF CONSTRUCTION IBC 1705.4 (ACI 530-13 TABLE 3.1.2 & 3.1.3)		
TASK	INSPECTION TYPE ¹	DESCRIPTION
1. Compliance with approved submittals prior to start	OBSERVE	
2. Proportions of site-mixed mortar.	OBSERVE	
3. Grade and type of reinforcement, anchor bolts, and prestressing tendons and anchorages	OBSERVE	
4. Prestressing technique	OBSERVE	
5. Properties of thin bed mortar for AAC masonry	OBSERVE	
MASONRY CONSTRUCTION – VERIFY THE FOLLOWING ARE IN COMPLIANCE <u>PRIOR TO</u> GROUTING IBC 1705.4 (ACI 530-13 TABLE 3.1.2 & 3.1.3)		
TASK	INSPECTION TYPE ¹	DESCRIPTION
6. Grout space	OBSERVE	
7. Proportions of site-prepared grout and prestressing grout for bonded tendons	OBSERVE	
8. Proportions of site-mixed grout and prestressing grout for bonded tendons	OBSERVE	
9. Placement of masonry units and mortar joints	OBSERVE	
10. Welding of reinforcement	CONTINUOUS	
MASONRY CONSTRUCTION – VERIFY THE FOLLOWING ARE IN COMPLIANCE <u>DURING</u> CONSTRUCTION IBC 1705.4 (ACI 530-13 TABLE 3.1.2 & 3.1.3)		
TASK	INSPECTION TYPE ¹	DESCRIPTION
11. Size and location of structural elements is in compliance	OBSERVE	
12. Preparation, construction, and protection of masonry during cold weather (temperature below 40°F (4.4°C) or hot weather (temp above 90°F (32.2°C))	OBSERVE	
13. Application and measurement of prestressing force	CONTINUOUS	
14. Placement of grout and prestressing grout for bonded tendons	CONTINUOUS	
15. Placement of AAC masonry units and construction of thin bed mortar joints	CONTINUOUS	Continuous for first 5000 square feet only (465 square meters).
16. Observe preparation of grout specimens, mortar specimens, and/or prisms	OBSERVE	
17. Type, size and placement of reinforcement, connectors, anchor bolts and prestressing tendons and anchorages, including details of anchorage of masonry to structural members, frames, or other construction	OBSERVE	

END SECTION

¹ **OBSERVE:** Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.

CONTINUOUS: Constant monitoring of identified tasks by a special inspector over the duration of performance of said tasks.

STRUCTURAL - WOOD CONSTRUCTION – SPECIALTY ITEMS SECTION**ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED:** ☐

WOOD CONSTRUCTION – VERIFY THE FOLLOWING ARE IN COMPLIANCE IBC 1705.5		
TASK	INSPECTION TYPE ¹	DESCRIPTION
1. High-load diaphragms where applicable	OBSERVE	Verify thickness and grade of sheathing, size of framing members at panel edges, nail diameters and length, and the number of fastener lines and that fastener spacing is per approved contract documents.
2. Metal-plate connected wood trusses spanning 60 feet or greater	OBSERVE	Verify that the temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the approved truss submittal package

END SECTION**STRUCTURAL - WOOD CONSTRUCTION - SEISMIC & WIND SECTION****THIS SECTION IS APPLICABLE IF BOX IS CHECKED:** ☐

WOOD CONSTRUCTION SEISMIC AND WIND – VERIFY THE FOLLOWING ARE IN COMPLIANCE 2018 IBC 1705.11 & 1705.12.2		
TASK	INSPECTION TYPE ¹	DESCRIPTION
1. Nailing, bolting, anchoring and other fastening of elements of the main wind/seismic force-resisting system	OBSERVE (CONTINUOUS FOR GLUING)	Includes connectors for: shearwall sheathing, roof/floor sheathing, drag struts/collectors (double top plates), braces, hold downs, roof connections to exterior walls.

END SECTION**STRUCTURAL – ISOLATION AND ENERGY DISSIPATION SYSTEMS SECTION****ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED:** ☐

ISOLATION AND ENERGY DISSIPATION SYSTEMS – VERIFY THE FOLLOWING ARE IN COMPLIANCE 2018 IBC TABLE 1705.12.8		
TASK	INSPECTION TYPE ¹	DESCRIPTION
1. Fabrication and installation	OBSERVE	Verify that fabrication and installation of isolator units and energy dissipation devices conform to manufacturer's recommendations and approved construction documents
2. Testing of seismic isolation Systems in seismically isolated structures		Seismic Isolation Systems in seismically isolated structures shall be tested accordance with ASCE 7, Section 17.8

END SECTION

¹ **OBSERVE:** Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.

GEOTECHNICAL - SOILS INSPECTION SECTION**ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

SOILS INSPECTION – VERIFY THE FOLLOWING ARE IN COMPLIANCE IBC 1705.6		
TASK	INSPECTION TYPE ¹	DESCRIPTION
1. Materials below shallow foundations are adequate to achieve the design bearing capacity.	OBSERVE	
2. Excavations are extended to proper depth and have reached proper material	OBSERVE	
3. Perform classification and testing of compacted fill materials	OBSERVE	
4. Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill	CONTINUOUS	
5. Prior to placement of compacted fill, inspect subgrade and verify that site has been prepared properly.	OBSERVE	During fill placement, the special inspector shall verify that proper materials and procedures are used in accordance with the provisions of the approved geotechnical report

END SECTION**GEOTECHNICAL - DRIVEN DEEP FOUNDATION ELEMENTS SECTION****ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☐**

DEEP DRIVEN FOUNDATION CONSTRUCTION – VERIFY THE FOLLOWING ARE IN COMPLIANCE IBC 1705.7		
TASK	INSPECTION TYPE ¹	DESCRIPTION
1. Verify element materials, sizes and lengths comply with requirements	CONTINUOUS	
2. Inspect driving operations and maintain complete and accurate records for each element	CONTINUOUS	
3. Verify placement locations and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and document any damage to foundation element	CONTINUOUS	
4. Determine capacities of test elements and conduct additional load tests if required.	CONTINUOUS	
5. For steel or concrete elements, perform additional special inspections in accordance with the Steel and Concrete sections in this schedule		

END SECTION

¹ **OBSERVE:** Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.

CONTINUOUS: Constant monitoring of identified tasks by a special inspector over the duration of performance of said tasks.

GEOTECHNICAL - HELICAL PILE FOUNDATIONS SECTION**ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED:** ☐

HELICAL PILE FOUNDATIONS – VERIFY THE FOLLOWING ARE IN COMPLIANCE
2018 IBC 1705.9

TASK	INSPECTION TYPE ¹	DESCRIPTION
1. Record installation equipment used, pile dimensions, tip elevations, final depth, final installation torque and other pertinent installation data as required. The approved geotechnical report and the contract documents shall be used to determine compliance	CONTINUOUS	

END SECTION**GEOTECHNICAL - CAST IN PLACE DEEP FOUNDATION ELEMENTS SECTION****ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED:** ☐

CAST IN PLACE DEEP FOUNDATION ELEMENTS – VERIFY THE FOLLOWING ARE IN COMPLIANCE
2018 IBC 1705.8

TASK	INSPECTION TYPE ¹	DESCRIPTION
1. Inspect drilling operations and maintain complete and accurate records for each element.	CONTINUOUS	
2. Verify placement locations and plumbness, confirm element diameters, bell diameters (if applicable), lengths, embedment into bedrock (if applicable) and adequate end-bearing strata capacity. Record concrete or grout volumes	CONTINUOUS	For concrete elements, perform additional special inspections in accordance with the Concrete section in this schedule

END SECTION

¹ **CONTINUOUS:** Constant monitoring of identified tasks by a special inspector over the duration of performance of said tasks.

FIRE PROTECTION - SPRAYED FIRE-RESISTANT MATERIALS SECTION**ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED:** ☐

SPRAYED FIRE RESISTANT MATERIALS (SFRM) – VERIFY THE FOLLOWING ARE IN COMPLIANCE
2018 IBC 1705.14

TASK	INSPECTION TYPE ¹	DESCRIPTION
1. Substrate condition	OBSERVE	Prior to application, confirm that surfaces have been prepared according to the approved fire-resistance design and manufacturer's instructions.
2. Material thickness	OBSERVE	Verify SFRM thickness according to 2018 IBC 1705.14.4
3. Material density	OBSERVE	Verify SFRM density according to 2018 IBC 1705.14.5
4. Bond strength	OBSERVE	Verify bond strength of cured SFRM according to IBC 1705.14.6

END SECTION**FIRE PROTECTION - MASTIC AND INTUMESCENT COATINGS SECTION****ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED:** ☐

MASTIC AND INTUMESCENT FIRE-RESISTANT COATINGS – VERIFY THE FOLLOWING ARE IN COMPLIANCE
2018 IBC 1705.15

TASK	INSPECTION TYPE ¹	DESCRIPTION
1. Inspect according to AWCI 12-B and the contract documents	OBSERVE	Inspections shall be performed in accordance with AWCI 12-B, Standard Practice for the Testing and Inspection of Field Applied Thin Film Intumescent Fire-Resistive Materials.

END SECTION**FIRE PROTECTION – FIRE RESISTANT PENETRATIONS AND JOINTS SECTION****ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED:** ☒

FIRE RESISTANT PENETRATIONS AND JOINTS – VERIFY THE FOLLOWING ARE IN COMPLIANCE
2018 IBC 1705.17

TASK	INSPECTION TYPE ¹	DESCRIPTION
1. Inspections of penetration firestop systems conducted in accordance with ASTM E 2174.	OBSERVE	
2. Inspections of fire-resistant joint systems conducted in accordance with ASTM E 2393	OBSERVE	

END SECTION

¹ **OBSERVE:** Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.

FIRE PROTECTION – SMOKE CONTROL SECTION**ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED:** ☐**SMOKE CONTROL – VERIFY THE FOLLOWING ARE IN COMPLIANCE**
2018 IBC 1705.18

TASK	INSPECTION TYPE ¹	DESCRIPTION
1. Verify device locations and perform leakage testing	OBSERVE	Perform during erection of ductwork and prior to concealment
2. Pressure difference testing, flow measurements and detection and control verification	OBSERVE	Perform prior to occupancy and after sufficient completion

END SECTION

¹ **OBSERVE:** Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.

ARCHITECTURAL - EXTERIOR INSULATION AND FINISH SYSTEMS SECTION**ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED:** ☐

EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS) – VERIFY THE FOLLOWING ARE IN COMPLIANCE 2018 IBC 1705.16		
TASK	INSPECTION TYPE ¹	DESCRIPTION
1. Water resistive barrier coating applied over a sheathing substrate.	OBSERVE	Verify that water resistive barrier coating complies with ASTM E 2570.

END SECTION**ARCHITECTURAL – ARCHITECTURAL COMPONENTS****ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED:** ☒

ARCHITECTURAL COMPONENTS – VERIFY THE FOLLOWING ARE IN COMPLIANCE 2018 IBC 1705.12.5, 1705.12.7		
TASK	INSPECTION TYPE ¹	DESCRIPTION
1. Erection and fastening of exterior cladding and interior and exterior veneer.	OBSERVE	Verify appropriate materials, fasteners and attachment at commencement of work and at completion. Inspector Note: Inspection not required if height is less than 30 feet or weight is less than 5psf
2. Interior and exterior non-load bearing walls	OBSERVE	Verify appropriate materials, fasteners and attachment at commencement of work and at completion. Inspector Note: Inspection not required if interior non-load bearing walls weigh less than 15psf
3. Access floors	OBSERVE	Verify that anchorage complies with approved construction documents.
4. Storage racks	OBSERVE	Verify that anchorage complies with approved construction documents. Inspection of post-installed anchors shall comply with approved ICC-ES report. Inspector Note: Not required for racks less than 8 feet in height

END SECTION

¹ **OBSERVE:** Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.

PLUMBING/MECHANICAL/ELECTRICAL DESIGNATED SEISMIC SYSTEMS SECTION

ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒

PLUMBING, MECHANICAL AND ELECTRICAL IBC 1705.12.6		
TASK	INSPECTION TYPE ¹	DESCRIPTION
1. Anchorage of electrical equipment for emergency and standby power systems	OBSERVE	✓ Check for general conformance
2. Anchorage of all other electrical equipment in Seismic Design Categories E and F only (See first page of this schedule for Seismic Design Category)	OBSERVE	✓ Check for general conformance
3. Installation and anchorage of piping designed to carry hazardous materials and their associated mechanical units.	OBSERVE	✓ Check for general conformance
4. Installation and anchorage of vibration isolation systems where the construction documents require a nominal clearance of ¼" or less between support framing and restraint.	OBSERVE	✓ Check for general conformance
5. Verification of clearance between fire sprinkler piping and surrounding mechanical and electrical equipment, including ductwork, piping and their structural supports.	OBSERVE	✓ Check for minimum clearances noted in ASCE7 13.2.3 or a nominal clearance of not less than 3 inches

END SECTION

¹ **OBSERVE:** Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.

SECTION 01 50 00

TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C511 (2017) Reduced-Pressure Principle Backflow
Prevention Assembly

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA
20-1; TIA 20-2; TIA 20-3; TIA 20-4)
National Electrical Code

NFPA 241 (2019) Standard for Safeguarding
Construction, Alteration, and Demolition
Operations

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2024) Safety -- Safety and Occupational
Health (SOH) Requirements

U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)

MUTCD (2009; Rev 2012) Manual on Uniform Traffic
Control Devices

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Construction Site Plan; G

Traffic Control Plan; G

Haul Road Plan; G

Contractor Computer Cybersecurity Compliance Statements; G

Contractor Temporary Network Cybersecurity Compliance Statements; G

SD-03 Product Data

Backflow Preventers; G

SD-06 Test Reports

Backflow Preventer Tests

SD-07 Certificates

Backflow Tester Certification

Backflow Preventers Certificate of Full Approval

1.3 CONSTRUCTION SITE PLAN

Prior to the start of work, submit for Government approval a site plan showing the locations and dimensions of temporary facilities (including layouts and details, equipment and material storage area (onsite and offsite), and access and haul routes, avenues of ingress/egress to the fenced area and details of the fence installation. Identify any areas which may have to be graveled to prevent the tracking of mud. Indicate if the use of a supplemental or other staging area is desired. Show locations of safety and construction fences, site trailers, construction entrances, trash dumpsters, temporary sanitary facilities, and worker parking areas.

1.4 BACKFLOW PREVENTERS CERTIFICATE

1.4.1 Backflow Tester Certificate

Prior to testing, submit to the Contracting Officer certification issued by the State or local regulatory agency attesting that the backflow tester has successfully completed a certification course sponsored by the regulatory agency. Tester must not be affiliated with a company participating in other phases of this Contract.

1.4.2 Backflow Prevention Training Certificate

Submit a certificate recognized by the State or local authority that states the Contractor has completed at least 10 hours of training in backflow preventer installations. The certificate must be current.

1.5 DOD CONDITION OF READINESS (COR)

DOD will set the Condition of Readiness (COR) based on the weather forecast for sustained winds 50 knots (58 mph) or greater. Contact the Contracting Officer for the current COR setting.

Monitor weather conditions a minimum of twice a day and take appropriate actions according to the approved Emergency Plan in the accepted Accident Prevention Plan, EM 385-1-1 Section 01 Emergency Planning and the instructions below.

Unless otherwise directed by the Contracting Officer, comply with:

- a. Condition FOUR (Sustained winds of 58 mph or greater expected within 72 hours): Normal daily job site cleanup and good housekeeping

practices. Collect and store in piles or containers scrap lumber, waste material, and rubbish for removal and disposal at the close of each work day. Maintain the construction site including storage areas, free of accumulation of debris. Stack form lumber in neat piles less than 3.3 feet high. Remove all debris, trash, or objects that could become missile hazards. Review requirements pertaining to "Condition THREE" and continue action as necessary to attain "Condition FOUR" readiness. Contact Contracting Officer for weather and COR updates and completion of required actions.

- b. Condition THREE (Sustained winds of 58 mph or greater expected within 48 hours): Maintain "Condition FOUR" requirements and commence securing operations necessary for "Condition ONE" which cannot be completed within 18 hours. Cease all routine activities which might interfere with securing operations. Commence securing and stow all gear and portable equipment. Make preparations for securing buildings. Reinforce or remove formwork and scaffolding. Secure machinery, tools, equipment, materials, or remove from the job site. Expend every effort to clear all missile hazards and loose equipment from general base areas. Contact Contracting Officer for weather and COR updates and completion of required actions. Review requirements pertaining to "Condition TWO" and continue action as necessary to attain "Condition THREE" readiness.
- c. Condition TWO (Sustained winds of 58 mph or greater expected within 24 hours): Secure the job site, and leave Government premises.
- d. Condition ONE. (Sustained winds of 58 mph or greater expected within 12 hours): Contractor access to the job site and Government premises is prohibited.

1.6 CYBERSECURITY DURING CONSTRUCTION

{For Reference Only: This subpart (and its subparts) relates to AC-18, SA-3, CCI-00258.} Meet the following requirements throughout the construction process.

1.6.1 Contractor Computer Equipment

Contractor owned computers may be used for construction. When used, contractor computers must meet the following requirements:

1.6.1.1 Operating System

The operating system must be an operating system currently supported by the manufacturer of the operating system. The operating system must be current on security patches and operating system manufacturer required updates.

1.6.1.2 Anti-Malware Software

The computer must run anti-malware software from a reputable software manufacturer. Anti-malware software must be a version currently supported by the software manufacturer, must be current on all patches and updates, and must use the latest definitions file. All computers used on this project must be scanned using the installed software at least once per day.

1.6.1.3 Passwords and Passphrases

The passwords and passphrases for all computers must be changed from their default values. Passwords must be a minimum of eight characters with a minimum of one uppercase letter, one lowercase letter, one number and one special character.

1.6.1.4 Contractor Computer Cybersecurity Compliance Statements

Provide a single submittal containing completed Contractor Computer Cybersecurity Compliance Statements for each company using contractor owned computers. Contractor Computer Cybersecurity Compliance Statements must use the template published at <http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/forms-graphics-tables>. Each Statement must be signed by a cybersecurity representative for the relevant company.

1.6.2 Temporary IP Networks

Temporary contractor-installed IP networks may be used during construction. When used, temporary contractor-installed IP networks must meet the following requirements:

1.6.2.1 Network Boundaries and Connections

The network must not extend outside the project site and must not connect to any IP network other than IP networks provided under this project or Government furnished IP networks provided for this purpose. Any and all network access from outside the project site is prohibited.

1.6.3 Government Access to Network

Government personnel must be allowed to have complete and immediate access to the network at any time in order to verify compliance with this specification.

1.6.4 Temporary Wireless IP Networks

In addition to the other requirements on temporary IP networks, temporary wireless IP (WiFi) networks must not interfere with existing wireless network and must use WPA2 security. Network names (SSID) for wireless networks must be changed from their default values.

1.6.5 Passwords and Passphrases

The passwords and passphrases for all network devices and network access must be changed from their default values. Passwords must be a minimum 8 characters with a minimum of one uppercase letter, one lowercase letter, one number and one special character.

1.6.6 Contractor Temporary Network Cybersecurity Compliance Statements

Provide a single submittal containing completed Contractor Temporary Network Cybersecurity Compliance Statements for each company implementing a temporary IP network. Contractor Temporary Network Cybersecurity Compliance Statements must use the template published at <http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/forms-graphics-tables>. Each Statement must be signed by a cybersecurity representative for the relevant company. If no temporary IP networks will

be used, provide a single copy of the Statement indicating this.

PART 2 PRODUCTS

2.1 TEMPORARY SIGNAGE

2.1.1 Bulletin Board

Prior to the commencement of work activities, provide a clear weatherproof covered bulletin board not less than 36 by 48 inches in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the Contract, Wage Rate Information poster, Safety and Health Information as required by EM 385-1-1 Section 01 and other information approved by the Contracting Officer. Coordinate requirements herein with 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS. Locate the bulletin board at the project site in a conspicuous place easily accessible to all employees, and in location as approved by the Contracting Officer.

2.1.2 Project Identification Signs

The requirements for the signs, their content, and location are as indicated and as specified in Section 01 58 00 PROJECT IDENTIFICATION. Erect signs within 15 days after receipt of the notice to proceed. Correct the data required by the safety sign daily, with light colored metallic or non-metallic numerals.

2.1.3 Warning Signs

Post temporary signs, tags, and labels to give workers and the public adequate warning and caution of construction hazards according to the EM 385-1-1 Section 04. Attach signs to the perimeter fencing every 150 feet warning the public of the presence of construction hazards. Signs must require unauthorized persons to keep out of the construction site. Correct the data required by safety signs daily. Post signs at all points of entry designating the construction site as a hard hat area.

2.2 TEMPORARY TRAFFIC CONTROL

2.2.1 Haul Roads

Construct access and haul roads necessary for proper prosecution of the work under this Contract in accordance with EM 385-1-1 Section 04. Construct with suitable grades and widths; avoid sharp curves, blind corners, and dangerous cross traffic. Submit haul road plan for approval. Provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust control, although optional, must be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and haul roads are subject to approval by the Contracting Officer. Lighting must be adequate to assure full and clear visibility for full width of haul road and work areas during any night work operations.

2.2.2 Barricades

Erect and maintain temporary barricades to limit public access to hazardous areas. Barricades are required whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of

both pedestrian and vehicular traffic. Securely place barricades clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

2.3 FENCING

Provide fencing along the construction site and at all open excavations and tunnels to control access by unauthorized personnel. Safety fencing must be highly visible to be seen by pedestrians and vehicular traffic. All fencing must meet the requirements of EM 385-1-1. Remove the fence upon completion and acceptance of the work. The construction site shall have temporary safety fencing around the perimeter.

2.3.1 Polyethylene Mesh Safety Fencing

Temporary safety fencing must be a high visibility orange colored, high density polyethylene grid, a minimum of 48 inches high and maximum mesh size of 2 inches. Fencing must extend from the grade to a minimum of 48 inches above the grade and be tightly secured to T-posts spaced as necessary to maintain a rigid and taut fence. Fencing must remain rigid and taut with a minimum of 200 pounds of force exerted on it from any direction with less than 4 inches of deflection.

2.3.2 Chain Link Panel Fencing

Temporary panel fencing must be galvanized steel chain link panels 6 feet high. Multiple fencing panels may be linked together at the bases to form long spans as needed. Each panel base must be weighted down using sand bags or other suitable materials in order for the fencing to withstand anticipated winds while remaining upright. Fencing must remain rigid and taut with a minimum of 200 pounds of force exerted on it from any direction with less than 4 inches of deflection. A metal 6 foot chainlink temporary fence is required around the storage yard/contractor area.

2.3.3 Post-Driven Chain Link Fencing

Temporary post-driven fencing must be galvanized chain link fencing 6 feet high supported by an tightly secured to galvanized steel posts driven below grade. Fence posts must be located on minimum 10 foot centers. Posts may be set in various surfaces such as sand, soil, asphalt or concrete as necessary. Chain link fencing must remain rigid and taut with a minimum of 200 pounds of force exerted on it from any direction with less than 4 inches of deflection. Completely remove fencing and posts at the completion of construction and restore surfaces disturbed or damaged to its original condition. Locate and identify underground utilities prior to setting fence posts. Equip fence with a lockable gate. Gate must remain locked when construction personnel are not present.

2.4 TEMPORARY WIRING

Provide temporary wiring in accordance with EM 385-1-1 Section 11, NFPA 241 and NFPA 70. Include monthly inspection and testing of all equipment and apparatus.

2.5 BACKFLOW PREVENTERS

Certificate of Full Approval from FCCCHR List, University of Southern California, attesting that the design, size and make of each backflow preventer has satisfactorily passed the complete sequence of performance

testing and evaluation for the respective level of approval. Certificate of Provisional Approval is not acceptable.

Reduced pressure principle type conforming to the applicable requirements AWWA C511. Provide backflow preventers complete with 150 pound flanged cast iron, brass mounted gate valve and strainer, 304 stainless steel or bronze, internal parts.

PART 3 EXECUTION

3.1 EMPLOYEE PARKING

Construction Contract employees must park privately owned vehicles in an area designated by the Contracting Officer. Employee parking must not interfere with existing and established parking requirements of the Government installation.

3.2 AVAILABILITY AND USE OF UTILITY SERVICES

3.2.1 Temporary Utilities

Provide temporary utilities required for construction. Materials may be new or used, must be adequate for the required usage, not create unsafe conditions, and not violate applicable codes and standards.

3.2.2 Payment for Utility Services

- a. The Government will make all reasonably required utilities available from existing outlets and supplies, as specified in the Contract. Unless otherwise provided in the Contract, the amount of each utility service consumed will be charged to or paid at prevailing rates charged to the Government or, where the utility is produced by the Government, at reasonable rates determined by the Contracting Officer. Carefully conserve utilities furnished without charge.
- b. The point at which the Government will deliver such utilities or services and the quantity available is must be coordinated with the Contracting Officer. Pay all costs incurred in connecting, converting, and transferring the utilities to the work. Make connections, including providing backflow-preventing devices on connections to domestic water lines; providing meters; and providing transformers; and make disconnections. Under no circumstances will taps to base fire hydrants be allowed for obtaining domestic water.
- c. The Contractor must provide their own utilities.

3.2.3 Meters and Temporary Connections

Provide and maintain necessary temporary connections, distribution lines, and meter bases (Government will provide meters) required to measure the amount of each utility used for the purpose of determining charges. Notify the Contracting Officer, in writing, 5 working days before final electrical connection is desired so that a utilities contract can be established. The Government will provide a meter and make the final hot connection after inspection and approval of the Contractor's temporary wiring installation. Do not make the final electrical connection.

3.2.4 Advance Deposit

An advance deposit for utilities consisting of an estimated month's usage or a minimum of \$50.00 will be required. The last monthly bills for the fiscal year will normally be offset by the deposit and adjustments will be billed or returned as appropriate. Services to be rendered for the next fiscal year, beginning 1 October, will require a new deposit. Notification of the due date for this deposit will be mailed prior to the end of the current fiscal year.

3.2.5 Final Meter Reading

Before completion of the work and final acceptance of the work by the Government, notify the Contracting Officer, in writing, 5 working days before termination is desired. The Government will take a final meter reading, disconnect service, and remove the meters. Then remove all the temporary distribution lines, meter bases, and associated appurtenances. Pay all outstanding utility bills before final acceptance of the work by the Government.

3.2.6 Sanitation

Provide and maintain within the construction area minimum field-type sanitary facilities in accordance with EM 385-1-1 Section 02. Locate the facilities behind the construction fence or out of the public view. Clean units and empty wastes at least once a week or more frequently into a municipal, district, or station sanitary sewage system, or remove waste to a commercial facility. Obtain approval from the system owner prior to discharge into a municipal, district, or commercial sanitary sewer system. Penalties or fines associated with improper discharge will be the responsibility of the Contractor. Coordinate with the Contracting Officer and follow station regulations and procedures when discharging into the station sanitary sewer system. Maintain these conveniences at all times. Include provisions for pest control and elimination of odors. Government toilet facilities will not be available to Contractor's personnel.

3.2.7 Telephone

Make arrangements and pay all costs for telephone facilities desired.

3.2.8 Fire Protection

Provide temporary fire protection equipment for the protection of personnel and property during construction. Remove debris and flammable materials daily to minimize potential hazards.

3.3 TRAFFIC PROVISIONS

3.3.1 Maintenance of Traffic

- a. Conduct operations in a manner that will not close a thoroughfare or interfere with traffic on railways or highways except with written permission of the Contracting Officer at least 15 calendar days prior to the proposed modification date, and provide a Traffic Control Plan for Government approval detailing the proposed controls to traffic movement for approval. The plan must be in accordance with State and local regulations and the MUTCD, Part VI. Make all notifications and obtain all permits required for modification to traffic movements outside Station's jurisdiction. Contractor may move oversized and

slow-moving vehicles to the work site provided requirements of the highway authority have been met.

- b. Conduct work so as to minimize obstruction of traffic, and maintain traffic on at least half of the roadway width at all times. Obtain approval from the Contracting Officer prior to starting any activity that will obstruct traffic.
- c. Provide, erect, and maintain, at Contractor's expense, lights, barriers, signals, passageways, detours, and other items, that may be required by the Life Safety Signage, overhead protection authority having jurisdiction.
- d. Provide cones, signs, barricades, lights, or other traffic control devices and personnel required to control traffic. Do not use foil-backed material for temporary pavement marking because of its potential to conduct electricity during accidents involving downed power lines.

3.3.2 Protection of Traffic

Maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment the work, and the erection and maintenance of adequate warning, danger, and direction signs, will be as required by the State and local authorities having jurisdiction. Provide self-illuminated (lighted) barricades during hours of darkness. Brightly-colored (orange) vests are required for all personnel working in roadways. Protect the traveling public from damage to person and property. Minimize the interference with public traffic on roads selected for hauling material to and from the site. Investigate the adequacy of existing roads and their allowable load limit. Contractor is responsible for the repair of damage to roads caused by construction operations.

3.3.3 Rush Hour Restrictions

Do not interfere with the peak traffic flows preceding and during normal operations without notification to and approval by the Contracting Officer.

3.3.4 Dust Control

Dust control methods and procedures must be approved by the Contracting Officer. Coordinate dust control methods with 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS.

3.4 REDUCED PRESSURE BACKFLOW PREVENTERS

Provide an approved reduced pressure backflow prevention assembly at each location where the Contractor taps into the Government potable water supply.

Perform backflow preventer tests using test equipment, procedures, and certification forms conforming to those outlined in the latest edition of the Manual of Cross-Connection Control published by the FCCCHR Manual. Test and tag each reduced pressure backflow preventer upon initial installation (prior to continued water use) and monthly thereafter. Tag must contain the following information: Make, model, serial number, dates

of tests, results, maintenance performed, and signature of tester. Record test results on certification forms conforming to requirements cited earlier in this paragraph.

3.5 CONTRACTOR'S TEMPORARY FACILITIES

Contractor-owned or -leased trailers must be identified by Government assigned numbers. Apply the number to the trailer within 14 calendar days of notification, or sooner, if directed by the Government. Temporary facilities must meet requirements as identified in EM 385-1-1 Section 04.

Contractor is responsible for security of their property. Provide adequate outside security lighting at the temporary facilities. Trailers must be anchored to resist high winds and meet applicable state or local standards for anchoring mobile trailers. Coordinate anchoring with EM 385-1-1 Section 04. The Contract Clause entitled "FAR 52.236-10, Operations and Storage Areas" and the following apply:

3.5.1 Administrative Field Offices

Provide and maintain administrative field office facilities within the construction area at the designated site. Government office and warehouse facilities will not be available to the Contractor's personnel.

3.5.2 Storage Area

Construct a temporary 6 foot high chain link fence around trailers and materials. Include plastic strip inserts, colored green, so that visibility through the fence is obstructed. Fence posts may be driven, in lieu of concrete bases, where soil conditions permit. Do not place or store trailers, materials, or equipment outside the fenced area unless such trailers, materials, or equipment are assigned a separate and distinct storage area by the Contracting Officer away from the vicinity of the construction site but within the installation boundaries. Trailers, equipment, or materials must not be open to public view with the exception of those items which are in support of ongoing work on the current day. Do not stockpile materials outside the fence in preparation for the next day's work. Park mobile equipment, such as tractors, wheeled lifting equipment, cranes, trucks, and like equipment within the fenced area at the end of each work day.

3.5.3 Supplemental Storage Area

Upon request, and pending availability, the Contracting Officer will designate another or supplemental area for the use and storage of trailers, equipment, and materials. This area may not be in close proximity of the construction site but will be within the installation boundaries. Maintain the area in a clean and orderly fashion and secured if needed to protect supplies and equipment. Utilities will not be provided to this area by the Government.

3.5.4 Appearance of Trailers

- a. Trailers must be roadworthy and comply with all appropriate state and local vehicle requirements. Trailers which are rusted, have peeling paint or are otherwise in need of repair will not be allowed on Installation property. Trailers must present a clean and neat exterior appearance and be in a state of good repair.

- b. Maintain the temporary facilities. Failure to do so will be sufficient reason to require their removal at the Contractor's expense.

3.5.5 Safety Systems

Protect the integrity of all installed safety systems or personnel safety devices. Obtain prior approval from the Contracting Officer if entrance into systems serving safety devices is required. If it is temporarily necessary to remove or disable personnel safety devices in order to accomplish Contract requirements, provide alternative means of protection prior to removing or disabling any permanently installed safety devices or equipment and obtain approval from the Contracting Officer.

3.5.6 Weather Protection of Temporary Facilities and Stored Materials

Take necessary precautions to ensure that roof openings and other critical openings in the building are monitored carefully. Take immediate actions required to seal off such openings when rain or other detrimental weather is imminent, and at the end of each workday. Ensure that the openings are completely sealed off to protect materials and equipment in the building from damage.

3.5.6.1 Building and Site Storm Protection

When a warning of gale force winds is issued, take precautions to minimize danger to persons, and protect the work and nearby Government property. Precautions must include, but are not limited to, closing openings; removing loose materials, tools and equipment from exposed locations; and removing or securing scaffolding and other temporary work. Close openings in the work when storms of lesser intensity pose a threat to the work or any nearby Government property.

3.6 PLANT COMMUNICATIONS

Whenever the individual elements of the plant are located so that operation by normal voice between these elements is not satisfactory, install a satisfactory means of communication, such as telephone or other suitable devices and make available for use by Government personnel.

3.7 TEMPORARY PROJECT SAFETY FENCING

As soon as practicable, but not later than 15 days after the date established for commencement of work, furnish and erect temporary project safety fencing at the work site. Maintain the safety fencing during the life of the Contract and, upon completion and acceptance of the work, remove from the work site.

3.8 DUMPSTERS

Equip dumpsters with a secure cover and paint the standard installation color. Keep dumpster closed, except when being loaded with trash and debris. Locate dumpsters behind the construction fence or out of the public view. Empty site dumpsters at least once a week, or as needed to keep the site free of debris and trash. If necessary, provide 55 gallon trash containers painted the darker installation color to collect debris in the construction site area. For large demolitions, large dumpsters without lids are acceptable, but must not have debris higher than the sides before emptying.

3.9 CLEANUP

Remove construction debris, waste materials, packaging material and the like from the work site daily. Any dirt or mud which is tracked onto paved or surfaced roadways must be cleaned away. Store all salvageable materials resulting from demolition activities within the fenced area described above or at the supplemental storage area. Neatly stack stored materials not in trailers, whether new or salvaged.

3.10 RESTORATION OF STORAGE AREA

Upon completion of the project remove the bulletin board, signs, barricades, haul roads, and all other temporary products from the site. After removal of trailers, materials, and equipment from within the fenced area, remove the fence. Restore areas used during the performance of the Contract to the original or better condition. Remove gravel used to traverse grassed areas and restore the area to its original condition, including top soil and seeding as necessary.

-- End of Section --

SECTION 01 57 19

TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.120	Hazardous Waste Operations and Emergency Response
29 CFR 1910.1053	Respirable Crystalline Silica
29 CFR 1926.1153	Respirable Crystalline Silica
40 CFR 50	National Primary and Secondary Ambient Air Quality Standards
40 CFR 60	Standards of Performance for New Stationary Sources
40 CFR 61	National Emission Standards for Hazardous Air Pollutants
40 CFR 63	National Emission Standards for Hazardous Air Pollutants for Source Categories
40 CFR 64	Compliance Assurance Monitoring
40 CFR 82	Protection of Stratospheric Ozone
40 CFR 112	Oil Pollution Prevention
40 CFR 122.26	Storm Water Discharges (Applicable to State NPDES Programs, see section 123.25)
40 CFR 241	Guidelines for Disposal of Solid Waste
40 CFR 243	Guidelines for the Storage and Collection of Residential, Commercial, and Institutional Solid Waste
40 CFR 258	Subtitle D Landfill Requirements
40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 261.7	Residues of Hazardous Waste in Empty Containers

40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 262.34	Standards Applicable to Generators of Hazardous Waste-Accumulation Time
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 266	Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
40 CFR 268	Land Disposal Restrictions
40 CFR 273	Standards for Universal Waste Management
40 CFR 273.2	Standards for Universal Waste Management - Batteries
40 CFR 273.4	Standards for Universal Waste Management - Mercury Containing Equipment
40 CFR 273.5	Standards for Universal Waste Management - Lamps
40 CFR 279	Standards for the Management of Used Oil
40 CFR 300	National Oil and Hazardous Substances Pollution Contingency Plan
40 CFR 300.125	National Oil and Hazardous Substances Pollution Contingency Plan - Notification and Communications
40 CFR 355	Emergency Planning and Notification
40 CFR 403	General Pretreatment Regulations for Existing and New Sources of Pollution
40 CFR 745	Lead-Based Paint Poisoning Prevention in Certain Residential Structures
49 CFR 171	General Information, Regulations, and Definitions
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements

Shippers - General Requirements for Shipments and Packagings

Specifications for Packagings

1.2.1 Class I and II Ozone Depleting Substance (ODS)

Class II ODS is defined in Section 602(s) of The Clean Air Act. A list of Class II ODS can be found on the EPA website at the following weblink.
<https://www.epa.gov/ozone-layer-protection/ozone-depleting-substances>.

Contractor generated hazardous waste is materials that, if abandoned or disposed of, may meet the definition of a hazardous waste. These waste streams would typically consist of material brought on site by the Contractor to execute work, but are not fully consumed during the course of construction. Examples include, but are not limited to, excess paint thinners (i.e., methyl ethyl ketone, toluene), waste thinners, excess paints, excess solvents, waste solvents, excess pesticides, and contaminated pesticide equipment rinse water.

Electronics waste is discarded electronic devices intended for salvage, recycling, or disposal.

Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the environment aesthetically, culturally or historically.

Environmental protection is the prevention/control of pollution and habitat disruption that may occur to the environment during construction. The control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

As defined in paragraph SOLID WASTE, debris that contains listed hazardous waste (either on the debris surface, or in its interstices, such as pore structure) in accordance with 40 CFR 261. Hazardous debris also includes debris that exhibits a characteristic of hazardous waste in accordance with 40 CFR 261.

1.2.7 Hazardous Materials

Hazardous materials as defined in 49 CFR 171 and listed in 49 CFR 172.

Hazardous material is any material that: Is regulated as a hazardous material in accordance with 49 CFR 173; or requires a Safety Data Sheet (SDS) in accordance with 29 CFR 1910.120; or during end use, treatment, handling, packaging, storage, transportation, or disposal meets or has components that meet or have potential to meet the definition of a hazardous waste as defined by 40 CFR 261 Subparts A, B, C, or D. Designation of a material by this definition, when separately regulated or controlled by other sections or directives, does not eliminate the need for adherence to that hazard-specific guidance which takes precedence over this section for "control" purposes. Such material includes ammunition, weapons, explosive actuated devices, propellants, pyrotechnics, chemical and biological warfare materials, medical and pharmaceutical supplies, medical waste and infectious materials, bulk fuels, radioactive materials, and other materials such as asbestos, mercury, and polychlorinated biphenyls (PCBs).

1.2.8 Hazardous Waste

Hazardous Waste is any material that meets the definition of a solid waste and exhibit a hazardous characteristic (ignitability, corrosivity, reactivity, or toxicity) as specified in 40 CFR 261, Subpart C, or contains a listed hazardous waste as identified in 40 CFR 261, Subpart D.

1.2.9 Land Application

Land Application means spreading or spraying discharge water at a rate that allows the water to percolate into the soil. No sheeting action, soil erosion, discharge into storm sewers, discharge into defined drainage areas, or discharge into the "waters of the United States" must occur. Comply with federal, state, and local laws and regulations.

1.2.10 Municipal Separate Storm Sewer System (MS4) Permit

MS4 permits are those held by installations to obtain NPDES permit coverage for their stormwater discharges.

1.2.11 National Pollutant Discharge Elimination System (NPDES)

The NPDES permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States.

1.2.12 Oily Waste

Oily waste are those materials that are, or were, mixed with Petroleum, Oils, and Lubricants (POLs) and have become separated from that POLs. Oily wastes also means materials, including wastewaters, centrifuge solids, filter residues or sludges, bottom sediments, tank bottoms, and sorbents which have come into contact with and have been contaminated by, POLs and may be appropriately tested and discarded in a manner which is in compliance with other state and local requirements.

This definition includes materials such as oily rags, "kitty litter" sorbent clay and organic sorbent material. These materials may be land filled provided that: It is not prohibited in other state regulations or

local ordinances; the amount generated is "de minimus" (a small amount); it is the result of minor leaks or spills resulting from normal process operations; and free-flowing oil has been removed to the practicable extent possible. Large quantities of this material, generated as a result of a major spill or in lieu of proper maintenance of the processing equipment, are a solid waste. As a solid waste, perform a hazardous waste determination prior to disposal. As this can be an expensive process, it is recommended that this type of waste be minimized through good housekeeping practices and employee education.

1.2.13 Regulated Waste

Regulated waste are solid wastes that have specific additional federal, state, or local controls for handling, storage, or disposal.

1.2.14 Sediment

Sediment is soil and other debris that have eroded and have been transported by runoff water or wind.

1.2.15 Solid Waste

Solid waste is a solid, liquid, semi-solid or contained gaseous waste. A solid waste can be a hazardous waste, non-hazardous waste, or non-Resource Conservation and Recovery Act (RCRA) regulated waste. Types of solid waste typically generated at construction sites may include:

1.2.15.1 Debris

Debris is non-hazardous solid material generated during the construction, demolition, or renovation of a structure that exceeds 2.5-inch particle size that is: A manufactured object; plant or animal matter; or natural geologic material (for example, cobbles and boulders), broken or removed concrete, masonry, and rock asphalt paving; ceramics; roofing paper and shingles. Inert materials may not be reinforced with or contain ferrous wire, rods, accessories and weldments. A mixture of debris and other material such as soil or sludge is also subject to regulation as debris if the mixture is comprised primarily of debris by volume, based on visual inspection.

1.2.15.2 Green Waste

Green waste is the vegetative matter from landscaping, land clearing and grubbing, including, but not limited to, grass, bushes, scrubs, small trees and saplings, tree stumps and plant roots. Marketable trees, grasses and plants that are indicated to remain, be re-located, or be re-used are not included.

1.2.15.3 Material Not Regulated As Solid Waste

Material not regulated as solid waste is nuclear source or byproduct materials regulated under the Federal Atomic Energy Act of 1954 as amended; suspended or dissolved materials in domestic sewage effluent or irrigation return flows, or other regulated point source discharges; regulated air emissions; and fluids or wastes associated with natural gas or crude oil exploration or production.

1.2.15.4 Non-Hazardous Waste

Non-hazardous waste is waste that is excluded from, or does not meet, hazardous waste criteria in accordance with 40 CFR 263.

1.2.15.5 Recyclables

Recyclables are materials, equipment and assemblies such as doors, windows, door and window frames, plumbing fixtures, glazing and mirrors that are recovered and sold as recyclable, wiring, insulated/non-insulated copper wire cable, wire rope, and structural components. It also includes commercial-grade refrigeration equipment with Freon removed, household appliances where the basic material content is metal, clean polyethylene terephthalate bottles, cooking oil, used fuel oil, textiles, high-grade paper products and corrugated cardboard, stackable pallets in good condition, clean crating material, and clean rubber/vehicle tires. Metal meeting the definition of lead contaminated or lead based paint contaminated may not be included as recyclable if sold to a scrap metal company. Paint cans that meet the definition of empty containers in accordance with 40 CFR 261.7 may be included as recyclable if sold to a scrap metal company.

1.2.15.6 Surplus Soil

Surplus soil is existing soil that is in excess of what is required for this work, including aggregates intended, but not used, for on-site mixing of concrete, mortars, and paving. Contaminated soil meeting the definition of hazardous material or hazardous waste is not included and must be managed in accordance with paragraph HAZARDOUS MATERIAL MANAGEMENT.

1.2.15.7 Scrap Metal

This includes scrap and excess ferrous and non-ferrous metals such as reinforcing steel, structural shapes, pipe, and wire that are recovered or collected and disposed of as scrap. Scrap metal meeting the definition of hazardous material or hazardous waste is not included.

1.2.15.8 Wood

Wood is dimension and non-dimension lumber, plywood, chipboard, hardboard. Treated or painted wood that meets the definition of lead contaminated or lead based contaminated paint is not included. Treated wood includes, but is not limited to, lumber, utility poles, crossties, and other wood products with chemical treatment.

1.2.16 Surface Discharge

Surface discharge means discharge of water into drainage ditches, storm sewers, creeks or "waters of the United States". Surface discharges are discrete, identifiable sources and require a permit from the governing agency. Comply with federal, state, and local laws and regulations.

1.2.17 Wastewater

Wastewater is the used water and solids from a community that flow to a treatment plant.

1.2.17.1 Stormwater

Stormwater is any precipitation in an urban or suburban area that does not evaporate or soak into the ground, but instead collects and flows into storm drains, rivers, and streams.

1.2.18 Waters of the United States

Waters of the United States means Federally jurisdictional waters, including wetlands, that are subject to regulation under Section 404 of the Clean Water Act or navigable waters, as defined under the Rivers and Harbors Act.

1.2.19 Wetlands

Wetlands are those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

1.2.20 Universal Waste

The universal waste regulations streamline collection requirements for certain hazardous wastes in the following categories: Batteries, pesticides, mercury-containing equipment (for example, thermostats), and lamps (for example, fluorescent bulbs). The rule is designed to reduce hazardous waste in the municipal solid waste (MSW) stream by making it easier for universal waste handlers to collect these items and send them for recycling or proper disposal. These regulations can be found at 40 CFR 273.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Preconstruction Survey

Solid Waste Management Permit; G

Regulatory Notifications; G

Environmental Protection Plan; G

Stormwater Pollution Prevention Plan (SWPPP); G

Stormwater Notice of Intent (for NPDES coverage under the general permit for construction activities); G

Dirt and Dust Control Plan; G

Employee Training Records; G

Environmental Manager Qualifications; G

SD-06 Test Reports

Inspection Reports

Monthly Solid Waste Disposal Report; G

SD-07 Certificates

Employee Training Records; G

Erosion and Sediment Control Inspector Qualifications

SD-11 Closeout Submittals

Stormwater Pollution Prevention Plan Compliance Notebook; G

Stormwater Notice of Termination (for NPDES coverage under the general permit for construction activities); G

Waste Determination Documentation; G

Disposal Documentation for Hazardous and Regulated Waste; G

Assembled Employee Training Records; G

Solid Waste Management Permit; G

Project Solid Waste Disposal Documentation Report; G

Hazardous Waste/Debris Management; G

Regulatory Notifications; G

Sales Documentation; G

Contractor Certification

1.4 ENVIRONMENTAL PROTECTION REQUIREMENTS

Provide and maintain, during the life of the contract, environmental protection as defined. Plan for and provide environmental protective measures to control pollution that develops during construction practice. Plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. Protect the environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire duration of this Contract. Comply with federal, state, and local regulations pertaining to the environment, including water, air, solid waste, hazardous waste and substances, oily substances, and noise pollution.

Tests and procedures assessing whether construction operations comply with Applicable Environmental Laws may be required. Analytical work must be performed by qualified laboratories; and where required by law, the laboratories must be certified.

1.4.1 Conformance with the Environmental Management System

Perform work under this contract consistent with the policy and objectives identified in the installation's Environmental Management System (EMS). Perform work in a manner that conforms to objectives and targets of the environmental programs and operational controls identified by the EMS. Support Government personnel when environmental compliance and EMS audits are conducted by escorting auditors at the Project site, answering questions, and providing proof of records being maintained. Provide monitoring and measurement information as necessary to address environmental performance relative to environmental, energy, and transportation management goals. In the event an EMS nonconformance or environmental noncompliance associated with the contracted services, tasks, or actions occurs, take corrective and preventative actions. In addition, employees must be aware of their roles and responsibilities under the installation EMS and of how these EMS roles and responsibilities affect work performed under the contract.

Coordinate with the installation's EMS coordinator to identify training needs associated with environmental aspects and the EMS, and arrange training or take other action to meet these needs. Provide training documentation to the Contracting Officer. The Installation Environmental Office will retain associated environmental compliance records. Make EMS Awareness training completion certificates available to Government auditors during EMS audits and include the certificates in the Employee Training Records. See paragraph EMPLOYEE TRAINING RECORDS.

1.5 QUALITY ASSURANCE

1.5.1 Preconstruction Survey and Protection of Features

This paragraph supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS. Prior to start of any onsite construction activities, perform a Preconstruction Survey of the project site with the Contracting Officer, and take photographs showing existing environmental conditions in and adjacent to the site. Submit a report for the record. Include in the report a plan describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection along with the condition of trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the Contractor's assigned storage area and access route(s), as applicable. The Contractor and the Contracting Officer will sign this survey report upon mutual agreement regarding its accuracy and completeness. Protect those environmental features included in the survey report and any indicated on the drawings, regardless of interference that their preservation may cause to the work under the Contract.

1.5.2 Regulatory Notifications

Provide regulatory notification requirements in accordance with federal, state and local regulations. In cases where the Government will also provide public notification (such as stormwater permitting), coordinate with the Contracting Officer. Submit copies of regulatory notifications to the Contracting Officer at least 14 days prior to commencement of work activities. Typically, regulatory notifications must be provided for the following (this listing is not all-inclusive): Demolition, renovation, NPDES defined site work, construction, removal or use of a permitted air emissions source, and remediation of controlled substances (asbestos,

hazardous waste, lead paint).

1.5.3 Environmental Brief

Attend an environmental brief to be included in the preconstruction meeting. Provide the following information: Types, quantities, and use of hazardous materials that will be brought onto the installation; and types and quantities of wastes/wastewater that may be generated during the Contract. Discuss the results of the Preconstruction Survey at this time.

Prior to initiating any work on site, meet with the Contracting Officer and installation Environmental Office to discuss the proposed Environmental Protection Plan (EPP). Develop a mutual understanding relative to the details of environmental protection, including measures for protecting natural and cultural resources, required reports, required permits, permit requirements (such as mitigation measures), and other measures to be taken.

1.5.4 Environmental Manager

Appoint in writing an Environmental Manager for the project site. The Environmental Manager is directly responsible for coordinating contractor compliance with federal, state, local, and installation requirements. The Environmental Manager must ensure compliance with Hazardous Waste Program requirements (including hazardous waste handling, storage, manifesting, and disposal); implement the EPP; ensure environmental permits are obtained, maintained, and closed out; ensure compliance with Stormwater Program requirements; ensure compliance with Hazardous Materials (storage, handling, and reporting) requirements; and coordinate any remediation of regulated substances (lead, asbestos, PCB transformers). This can be a collateral position; however, the person in this position must be trained to adequately accomplish the following duties: Ensure waste segregation and storage compatibility requirements are met; inspect and manage Satellite Accumulation areas; ensure only authorized personnel add wastes to containers; ensure Contractor personnel are trained in 40 CFR requirements in accordance with their position requirements; coordinate removal of waste containers; and maintain the Environmental Records binder and required documentation, including environmental permits compliance and close-out. Submit Environmental Manager Qualifications to the Contracting Officer.

1.5.5 Employee Training Records

Prepare and maintain Employee Training Records throughout the term of the contract meeting applicable 40 CFR requirements. Provide Employee Training Records in the Environmental Records Binder. Ensure every employee completes a program of classroom instruction or on-the-job training that teaches them to perform their duties in a way that ensures compliance with federal, state and local regulatory requirements for RCRA Large Quantity Generator. Provide a Position Description for each employee, by subcontractor, based on the Davis-Bacon Wage Rate designation or other equivalent method, evaluating the employee's association with hazardous and regulated wastes. This Position Description will include training requirements as defined in 40 CFR 265 for a Large Quantity Generator facility. Submit these Assembled Employee Training Records to the Contracting Officer at the conclusion of the project, unless otherwise directed.

Train personnel to meet EPA and state requirements. Conduct environmental

protection/pollution control meetings for personnel prior to commencing construction activities. Contact additional meetings for new personnel and when site conditions change. Include in the training and meeting agenda: Methods of detecting and avoiding pollution; familiarization with statutory and contractual pollution standards; installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; recognition and protection of archaeological sites, artifacts, waters of the United States, and endangered species and their habitat that are known to be in the area. Provide copy of the Erosion and Sediment Control Inspector Certification as required by the state of Georgia.

1.5.6 Non-Compliance Notifications

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with federal, state or local environmental laws or regulations, permits, and other elements of the Contractor's EPP. After receipt of such notice, inform the Contracting Officer of the proposed corrective action and take such action when approved by the Contracting Officer. The Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. FAR 52.242-14 Suspension of Work provides that a suspension, delay, or interruption of work due to the fault or negligence of the Contractor allows for no adjustments to the contract for time extensions or equitable adjustments. In addition to a suspension of work, the Contracting Officer may use additional authorities under the contract or law.

1.6 ENVIRONMENTAL PROTECTION PLAN

The purpose of the EPP is to present an overview of known or potential environmental issues that must be considered and addressed during construction. Incorporate construction related objectives and targets from the installation's EMS into the EPP. Include in the EPP measures for protecting natural and cultural resources, required reports, and other measures to be taken. Meet with the Contracting Officer or Contracting Officer Representative to discuss the EPP and develop a mutual understanding relative to the details for environmental protection including measures for protecting natural resources, required reports, and other measures to be taken. Submit the EPP within 15 days after Contract award and not less than 10 days before the preconstruction meeting. Revise the EPP throughout the project to include any reporting requirements, changes in site conditions, or contract modifications that change the project scope of work in a way that could have an environmental impact. No requirement in this section will relieve the Contractor of any applicable federal, state, and local environmental protection laws and regulations. During Construction, identify, implement, and submit for approval any additional requirements to be included in the EPP. Maintain the current version onsite.

The EPP includes, but is not limited to, the following elements:

1.6.1 General Overview and Purpose

1.6.1.1 Descriptions

A brief description of each specific plan required by environmental permit or elsewhere in this Contract such as stormwater pollution prevention

plan, spill control plan, solid waste management plan, wastewater management plan, air pollution control plan, contaminant prevention plan, a historical, archaeological, cultural resources, biological resources and wetlands plan, traffic control plan, Hazardous, Toxic and Radioactive Waste (HTRW) Plan, Non-Hazardous Solid Waste Disposal Plan, and borrowing material plan.

1.6.1.2 Duties

The duties and level of authority assigned to the person(s) on the job site who oversee environmental compliance, such as who is responsible for adherence to the EPP, who is responsible for spill cleanup and training personnel on spill response procedures, who is responsible for manifesting hazardous waste to be removed from the site (if applicable), and who is responsible for training the Contractor's environmental protection personnel.

1.6.1.3 Procedures

A copy of any standard or project-specific operating procedures that will be used to effectively manage and protect the environment on the project site.

1.6.1.4 Communications

Communication and training procedures that will be used to convey environmental management requirements to Contractor employees and subcontractors.

1.6.1.5 Contact Information

Emergency contact information contact information (office phone number, cell phone number, and e-mail address).

1.6.2 General Site Information

1.6.2.1 Drawings

Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, jurisdictional wetlands, material storage areas, structures, sanitary facilities, storm drains and conveyances, and stockpiles of excess soil.

1.6.2.2 Work Area

Work area plan showing the proposed activity in each portion of the area and identify the areas of limited use or nonuse. Include measures for marking the limits of use areas, including methods for protection of features to be preserved within authorized work areas and methods to control runoff and to contain materials on site, and a traffic control plan.

1.6.2.3 Documentation

A letter signed by an officer of the firm appointing the Environmental Manager and stating that person is responsible for managing and implementing the Environmental Program as described in this contract. Include in this letter the Environmental Manager's authority to direct the removal and replacement of non-conforming work.

1.6.3 Management of Natural Resources

- a. Land resources
- b. Tree protection
- c. Replacement of damaged landscape features
- d. Temporary construction
- e. Stream crossings
- f. Fish and wildlife resources
- g. Wetland areas

1.6.4 Protection of Historical and Archaeological Resources

- a. Objectives
- b. Methods

1.6.5 Stormwater Management and Control

- a. Ground cover
- b. Erodible soils
- c. Temporary measures
 - (1) Structural Practices
 - (2) Temporary and permanent stabilization
- d. Effective selection, implementation and maintenance of Best Management Practices (BMPs).

1.6.6 Protection of the Environment from Waste Derived from Contractor Operations

Control and disposal of solid and sanitary waste. Control and disposal of hazardous waste.

This item consist of the management procedures for hazardous waste to be generated. The elements of those procedures will coincide with the Installation Hazardous Waste Management Plan. The Contracting Officer will provide a copy of the Installation Hazardous Waste Management Plan. As a minimum, include the following:

- a. List of the types of hazardous wastes expected to be generated
- b. Procedures to ensure a written waste determination is made for appropriate wastes that are to be generated
- c. Sampling/analysis plan, including laboratory method(s) that will be used for waste determinations and copies of relevant laboratory certifications

- d. Methods and proposed locations for hazardous waste accumulation/storage (that is, in tanks or containers)
- e. Management procedures for storage, labeling, transportation, and disposal of waste (treatment of waste is not allowed unless specifically noted)
- f. Management procedures and regulatory documentation ensuring disposal of hazardous waste complies with Land Disposal Restrictions (40 CFR 268)
- g. Management procedures for recyclable hazardous materials such as lead-acid batteries, used oil, and similar
- h. Used oil management procedures in accordance with 40 CFR 279; Hazardous waste minimization procedures
- i. Plans for the disposal of hazardous waste by permitted facilities; and Procedures to be employed to ensure required employee training records are maintained.

1.6.7 Prevention of Releases to the Environment

Procedures to prevent releases to the environment

Notifications in the event of a release to the environment

1.6.8 Regulatory Notification and Permits

List what notifications and permit applications must be made. Some permits require up to 180 days to obtain. Demonstrate that those permits have been obtained or applied for by including copies of applicable environmental permits. The EPP will not be approved until the permits have been obtained.

1.6.9 Clean Air Act Compliance

1.6.9.1 Haul Route

Submit truck and material haul routes along with a Dirt and Dust Control Plan for controlling dirt, debris, and dust on Installation roadways. As a minimum, identify in the plan the subcontractor and equipment for cleaning along the haul route and measures to reduce dirt, dust, and debris from roadways.

1.6.9.2 Pollution Generating Equipment

Identify air pollution generating equipment or processes that may require federal, state, or local permits under the Clean Air Act. Determine requirements based on any current installation permits and the impacts of the project. Provide a list of all fixed or mobile equipment, machinery or operations that could generate air emissions during the project to the Installation Environmental Office (Air Program Manager).

1.6.9.3 Stationary Internal Combustion Engines

Identify portable and stationary internal combustion engines that will be supplied, used or serviced. Comply with 40 CFR 60 Subpart IIII, 40 CFR 60 Subpart JJJJ, 40 CFR 63 Subpart ZZZZ, and local regulations as

applicable. At minimum, include the make, model, serial number, manufacture date, size (engine brake horsepower), and EPA emission certification status of each engine. Maintain applicable records and log hours of operation and fuel use. Logs must include reasons for operation and delineate between emergency and non-emergency operation.

1.6.9.4 Refrigerants

Identify management practices to ensure that heating, ventilation, and air conditioning (HVAC) work involving refrigerants complies with 40 CFR 82 requirements. Technicians must be certified, maintain copies of certification on site, use certified equipment and log work that requires the addition or removal of refrigerant. Any refrigerant reclaimed is the property of the Government, coordinate with the Installation Environmental Office to determine the appropriate turn in location.

1.6.9.5 Air Pollution-engineering Processes

Identify planned air pollution-generating processes and management control measures (including, but not limited to, spray painting, abrasive blasting, demolition, material handling, fugitive dust, and fugitive emissions). Log hours of operations and track quantities of materials used.

1.6.9.6 Compliant Materials

Provide the Government a list of SDSs for all hazardous materials proposed for use on site. Materials must be compliant with all Clean Air Act regulations for emissions including solvent and volatile organic compound contents, and applicable National Emission Standards for Hazardous Air Pollutants requirements. The Government may alter or limit use of specific materials as needed to meet installation permit requirements for emissions.

1.7 LICENSES AND PERMITS

Obtain licenses and permits required for the construction of the project and in accordance with FAR 52.236-7 Permits and Responsibilities. Notify the Government of all general use permitted equipment the Contractor plans to use on site. This paragraph supplements the Contractor's responsibility under FAR 52.236-7 Permits and Responsibilities.

a. The following permits have been obtained by the Government:

(1) NPDES

1.8 ENVIRONMENTAL RECORDS BINDER

Maintain on-site a separate three-ring Environmental Records Binder and submit at the completion of the project. Make separate parts within the binder that correspond to each submittal listed under paragraph CLOSEOUT SUBMITTALS in this section.

1.9 SOLID WASTE MANAGEMENT PERMIT

Provide the Contracting Officer with written notification of the quantity of anticipated solid waste or debris that is anticipated or estimated to be generated by construction. Include in the report the locations where various types of waste will be disposed or recycled. Include letters of

acceptance from the receiving location or as applicable; submit one copy of the receiving location state and local Solid Waste Management Permit or license showing such agency's approval of the disposal plan before transporting wastes off Government property.

1.9.1 Monthly Solid Waste Disposal Report

Monthly, submit a solid waste disposal report to the Contracting Officer. For each waste, the report will state the classification (using the definitions provided in this section), amount, location, and name of the business receiving the solid waste.

1.10 FACILITY HAZARDOUS WASTE GENERATOR STATUS

Hunter Army Airfield is designated as a Large Quantity Generator. Meet the regulatory requirements of this generator designation for any work conducted within the boundaries of this Installation. Comply with provisions of federal, state, and local regulatory requirements applicable to this generator status regarding training and storage, handling, and disposal of construction derived wastes.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 PROTECTION OF NATURAL RESOURCES

Minimize interference with, disturbance to, and damage to fish, wildlife, and plants, including their habitats. Prior to the commencement of activities, consult with the Installation Environmental Office, regarding rare species or sensitive habitats that need to be protected. The protection of rare, threatened, and endangered animal and plant species identified, including their habitats, is the Contractor's responsibility. The following species are known and could be affected within the construction area: American Alligator and Ocmulgee Skullcap.

Preserve the natural resources within the project boundaries and outside the limits of permanent work. Restore to an equivalent or improved condition upon completion of work that is consistent with the requirements of the Installation Environmental Office or as otherwise specified. Confine construction activities to within the limits of the work indicated or specified.

3.1.1 Flow Ways

Do not alter water flows or otherwise significantly disturb the native habitat adjacent to the project and critical to the survival of fish and wildlife, except as specified and permitted.

3.1.2 Vegetation

Except in areas to be cleared, do not remove, cut, deface, injure, or destroy trees or shrubs without the Contracting Officer's permission. Do not fasten or attach ropes, cables, or guys to existing nearby trees for anchorages unless authorized by the Contracting Officer. Where such use of attached ropes, cables, or guys is authorized, the Contractor is responsible for any resultant damage.

Protect existing trees that are to remain to ensure they are not injured, bruised, defaced, or otherwise damaged by construction operations. Remove displaced rocks from uncleared areas. Coordinate with the Contracting Officer and Installation Environmental Office to determine appropriate action for trees and other landscape features scarred or damaged by equipment operations.

3.1.3 Streams

Stream crossings must allow movement of materials or equipment without violating water pollution control standards of the federal, state, and local governments. Construction of stream crossing structures must be in compliance with any required permits including, but not limited to, Clean Water Act Section 404, and Section 401 Water Quality.

The Contracting Officer's approval and appropriate permits are required before any equipment will be permitted to ford live streams. In areas where frequent crossings are required, install temporary culverts or bridges. Obtain Contracting Officer's approval prior to installation. Remove temporary culverts or bridges upon completion of work, and repair the area to its original condition unless otherwise required by the Contracting Officer.

3.2 STORMWATER

Do not discharge stormwater from construction sites to the sanitary sewer. If the water is noted or suspected of being contaminated, it may only be released to the storm drain system if the discharge is specifically permitted. Obtain authorization in advance from the Installation Environmental Office for any release of contaminated water.

3.2.1 Construction General Permit

Provide a Construction General Permit as required by 40 CFR 122.26 or the State of Georgia General Permit. Under the terms and conditions of the permit, install, inspect, maintain BMPs, prepare stormwater erosion and sediment control inspection reports, and submit SWPPP inspection reports. Maintain construction operations and management in compliance with the terms and conditions of the general permit for stormwater discharges from construction activities.

3.2.1.1 Stormwater Pollution Prevention Plan

Submit a project-specific Stormwater Pollution Prevention Plan (SWPPP) to the Contracting Officer for approval, prior to the commencement of work. The SWPPP must meet the requirements of 40 CFR 122.26 and the Georgia State General Permit for stormwater discharges from construction sites.

Include the following:

- a. Comply with terms of the state general permit for stormwater discharges from construction activities. Prepare SWPPP in accordance with state requirements. Use state to prepare the SWPPP.
- b. Select applicable BMPs from EPA Fact Sheets located at <https://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater#constr> or in accordance with applicable state or local requirements.

- c. Include a completed copy of the Notice of Intent, BMP Inspection Report Template, and Stormwater Notice of Termination, except for the effective date.

3.2.1.2 Stormwater Notice of Intent for Construction Activities

Prepare and submit the Notice of Intent for NPDES coverage under the general permit for construction activities to the Contracting Officer for review and approval.

Submit the approved NOI and appropriate permit fees onto the appropriate federal or state agency for approval. No land disturbing activities may commence without permit coverage. Maintain an approved copy of the SWPPP at the onsite construction office, and continually update as regulations require, reflecting current site conditions.

3.2.1.3 Inspection Reports

Submit "Inspection Reports" to the Contracting Officer in accordance with the State of Georgia Construction General Permit.

3.2.1.4 Stormwater Pollution Prevention Plan Compliance Notebook

Create and maintain a three ring binder of documents that demonstrate compliance with the Construction General Permit. Include a copy of the permit Notice of Intent, proof of permit fee payment, SWPPP and SWPPP update amendments, inspection reports and related corrective action records, copies of correspondence with the Georgia Soil and Water Conservation Commission State Permitting Agency, and a copy of the permit Notice of Termination in the binder. At project completion, the notebook becomes property of the Government. Provide the compliance notebook to the Contracting Officer.

3.2.1.5 Stormwater Notice of Termination for Construction Activities

Submit a Notice of Termination to the Contracting Officer for approval once construction is complete and final stabilization has been achieved on all portions of the site for which the permittee is responsible. Once approved, submit the Notice of Termination to the appropriate state or federal agency.

3.2.2 Erosion and Sediment Control Measures

Provide erosion and sediment control measures in accordance with state and local laws and regulations. Preserve vegetation to the maximum extent practicable.

Erosion control inspection reports may be compiled as part of a stormwater pollution prevention plan inspection reports.

3.2.3 Work Area Limits

Mark the areas that need not be disturbed under this Contract prior to commencing construction activities. Mark or fence isolated areas within the general work area that are not to be disturbed. Protect monuments and markers before construction operations commence. Where construction operations are to be conducted during darkness, any markers must be visible in the dark. Personnel must be knowledgeable of the purpose for

marking and protecting particular objects.

3.2.4 Contractor Facilities and Work Areas

Place field offices, staging areas, stockpile storage, and temporary buildings in areas designated on the drawings or as directed by the Contracting Officer. Move or relocate the Contractor facilities only when approved by the Government. Provide erosion and sediment controls for onsite borrow and spoil areas to prevent sediment from entering nearby waters. Control temporary excavation and embankments for plant or work areas to protect adjacent areas.

3.2.5 Municipal Separate Storm Sewer System (MS4) Management

Comply with the Installation's MS4 permit requirements.

3.3 SURFACE AND GROUNDWATER

3.3.1 Cofferdams, Diversions, and Dewatering

Construction operations for dewatering, removal of cofferdams, tailrace excavation, and tunnel closure must be constantly controlled to maintain compliance with existing state water quality standards and designated uses of the surface water body. Comply with the State of Georgia water quality standards and anti-degradation provisions. Do not discharge excavation ground water to the sanitary sewer, storm drains, or to surface waters without prior specific authorization in writing from the Installation Environmental Office. Discharge of hazardous substances will not be permitted under any circumstances. Use sediment control BMPs to prevent construction site runoff from directly entering any storm drain or surface waters.

If the construction dewatering is noted or suspected of being contaminated, it may only be released to the storm drain system if the discharge is specifically permitted. Obtain authorization for any contaminated groundwater release in advance from the Installation Environmental Officer and the federal or state authority, as applicable. Discharge of hazardous substances will not be permitted under any circumstances.

3.3.2 Waters of the United States

Do not enter, disturb, destroy, or allow discharge of contaminants into waters of the United States.

3.4 AIR RESOURCES

Equipment operation, activities, or processes will be in accordance with 40 CFR 64 and state air emission and performance laws and standards.

3.4.1 Preconstruction Air Permits

Notify the Air Program Manager, through the Contracting Officer, at least 6 months prior to bringing equipment, assembled or unassembled, onto the Installation, so that air permits can be secured. Necessary permitting time must be considered in regard to construction activities. Clean Air Act (CAA) permits must be obtained prior to bringing equipment, assembled or unassembled, onto the Installation.

Confirm that these permits have been obtained.

3.4.2 Oil or Dual-fuel Boilers and Furnaces

Provide product data and details for new, replacement, or relocated fuel fired boilers, heaters, or furnaces to the Installation Environmental Office (Air Program Manager) through the Contracting Officer. Data to be reported include: Equipment purpose (water heater, building heat, process), manufacturer, model number, serial number, fuel type (oil type, gas type) size (MMBTU heat input). Provide in accordance with paragraph PRECONSTRUCTION AIR PERMITS.

3.4.3 Burning

Burning is prohibited on the Government premises.

3.4.4 Class I and II ODS Prohibition

Class I and II ODS are Government property and must be returned to the Government for appropriate management. Coordinate with the Installation Environmental Office to determine the appropriate location for turn in of all reclaimed refrigerant.

3.4.5 Accidental Venting of Refrigerant

Accidental venting of a refrigerant is a release and must be reported immediately to the Contracting Officer.

3.4.6 EPA Certification Requirements

Heating and air conditioning technicians must be certified through an EPA-approved program. Maintain copies of certifications at the employees' places of business; technicians must carry certification wallet cards, as provided by environmental law.

3.4.7 Dust Control

Keep dust down at all times, including during nonworking periods. Dry power brooming will not be permitted. Instead, use vacuuming, wet mopping, wet sweeping, or wet power brooming. Air blowing will be permitted only for cleaning nonparticulate debris such as steel reinforcing bars. Only wet cutting will be permitted for cutting concrete blocks, concrete, and bituminous concrete. Do not unnecessarily shake bags of cement, concrete mortar, or plaster. Since these products contain Crystalline Silica, comply with the applicable OSHA standard, 29 CFR 1910.1053 or 29 CFR 1926.1153 for controlling exposure to Crystalline Silica Dust.

3.4.7.1 Particulates

Dust particles, aerosols and gaseous by-products from construction activities, and processing and preparation of materials (such as from asphaltic batch plants) must be controlled at all times, including weekends, holidays, and hours when work is not in progress. Maintain excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates that would exceed 40 CFR 50, state, and local air pollution standards or that would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type,

baghouse, scrubbers, electrostatic precipitators, or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp. Provide sufficient, competent equipment available to accomplish these tasks. Perform particulate control as the work proceeds and whenever a particulate nuisance or hazard occurs. Comply with state and local visibility regulations.

3.4.7.2 Abrasive Blasting

Blasting operations cannot be performed without prior approval of the Installation Air Program Manager. The use of silica sand is prohibited in sandblasting.

Provide tarpaulin drop cloths and windscreens to enclose abrasive blasting operations to confine and collect dust, abrasive agent, paint chips, and other debris.

3.4.8 Odors

Control odors from construction activities. The odors must be in compliance with state regulations and local ordinances and may not constitute a health hazard.

3.5 WASTE MINIMIZATION

Minimize the use of hazardous materials and the generation of waste. Include procedures for pollution prevention/ hazardous waste minimization in the Hazardous Waste Management Section of the EPP. Obtain a copy of the installation's Pollution Prevention/Hazardous Waste Minimization Plan for reference material when preparing this part of the EPP. If no written plan exists, obtain information by contacting the Contracting Officer. Describe the anticipated types of the hazardous materials to be used in the construction when requesting information.

3.5.1 Salvage, Reuse and Recycle

Identify anticipated materials and waste for salvage, reuse, and recycling. Describe actions to promote material reuse, resale or recycling. To the extent practicable, all scrap metal must be sent for reuse or recycling and will not be disposed of in a landfill.

Include the name, physical address, and telephone number of the hauler, if transported by a franchised solid waste hauler. Include the destination and, unless exempted, provide a copy of the state or local permit (cover) or license for recycling.

3.5.2 Nonhazardous Solid Waste Diversion Report

Maintain an inventory of nonhazardous solid waste diversion and disposal of construction and demolition debris. Submit a report to the Contracting Officer on the first working day after each fiscal year quarter, starting the first quarter that nonhazardous solid waste has been generated. Include the following in the report:

Construction and Demolition (C&D) Debris Disposed	tons, as appropriate
C&D Debris Recycled	tons, as appropriate
C&D Debris Composted	tons, as appropriate
Total C&D Debris Generated	tons, as appropriate
Waste Sent to Waste-To-Energy Incineration Plant (This amount should not be included in the recycled amount)	tons, as appropriate

3.6 WASTE MANAGEMENT AND DISPOSAL

3.6.1 Waste Determination Documentation

Complete a Waste Determination form (provided at the pre-construction conference) for Contractor-derived wastes to be generated. All potentially hazardous solid waste streams that are not subject to a specific exclusion or exemption from the hazardous waste regulations (e.g., scrap metal, domestic sewage) or subject to special rules, (lead-acid batteries and precious metals) must be characterized in accordance with the requirements of 40 CFR 261 or corresponding applicable state or local regulations. Base waste determination on user knowledge of the processes and materials used, and analytical data when necessary. Consult with the Installation environmental staff for guidance on specific requirements. Attach support documentation to the Waste Determination form. As a minimum, provide a Waste Determination form for the following waste (this listing is not inclusive): Oil- and latex-based painting and caulking products, solvents, adhesives, aerosols, petroleum products, and containers of the original materials.

3.6.2 Solid Waste Management

3.6.2.1 Project Solid Waste Disposal Documentation Report

Provide copies of the waste handling facilities' weight tickets, receipts, bills of sale, and other sales documentation. In lieu of sales documentation, a statement indicating the disposal location for the solid waste that is signed by an employee authorized to legally obligate or bind the firm may be submitted. The sales documentation or Contractor certification must include the receiver's tax identification number and business, EPA or state registration number, along with the receiver's delivery and business addresses and telephone numbers. For each solid waste retained for the Contractor's own use, submit the information previously described in this paragraph on the solid waste disposal report. Prices paid or received do not have to be reported to the Contracting Officer unless required by other provisions or specifications of this Contract or public law.

3.6.2.2 Control and Management of Solid Wastes

Pick up solid wastes, and place in covered containers that are regularly emptied. Do not prepare or cook food on the project site. Prevent contamination of the site or other areas when handling and disposing of wastes. At project completion, leave the areas clean. Employ segregation measures so that no hazardous or toxic waste will become co-mingled with non-hazardous solid waste. Transport solid waste off Government property and dispose of it in compliance with 40 CFR 260, state, and local requirements for solid waste disposal. A Subtitle D RCRA permitted landfill is the minimum acceptable offsite solid waste disposal option. Verify that the selected transporters and disposal facilities have the necessary permits and licenses to operate. Segregate and separate treated wood components disposed at a lined landfill approved to accept this waste in accordance with local and state regulations. Solid waste disposal offsite must comply with most stringent local, state, and federal requirements, including 40 CFR 241, 40 CFR 243, and 40 CFR 258.

Manage hazardous material used in construction, including but not limited to, aerosol cans, waste paint, cleaning solvents, contaminated brushes, and used rags, in accordance with 49 CFR 173.

3.6.3 Control and Management of Hazardous Waste

Do not dispose of hazardous waste on Government property. Do not discharge any waste to a sanitary sewer, storm drain, or to surface waters or conduct waste treatment or disposal on Government property without written approval of the Contracting Officer.

3.6.3.1 Hazardous Waste/Debris Management

Identify construction activities that will generate hazardous waste or debris. Provide a documented waste determination for resultant waste streams. Identify, label, handle, store, and dispose of hazardous waste or debris in accordance with federal, state, and local regulations, including 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, 40 CFR 265, 40 CFR 266, and 40 CFR 268.

Manage hazardous waste in accordance with the approved Hazardous Waste Management Section of the EPP. Store hazardous wastes in approved containers in accordance with 49 CFR 173 and 49 CFR 178. Hazardous waste generated within the confines of Government facilities is identified as being generated by the Government. Prior to removal of any hazardous waste from Government property, hazardous waste manifests must be signed by personnel from the Installation Environmental Office. Do not bring hazardous waste onto Government property. Provide the Contracting Officer with a copy of waste determination documentation for any solid waste streams that have any potential to be hazardous waste or contain any chemical constituents listed in 40 CFR 372-SUBPART D.

3.6.3.2 Waste Storage/Satellite Accumulation/90 Day Storage Areas

Accumulate hazardous waste at satellite accumulation points and in compliance with 40 CFR 262.34 and applicable state or local regulations. Individual waste streams will be limited to 55 gallons of accumulation (or 1 quart for acutely hazardous wastes). If the Contractor expects to generate hazardous waste at a rate and quantity that makes satellite accumulation impractical, the Contractor may request a temporary 90 day accumulation point be established. Submit a request in writing to the

Contracting Officer and provide the following information (Attach Site Plan to the Request):

Contract Number	_____
Contractor	_____
Haz/Waste or Regulated Waste POC	_____
Phone Number	_____
Type of Waste	_____
Source of Waste	_____
Emergency POC	_____
Phone Number	_____
Location of the Site	_____

Attach a Waste Determination form for the expected waste streams. Allow 10 working days for processing this request. Additional compliance requirements (e.g. training and contingency planning) that may be required are the responsibility of the Contractor. Barricade the designated area where waste is being stored and post a sign identifying as follows:

"DANGER - UNAUTHORIZED PERSONNEL KEEP OUT"

3.6.3.3 Universal Waste Management

Manage the following categories of universal waste in accordance with federal, state, and local requirements and installation instructions:

- a. Batteries as described in 40 CFR 273.2
- b. Lamps as described in 40 CFR 273.5
- c. Mercury-containing equipment as described in 40 CFR 273.4

Mercury is prohibited in the construction of this facility, unless specified otherwise, and with the exception of mercury vapor lamps and fluorescent lamps. Dumping of mercury-containing materials and devices such as mercury vapor lamps, fluorescent lamps, and mercury switches, in rubbish containers is prohibited. Remove without breaking, pack to prevent breakage, and transport out of the activity in an unbroken condition for disposal as directed.

3.6.3.4 Electronics End-of-Life Management

Recycle or dispose of electronics waste, including, but not limited to, used electronic devices such computers, monitors, hard-copy devices, televisions, mobile devices, in accordance with 40 CFR 260-262, state, and local requirements, and installation instructions.

3.6.3.5 Disposal Documentation for Hazardous and Regulated Waste

Contact the Contracting Officer for the facility RCRA identification number that is to be used on each manifest.

3.6.4 Releases/Spills of Oil and Hazardous Substances

3.6.4.1 Response and Notifications

Exercise due diligence to prevent, contain, and respond to spills of hazardous material, hazardous substances, hazardous waste, sewage, regulated gas, petroleum, lubrication oil, and other substances regulated in accordance with 40 CFR 300. Maintain spill cleanup equipment and materials at the work site. In the event of a spill, take prompt, effective action to stop, contain, curtail, or otherwise limit the amount, duration, and severity of the spill/release. In the event of any releases of oil and hazardous substances, chemicals, or gases; immediately (within 15 minutes) notify the Installation Fire Department, the Installation Command Duty Officer, the Installation Environmental Office, and the Contracting Officer.

Submit verbal and written notifications as required by the federal (40 CFR 300.125 and 40 CFR 355), state, local regulations and instructions. Provide copies of the written notification and documentation that a verbal notification was made within 20 days. Spill response must be in accordance with 40 CFR 300 and applicable state and local regulations. Contain and clean up these spills without cost to the Government.

3.6.4.2 Clean Up

Clean up hazardous and non-hazardous waste spills. Reimburse the Government for costs incurred including sample analysis materials, clothing, equipment, and labor if the Government will initiate its own spill cleanup procedures, for Contractor-responsible spills, when: Spill cleanup procedures have not begun within one hour of spill discovery/occurrence; or, in the Government's judgment, spill cleanup is inadequate and the spill remains a threat to human health or the environment.

3.6.5 Mercury Materials

Immediately report to the Environmental Office and the Contracting Officer instances of breakage or mercury spillage. Clean mercury spill area to the satisfaction of the Contracting Officer.

Do not recycle a mercury spill cleanup; manage it as a hazardous waste for disposal.

3.6.6 Wastewater

3.6.6.1 Disposal of Wastewater

Disposal of wastewater must be as specified below.

3.6.6.1.1 Treatment

Do not allow wastewater from construction activities, such as onsite material processing, concrete curing, foundation and concrete clean-up, water used in concrete trucks, and forms to enter water ways or to be discharged prior to being treated to remove pollutants. Dispose of the construction-related waste water off-Government property in accordance with 40 CFR 403, state, regional, and local laws and regulations.

3.6.6.1.2 Surface Discharge

For discharge of ground water surface discharge in accordance with the requirements of the NPDES or state STORMWATER DISCHARGES FROM CONSTRUCTION SITES permit.

3.6.6.1.3 Land Application

Water generated from the flushing of lines after disinfection or disinfection in conjunction with hydrostatic testing must be discharged into the sanitary sewer with prior approval and notification to the Wastewater Treatment Plant's Operator.

3.7 HAZARDOUS MATERIAL MANAGEMENT

Include hazardous material control procedures in the Safety Plan, in accordance with Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS. Address procedures and proper handling of hazardous materials, including the appropriate transportation requirements. Do not bring hazardous material onto Government property that does not directly relate to requirements for the performance of this contract. Submit an SDS and estimated quantities to be used for each hazardous material to the Contracting Officer prior to bringing the material on the installation. Typical materials requiring SDS and quantity reporting include, but are not limited to, oil and latex based painting and caulking products, solvents, adhesives, aerosol, and petroleum products. Use hazardous materials in a manner that minimizes the amount of hazardous waste generated. Containers of hazardous materials must have National Fire Protection Association labels or their equivalent. Certify that hazardous materials removed from the site are hazardous materials and do not meet the definition of hazardous waste, in accordance with 40 CFR 261.

3.8 PREVIOUSLY USED EQUIPMENT

Clean previously used construction equipment prior to bringing it onto the project site. Equipment must be free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. Consult with the U.S. Department of Agriculture jurisdictional office for additional cleaning requirements.

3.9 CONTROL AND MANAGEMENT OF ASBESTOS-CONTAINING MATERIAL (ACM)

Manage and dispose of asbestos- containing waste in accordance with 40 CFR 61. Refer to Section 02 82 00 ASBESTOS REMEDIATION and the report titled, "Report of Pre-Demolition Asbestos Survey and Lead-Based Paint Screen, Military Working Dog Kennel, Hunter Army Airfield, Savannah, Georgia" by Geo-Hydro Engineers, dated May 20, 2020, hereinafter referred to as "HAZMAT Survey," which is included as an Attachment to this Section. Manifest asbestos-containing waste and provide the manifest to the Contracting Officer. Notifications to the state and Installation Air Program Manager are required before starting any asbestos work.

3.10 CONTROL AND MANAGEMENT OF LEAD-BASED PAINT (LBP)

Manage and dispose of lead-contaminated waste in accordance with 40 CFR 745 and Section 02 83 00 LEAD REMEDIATION and the HAZMAT Survey, which is included as an Attachment to this Section. Manifest any lead-contaminated waste and provide the manifest to the Contracting Officer.

3.11 MILITARY MUNITIONS

In the event military munitions, as defined in 40 CFR 260, are discovered or uncovered, immediately stop work in that area and immediately inform the Contracting Officer.

3.12 PETROLEUM, OIL, LUBRICANT (POL) STORAGE AND FUELING

POL products include flammable or combustible liquids, such as gasoline, diesel, lubricating oil, used engine oil, hydraulic oil, mineral oil, and cooking oil. Store POL products and fuel equipment and motor vehicles in a manner that affords the maximum protection against spills into the environment. Manage and store POL products in accordance with EPA 40 CFR 112, and other federal, state, regional, and local laws and regulations. Use secondary containments, dikes, curbs, and other barriers, to prevent POL products from spilling and entering the ground, storm or sewer drains, stormwater ditches or canals, or navigable waters of the United States. Describe in the EPP (see paragraph ENVIRONMENTAL PROTECTION PLAN) how POL tanks and containers must be stored, managed, and inspected and what protections must be provided. Storage of fuel on the project site must be in accordance with EPA, state, and local laws and regulations and paragraph OIL STORAGE INCLUDING FUEL TANKS.

3.12.1 Used Oil Management

Manage used oil generated on site in accordance with 40 CFR 279. Determine if any used oil generated while onsite exhibits a characteristic of hazardous waste. Used oil containing 1,000 parts per million of solvents is considered a hazardous waste and disposed of at the Contractor's expense. Used oil mixed with a hazardous waste is also considered a hazardous waste. Dispose in accordance with paragraph HAZARDOUS WASTE DISPOSAL.

3.12.2 Oil Storage Including Fuel Tanks

Provide secondary containment and overfill protection for oil storage tanks. A berm used to provide secondary containment must be of sufficient size and strength to contain the contents of the tanks plus 5 inches freeboard for precipitation. Construct the berm to be impervious to oil for 72 hours that no discharge will permeate, drain, infiltrate, or otherwise escape before cleanup occurs. Use drip pans during oil transfer operations; adequate absorbent material must be onsite to clean up any spills and prevent releases to the environment. Cover tanks and drip pans during inclement weather. Provide procedures and equipment to prevent overfilling of tanks. If tanks and containers with an aggregate aboveground capacity greater than 1,320 gallons will be used onsite (only containers with a capacity of 55 gallons or greater are counted), provide and implement a SPCC plan meeting the requirements of 40 CFR 112. Do not bring underground storage tanks to the installation for Contractor use during a project. Submit the SPCC plan to the Contracting Officer for approval.

Monitor and remove any rainwater that accumulates in open containment dikes or berms. Inspect the accumulated rainwater prior to draining from a containment dike to the environment, to determine there is no oil sheen present.

3.13 INADVERTENT DISCOVERY OF PETROLEUM-CONTAMINATED SOIL OR HAZARDOUS WASTES

If petroleum-contaminated soil, or suspected hazardous waste is found during construction that was not identified in the Contract documents, immediately notify the Contracting Officer. Do not disturb this material until authorized by the Contracting Officer.

3.14 CHLORDANE

Evaluate excess soils and concrete foundation debris generated during the demolition of housing units or other wooden structures for the presence of chlordane or other pesticides prior to reuse or final disposal.

3.15 SOUND INTRUSION

Make the maximum use of low-noise emission products, as certified by the EPA. Blasting or use of explosives are not permitted without written permission from the Contracting Officer, and then only during the designated times. Confine pile-driving operations to the period between 8 a.m. and 4 p.m., Monday through Friday, exclusive of holidays, unless otherwise specified.

Keep construction activities under surveillance and control to minimize environment damage by noise. Comply with the provisions of the State of Georgia rules.

3.16 POST CONSTRUCTION CLEANUP

Clean up areas used for construction in accordance with Contract Clause: "Cleaning Up". Unless otherwise instructed in writing by the Contracting Officer, remove traces of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. Grade parking area and similar temporarily used areas to conform with surrounding contours.

-- End of Section --

SECTION 01 58 00

PROJECT IDENTIFICATION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE)

EP 310-1-6a (2006; 2019 Change 2) Project Operation --
Sign Standards Manual, VOL 1

EP 310-1-6b (2006) Sign Standards Manual, VOL 2,
Appendices

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Sign Legend Orders; G

1.3 PROJECT IDENTIFICATION SIGN

Prior to initiating any work on site, provide one project identification sign at the location designated. Construct the sign in accordance with project sign detail, which can be downloaded at: <http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/forms-graphics-tables>. Maintain sign throughout the life of the project. Upon completion of the project, remove the sign from the site. Provide color rendering of the project. Reproduce the rendering on the signboard or enclose a copy of the rendering under a water-proof, transparent cover, and caulk for weather protection.

1.3.1 Construction Project Signs

Furnish the construction project sign package, maintain the signs during construction, and remove the signs from the job site upon completion of the project. The construction project sign package consists of two signs: One for project identification and the other to show the on-the-job safety performance of the Contractor. Ensure that the package conforms to the requirements of EP 310-1-6a and EP 310-1-6b, specifically Section 16. Submit the sign legend orders as described in Section 16 of EP 310-1-6a before erecting the signs.

SOF Military Working Dog Kennel
Hunter Army Airfield, Georgia

PN 69262

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 Co-mingle

The practice of placing unrelated materials together in a single container, usually for benefits of convenience and speed.

1.1.2 Construction Waste

Waste generated by construction activities, such as scrap materials, damaged or spoiled materials, temporary and expendable construction materials, and other waste generated by the workforce during construction activities.

1.1.3 Demolition Debris/Waste

Waste generated from demolition activities, including minor incidental demolition waste materials generated as a result of Intentional dismantling of all or portions of a building, to include clearing of building contents that have been destroyed or damaged.

1.1.4 Disposal

Depositing waste in a solid waste disposal facility, usually a managed landfill or incinerator, regulated in the US under the Resource Conservation and Recovery Act (RCRA).

1.1.5 Diversion

The practice of diverting waste from disposal in a landfill or incinerator, by means of eliminating or minimizing waste, or reuse of materials.

1.1.6 Final Construction Waste Diversion Report

A written assertion by a material recovery facility operator identifying constituent materials diverted from disposal, usually including summary tabulations of materials, weight in short-ton.

1.1.7 Recycling

The series of activities, including collection, separation, and processing, by which products or other materials are diverted from the solid waste stream for use in the form of raw materials in the manufacture of new products sold or distributed in commerce, or the reuse of such materials as substitutes for goods made of virgin materials, other than fuel.

1.1.1.8 Reuse

The use of a product or materials again for the same purpose, in its original form or with little enhancement or change.

1.1.1.9 Salvage

Usable, salable items derived from buildings undergoing demolition or deconstruction, parts from vehicles, machinery, other equipment, or other components.

1.1.1.10 Source Separation

The practice of administering and implementing a management strategy to identify and segregate unrelated waste at the first opportunity.

1.2 CONSTRUCTION WASTE (INCLUDES DEMOLITION DEBRIS/WASTE)

Divert a minimum of 60 percent by weight of the project construction waste and demolition debris/waste from the landfill or incinerator. Follow applicable industry standards in the management of waste. Apply sound environmental principles in the management of waste. (1) Practice efficient waste management when sizing, cutting, and installing products and materials and (2) use all reasonable means to divert construction waste and demolition debris/waste from landfills and incinerators and to facilitate the recycling or reuse of excess construction materials.

1.3 CONSTRUCTION WASTE MANAGEMENT

Implement a Construction Waste Management Program for the project. Take a pro-active, responsible role in the management of construction construction waste, recycling process, disposal of demolition debris/waste, and require all subcontractors, vendors, and suppliers to participate in the Construction Waste Management Program. Establish a process for clear tracking, and documentation of construction waste and demolition debris/waste.

1.3.1 Implementation of Construction Waste Management Program

Develop and document how the Construction Waste Management Program will be implemented in a Construction Waste Management Plan. Submit a Construction Waste Management Plan to the Contracting Officer for approval. Construction waste and demolition debris/waste materials include un-used construction materials not incorporated in the final work, as well as demolition debris/waste materials from demolition activities or deconstruction activities. In the management of waste, consider the availability of viable markets, the condition of materials, the ability to provide material in suitable condition and in a quantity acceptable to available markets, and time constraints imposed by internal project completion mandates.

1.3.2 Oversight

The Quality Control Manager, as specified in Section 01 45 00.00 10 QUALITY CONTROL, is responsible for overseeing and documenting results from executing the Construction Waste Management Plan for the project.

1.3.3 Special Programs

Implement special programs involving rebates or similar incentives related to recycling of construction waste and demolition debris/waste materials. Retain revenue or savings from salvaged or recycling, unless otherwise directed. Ensure firms and facilities used for recycling, reuse, and disposal are permitted for the intended use to the extent required by federal, state, and local regulations.

1.3.4 Special Instructions

Provide on-site instruction of appropriate separation, handling, recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the projects. Designation of single source separating or commingling will be clearly marked on the containers.

1.3.5 Waste Streams

Delineate waste streams and characterization, including estimated material types and quantities of waste, in the Construction Waste Management Plan. Manage all waste streams associated with the project. Typical waste streams are listed below. Include additional waste streams not listed:

- a. Land Clearing Debris
- b. Asphalt
- c. Masonry and CMU
- d. Concrete
- e. Metals (Includes, but is not limited to, banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized, stainless steel, aluminum, copper, zinc, bronze.)
- f. Wood (nails and staples allowed)
- g. Glass
- h. Paper
- i. Plastics (PET, HDPE, PVC, LDPE, PP, PS, Other)
- j. Gypsum
- k. Non-hazardous paint and paint cans
- l. Carpet
- m. Ceiling Tiles
- n. Insulation
- o. Beverage Containers

1.4 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for

information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Construction Waste Management Plan; G

SD-06 Test Reports

Quarterly Reports

Annual Report

SD-11 Closeout Submittals

Final Construction Waste Diversion Report

1.5 MEETINGS

Conduct Construction Waste Management meetings. After award of the Contract and prior to commencement of work, schedule and conduct a meeting with the Contracting Officer to discuss the proposed Construction Waste Management Plan and to develop a mutual understanding relative to the management of the Construction Waste Management Program and how waste diversion requirements will be met.

The requirements of this meeting may be fulfilled during the coordination and mutual Understanding meeting outlined in Section 01 45 00.00 10 QUALITY CONTROL. At a minimum, discuss and document waste management goals at following meetings:

- a. Preconstruction meeting.
- b. Regular site meetings.
- c. Work safety meeting (if applicable).

1.6 CONSTRUCTION WASTE MANAGEMENT PLAN

Submit Construction Waste Management Plan within 45 calendar days after contract award. Revise and resubmit Construction Waste Management Plan as necessary, in order for construction to begin. Submit Construction Waste Management Plan not less than 60 calendar days before scheduled final site or building design approval. Revise and resubmit Construction Waste Management Plan until it receives final approval from the Contracting Officer, in order for construction to begin. Execute demolition or deconstruction activities in accordance with Section 02 41 00 DEMOLITION. Manage demolition debris/waste or deconstruction materials in accordance with the approved construction waste management plan.

An approved Construction Waste Management Plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations or meeting project cumulative waste diversion requirement. Ensure all subcontractors receive a copy of the approved Construction Waste Management Plan. The plan demonstrates how to meet the project waste diversion requirement. Also, include the following in the plan:

- a. Identify the names of individuals responsible for waste management and waste management tracking, along with roles and responsibilities on the project..
- b. Actions that will be taken to reduce solid waste generation, including coordination with subcontractors to ensure awareness and participation.
- c. Description of the regular meetings to be held to address waste management.
- d. Description of the specific approaches to be used in recycling/reuse of the various materials generated, including the areas on site and equipment to be used for processing, sorting, and temporary storage of materials.
- e. Name of landfill and incinerator to be used.
- f. Identification of local and regional re-use programs, including non-profit organizations such as schools, local housing agencies, and organization that accept used materials such as material exchange networks and resale stores. Include the name, location, phone number for each re-use facility identified, and provide a copy of the permit or license for each facility.
- g. List of specific materials, by type and quantity, that will be salvaged for resale, salvaged and reused on the current project, salvaged and stored for reuse on a future project, or recycled. Identify the recycling facilities by name, address, and phone number.
- h. Identification of materials that cannot be recycled or reused with an explanation or justification, to be approved by the Contracting Officer.
- i. Description of the means by which materials identified in item (g) above will be protected from contamination.
- j. Description of the means of transportation of the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site).
- k. Copy of training plan for subcontractors and other services to prevent contamination by co-mingling materials identified for diversion and waste materials.

Distribute copies of the waste management plan to each subcontractor, Quality Control Manager, and the Contracting Officer.

1.7 RECORDS (DOCUMENTATION)

1.7.1 General

Maintain records to document the types and quantities of waste generated and diverted through re-use, recycling and sale to third parties; through disposal to a landfill or incinerator facility. Provide explanations for materials not recycled, reused or sold. Collect and retain manifests, weight tickets, sales receipts, and invoices specifically identifying diverted project waste materials or disposed materials.

1.7.2 Accumulated

Maintain a running record of materials generated and diverted from landfill disposal, including accumulated diversion rates for the project. Make records available to the Contracting Officer during construction or incidental demolition activities. Provide a copy of the diversion records to the Contracting Officer upon completion of the construction, incidental demolitions or minor deconstruction activities.

1.8 REPORTS

1.8.1 General

Maintain current construction waste diversion information on site for periodic inspection by the Contracting Officer. Include in the quarterly reports, annual reports and final reports: the project name, contract information, information for waste generated, diverted and disposed of for the current reporting period and show cumulative totals for the project. Reports must identify quantities of waste by type and disposal method. Also include in each report, supporting documentation to include manifests, weigh tickets, receipts, and invoices specifically identifying the project and waste material type and weighted sum.

1.8.2 Quarterly Reporting

Provide cumulative reports at the end of each quarter (December, March, June, and September, corresponding with the federal fiscal year for reporting purposes). Submit quarterly reports not later than 15 calendar days after the preceding quarter has ended.

1.8.3 Annual Reporting

Provide a cumulative construction waste diversion report annually. Submit annual report not later than 30 calendar days after the preceding fourth quarter has ended.

1.9 FINAL CONSTRUCTION WASTE DIVERSION REPORT

A Final Construction Waste Diversion Report is required at the end of the project. Provide Final Construction Waste Diversion Report 60 days prior to the Beneficial Occupancy Date (BOD).

1.10 COLLECTION

Collect, store, protect, and handle reusable and recyclable materials at the site in a manner which prevents contamination, and provides protection from the elements to preserve their usefulness and monetary value. Provide receptacles and storage areas designated specifically for recyclable and reusable materials and label them clearly and appropriately to prevent contamination from other waste materials. Keep receptacles or storage areas neat and clean.

Train subcontractors and other service providers to either separate waste streams or use the co-mingling method as described in the Construction Waste Management Plan. Handle hazardous waste and hazardous materials in accordance with applicable regulations and coordinate with Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS. Separate materials by one of the following methods described herein:

1.10.1 Source Separation Method

Separate waste products and materials that are recyclable from trash and sort as described below into appropriately marked separate containers and then transport to the respective recycling facility for further processing. Deliver materials in accordance with recycling or reuse facility requirements (e.g., free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process). Separate materials into the category types as defined in the Construction Waste Management Plan.

1.10.2 Other Methods

Other methods proposed by the Contractor may be used when approved by the Contracting Officer.

1.11 DISPOSAL

Control accumulation of waste materials and trash. Recycle or dispose of collected materials off-site at intervals approved by the Contracting Officer and in compliance with waste management procedures as described in the waste management plan. Except as otherwise specified in other sections of the specifications, dispose of in accordance with the following:

1.11.1 Reuse

Give first consideration to reusing construction and demolition materials as a disposition strategy. Recover for reuse materials, products, and components as described in the approved Construction Waste Management Plan. Coordinate with the Contracting Officer to identify onsite reuse opportunities or material sales or donation available through Government resale or donation programs. Sale of recovered materials is not allowed on the Installation. Consider the use of surplus industrial supply broker services, who match entities with reusable or repurpose industrial materials with entities with need of such materials.

1.11.2 Recycle

Recycle non-hazardous construction and demolition/debris materials that are not suitable for reuse. Track rejection of contaminated recyclable materials by the recycling facility. Rejected recyclables materials will not be counted as a percentage of diversion calculation. Recycle all fluorescent lamps, HID lamps, mercury (Hg) -containing thermostats and ampoules, and PCBs-containing ballasts and electrical components as directed by the Contracting Officer. Do not crush lamps on site as this creates a hazardous waste stream with additional handling requirements.

1.11.3 Waste

Dispose by landfill or incineration only those waste materials with no practical use, economic benefit, or recycling opportunity.

PART 2 PRODUCTS

Not used.

SOF Military Working Dog Kennel
Hunter Army Airfield, Georgia

PN 69262

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 78 00

CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM E1971	(2005; R 2011) Standard Guide for Stewardship for the Cleaning of Commercial and Institutional Buildings

GREEN SEAL (GS)

GS-37	(2017) Cleaning Products for Industrial and Institutional Use

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 1110-1-2909	(2012) Engineering and Design -- Geospatial Data and Systems
ERDC/ITL TR-12-1	(2015) A/E/C Graphics Standard, Release 2.0
ERDC/ITL TR-12-6	(2015) A/E/C CAD Standard - Release 6.0

U.S. DEPARTMENT OF DEFENSE (DOD)

FC 1-300-09N	(2014; with Change 4, 2018) Navy and Marine Corps Design

1.2 DEFINITIONS

1.2.1 As-Built Drawings

As-built drawings are the marked-up drawings, maintained by the Contractor on-site, that depict actual conditions and deviations from the Contract Documents. These deviations and additions may result from coordination required by, but not limited to: Contract modifications; official responses to submitted Requests for Information (RFI's); direction from the Contracting Officer; design that is the responsibility of the Contractor, and differing site conditions. Maintain the as-builts throughout construction as red-lined PDF files. These files serve as the basis for the creation of the record drawings.

1.2.2 Record Drawings

The record drawings are the final compilation of actual conditions reflected in the as-built drawings.

Produce the record drawings from the Record Model(s) and do not include annotations indicating revisions.

1.2.3 Record Model

A model reflecting approved changes during construction including red-lines, requests for information (RFI's), and contract modifications. Include updated construction phase facility/site data for components.

1.2.4 Advanced Modeling

A subset of geospatial technologies as defined in EM 1110-1-2909 to include Building Information Modeling (BIM), Civil Information Modeling (CIM), Geographic Information Systems (GIS), and Computer-Aided Design (CAD). Advanced modeling is comprised of models and drawings that form a digital representation of the project, or part thereof, that are comprised of model elements with facility data.

1.2.5 USACE CAD/BIM Technology Center

The USACE CAD/BIM Technology Center hosts all standard content for USACE. This content can be accessed through the CAD/BIM Technology Center website, <https://cadbimcenter.erdc.dren.mil/>.

1.3 SOURCE DRAWING FILES

Request the full set of electronic drawings, in the source format, for Record Drawing preparation, after award and at least 30 days prior to required use.

1.3.1 Terms and Conditions

Data contained on these electronic files must not be used for any purpose other than as a convenience in the preparation of construction drawings and data for the referenced project. Any other use or reuse shall be at the sole risk of the Contractor and without liability or legal exposure to the Government. The Contractor must make no claim and waives to the fullest extent permitted by law, any claim or cause of action of any nature against the Government, its agents or sub consultants that may arise out of or in connection with the use of these electronic files. The Contractor must, to the fullest extent permitted by law, indemnify and hold the Government harmless against all damages, liabilities or costs, including reasonable attorney's fees and defense costs, arising out of or resulting from the use of these electronic files.

These electronic CAD drawing files are not construction documents. Differences may exist between the CAD files and the corresponding construction documents. The Government makes no representation regarding the accuracy or completeness of the electronic CAD files, nor does it make representation to the compatibility of these files with the Contractor hardware or software. In the event that a conflict arises between the signed and sealed construction documents prepared by the Government and the furnished Source drawing files, the signed and sealed construction documents govern. The Contractor is responsible for determining if any conflict exists. Use of these Source Drawing files does not relieve the Contractor of duty to fully comply with the contract documents, including and without limitation, the need to check, confirm and coordinate the work of all contractors for the project. If the Contractor uses, duplicates or modifies these electronic source drawing files for use in producing

construction drawings and data related to this contract, remove all previous indicia of ownership (seals, logos, signatures, initials and dates).

1.4 RECORD DRAWINGS

The Government will provide pdf and or program files at the preconstruction conference that contains one set of "as-designed" electronic CAD files in the specified software and format revised to reflect all amendments and the final contract PDF drawings. The CAD files are provided to enable preparation of as-built or as-constructed drawings. If discrepancies exist between the CAD files and the contract PDF drawings, correct the CAD files to show the contract PDF drawings.

1.4.1 Variation with Contract Drawings

The electronic files provided are not part of the contract documents. If there is any discrepancy between the electronic files and the contract drawings, the contract drawings govern. The Government has no responsibility to modify any GFM due to changes in the design that occur after award.

Evaluate the content and quality of the GFM upon receipt. If major discrepancies or omissions occur in the GFM, notify the Contracting Officer and indicate the nature of such variations.

1.4.2 Data Loss, Corruption, and Error

Transfer of GFM files may result in corrupted files resulting in data loss and errors. Use of GFM files at own risk. Verify data integrity upon receipt and request a replacement if necessary. Make any adjustment in file structure, format, or software version as needed to make GFM compatible with computer systems and/or software to meet the requirements of the contract.

1.4.3 Modeling Completeness and Quality

The Government makes no guarantee that the GFM provide the level of completeness or quality as required by the contract. Further, the Government makes no guarantee that identified variations will be corrected upon notification.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Warranty Management Plan

Warranty Tags

Final Cleaning

Spare Parts Data

SD-08 Manufacturer's Instructions

Posted Instructions

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals; G

SD-11 Closeout Submittals

As-Built Drawings; G

Record Drawings; G

Record Model; G

As-Built Record of Equipment and Materials

Construction Contract Specifications; G

Certification of EPA Designated Items; G

Certification Of USDA Designated Items; G

1.6 SPARE PARTS DATA

Submit two copies of the Spare Parts Data list.

- a. Indicate manufacturer's name, part number, and stock level required for test and balance, pre-commissioning, maintenance and repair activities. List those items that may be standard to the normal maintenance of the system.
- b. At acceptance of commissioning, ensure the required stock level is supplied as indicated in subparagraph a for maintenance and repair activities through the facilities warranty period. Provision of spare parts does not relieve the Contractor of responsibilities listed under the contract guarantee provisions.

1.7 QUALITY CONTROL

Additions and corrections to the contract drawings must be equal in quality and detail to that of the originals. Line colors, line weights, lettering, layering conventions, and symbols must be the same as the original line colors, line weights, lettering, layering conventions, and symbols.

1.8 WARRANTY MANAGEMENT

1.8.1 Warranty Management Plan

Develop a warranty management plan which contains information relevant to FAR 52.246-21 Warranty of Construction. At least 30 days before the planned pre-warranty conference, submit one set of the warranty management plan. Include within the warranty management plan all required actions and documents to assure that the Government receives all warranties to which it is entitled. The plan narrative must contain sufficient detail

to render it suitable for use by future maintenance and repair personnel, whether tradesmen, or of engineering background, not necessarily familiar with this contract. The term "status" as indicated below must include due date and whether item has been submitted or was accomplished. Submit warranty information, made available during the construction phase, to the Contracting Officer for approval prior to each monthly pay estimate. Assemble approved information in a binder and turn over to the Government upon acceptance of the work. The construction warranty period must begin on the date of project acceptance and continue for the full product warranty period. Conduct a joint 4 month and 9 month warranty inspection, measured from time of acceptance; with the Contractor, Contracting Officer and the Customer Representative. The warranty management plan must include, but is not limited to, the following:

- a. Roles and responsibilities of personnel associated with the warranty process, including points of contact and telephone numbers within the organizations of the Contractors, subcontractors, manufacturers or suppliers involved.
- b. For each warranty, the name, address, telephone number, and e-mail of each of the guarantor's representatives nearest to the project location.
- c. A list and status of delivery of Certificates of Warranty for extended warranty items, including roofs, HVAC balancing, pumps, motors, transformers, and for commissioned systems, such as fire protection and alarm systems, sprinkler systems, and lightning protection systems.
- d. As-Built Record of Equipment and Materials list for each warranted equipment, item, feature of construction or system indicating:
 - (1) Name of item.
 - (2) Model and serial numbers.
 - (3) Location where installed.
 - (4) Name and phone numbers of manufacturers or suppliers.
 - (5) Names, addresses and telephone numbers of sources of spare parts.
 - (6) Warranties and terms of warranty. Include one-year overall warranty of construction, including the starting date of warranty of construction. Items which have warranties longer than one year must be indicated with separate warranty expiration dates.
 - (7) Cross-reference to warranty certificates as applicable.
 - (8) Starting point and duration of warranty period.
 - (9) Summary of maintenance procedures required to continue the warranty in force.
 - (10) Cross-reference to specific pertinent Operation and Maintenance manuals.
 - (11) Organization, names and phone numbers of persons to call for warranty service.
 - (12) Typical response time and repair time expected for various warranted equipment.
- e. The plans for attendance at the 4 and 9 month post-construction warranty inspections conducted by the Government.
- f. Procedure and status of tagging of equipment covered by warranties longer than one year.
- g. Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty or safety reasons.

1.8.2 Performance Bond

The Performance Bond must remain effective throughout the construction and warranty period.

- a. In the event the Contractor fails to commence and diligently pursue any construction warranty work required, the Contracting Officer will have the work performed by others, and after completion of the work, will charge the remaining construction warranty funds of expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.
- b. In the event sufficient funds are not available to cover the construction warranty work performed by the Government at the Contractor's expense, the Contracting Officer will have the right to recoup expenses from the bonding company.
- c. Following oral or written notification of required construction warranty repair work, respond in a timely manner. Written verification will follow oral instructions. Failure to respond will be cause for the Contracting Officer to proceed against the Contractor.

1.8.3 Pre-Warranty Conference

Prior to contract completion, and at a time designated by the Contracting Officer, meet with the Contracting Officer to develop a mutual understanding with respect to the requirements of this section. At this meeting, establish and review communication procedures for Contractor notification of construction warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Contracting Officer for the execution of the construction warranty. In connection with these requirements and at the time of the Contractor's quality control completion inspection, furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue construction warranty work action on behalf of the Contractor. This point of contact must be located within the local service area of the warranted construction, be continuously available, and be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of its responsibilities in connection with other portions of this provision.

1.8.4 Contractor's Response to Construction Warranty Service Requirements

Following oral or written notification by the Contracting Officer, respond to construction warranty service requirements in accordance with the "Construction Warranty Service Priority List" and the three categories of priorities listed below. Submit a report on any warranty item that has been repaired during the warranty period. Include within the report the cause of the problem, date reported, corrective action taken, and when the repair was completed. If the Contractor does not perform the construction warranty within the timeframe specified, the Government will perform the work and back charge the construction warranty payment item established.

- a. First Priority Code 1. Perform onsite inspection to evaluate situation, and determine course of action within 4 hours, initiate work within 6 hours and work continuously to completion or relief.

- b. Second Priority Code 2. Perform onsite inspection to evaluate situation, and determine course of action within 8 hours, initiate work within 24 hours and work continuously to completion or relief.
- c. Third Priority Code 3. All other work to be initiated within 3 work days and work continuously to completion or relief.
- d. The "Construction Warranty Service Priority List" is as follows:

Code 1-Life Safety Systems

- (1) Fire suppression systems.
- (2) Fire alarm system(s) in place in the building.

Code 1-Air Conditioning Systems

- (1) Recreational support.
- (2) Air conditioning leak in part of building, if causing damage.
- (3) Air conditioning system not cooling properly.

Code 1-Doors

- (1) Overhead doors not operational, causing a security, fire, or safety problem.
- (2) Interior, exterior personnel doors or hardware, not functioning properly, causing a security, fire, or safety problem.

Code 3-Doors

- (1) Overhead doors not operational.
- (2) Interior/exterior personnel doors or hardware not functioning properly.

Code 1-Electrical

- (1) Power failure (entire area or any building operational after 1600 hours).
- (2) Security lights
- (3) Smoke detectors

Code 2-Electrical

- (1) Power failure (no power to a room or part of building).
- (2) Receptacle and lights (in a room or part of building).

Code 3-Electrical

Street lights.

Code 1-Gas

- (1) Leaks and breaks.
- (2) No gas to family housing unit or cantonment area.

Code 1-Heat

- (1) Area power failure affecting heat.
- (2) Heater in unit not working.

Code 2-Kitchen Equipment

- (1) Dishwasher not operating properly.
- (2) All other equipment hampering preparation of a meal.

Code 1-Plumbing

- (1) Hot water heater failure.
- (2) Leaking water supply pipes.

Code 2-Plumbing

- (1) Flush valves not operating properly.
- (2) Fixture drain, supply line to commode, or any water pipe leaking.
- (3) Commode leaking at base.

Code 3-Plumbing
Leaky faucets.

Code 3-Interior
(1) Floors damaged.
(2) Paint chipping or peeling.
(3) Casework.

Code 1-Roof Leaks
Temporary repairs will be made where major damage to property is occurring.

Code 2-Roof Leaks
Where major damage to property is not occurring, check for location of leak during rain and complete repairs on a Code 2 basis.

Code 2-Water (Exterior)
No water to facility.

Code 2-Water (Hot)
No hot water in portion of building listed.

Code 3-All other work not listed above.

1.8.5 Warranty Tags

At the time of installation, tag each warranted item with a durable, oil and water resistant tag approved by the Contracting Officer. Attach each tag with a copper wire and spray with a silicone waterproof coating. Also, submit two record copies of the warranty tags showing the layout and design. The date of acceptance and the QC signature must remain blank until the project is accepted for beneficial occupancy. Show the following information on the tag.

Type of product/material	
Model number	
Serial number	
Contract number	
Warranty period from/to	
Inspector's signature	
Construction Contractor	

Address	
Telephone number	
Warranty contact	
Address	
Telephone number	
Warranty response time priority code	
WARNING - PROJECT PERSONNEL TO PERFORM ONLY OPERATIONAL MAINTENANCE DURING THE WARRANTY PERIOD.	

PART 2 PRODUCTS

2.1 RECORD DRAWINGS

Prepare the CAD drawing files in AutoCAD Release 2013 format compatible with a Windows 7 operating system. As-builts shall be in accordance with Attachment 1 - FSGA DPW Master Planning Branch Digital Data Requirements.

2.1.1 Additional Drawings

If additional drawings are required, prepare them using the specified electronic file format applying the same graphic standards specified for original drawings. The title block and drawing border to be used for any new final record drawings must be identical to that used on the contract drawings.

2.1.1.1 Sheet Numbers and File Names

If a sheet needs to be added between two sequential sheets, append a Supplemental Drawing Designator in accordance with ERDC/ITL TR-12-6 Adding a drawing sheet, and ERDC/ITL TR-12-1 Adding or deleting drawing sheets and index sheet procedures.

2.2 ADVANCED MODELING PACKAGE

For each Advanced Modeling Package submittal for both the Interim Record Model Package and the Final Record Model Package, submit in accordance with ERDC/ITL TR-12-6 and also provide the following items:

- a. Advanced Modeling PxP: Provide an electronic copy of the most current approved version of the project Advanced Modeling PxP.
- b. Electronic Files: Provide an electronic list (.txt file or similar), of all submitted electronic files including a description, directory, and file name for each file submitted. Identify which files have been produced from the Model and Facility Data. For all sheet files, include a list of the sheet titles and sheet numbers.
- c. Advanced Modeling Submittal Checklist: Complete the USACE BIM/CIM

Advanced Modeling Submittal Checklist and include with each submittal. Download the Checklist from the USACE CAD/BIM Technology Center website.

- d. Advanced Modeling Files: Provide all native Advanced Modeling files associated with the production of the contract drawings and associated as-modeled drawings. Update and maintain in compliance with the Advanced Modeling formatting, content requirement, and standards in order to yield a complete and coordinated document package.
- e. Quality Control (QC) Reports: Provide electronic PDFs of all QC reports and checklist utilized to ensure full compliance with the contract requirements and standards.

2.3 CERTIFICATION OF EPA DESIGNATED ITEMS

Submit the Certification of EPA Designated Items as required by FAR 52.223-9 Estimate of Percentage of Recovered Material Content for EPA Designated Items and FAR 52-223-17 Affirmative Procurement of EPA designated items in Service and Construction Contracts. Include on the certification form the following information: Project name, project number, Contractor name, license number, Contractor address, and certification. The certification will read as follows and be signed and dated by the Contractor. "I hereby certify the information provided herein is accurate and that the requisition/procurement of all materials listed on this form comply with current EPA standards for recycled/recovered materials content. The following exemptions may apply to the non-procurement of recycled/recovered content materials:

- a. The product does not meet appropriate performance standards;
- b. The product is not available within a reasonable time frame;
- c. The product is not available competitively (from two or more sources);
- d. The product is only available at an unreasonable price (compared with a comparable non-recycled content product)."

Record each product used in the project that has a requirement or option of containing recycled content in accordance with SECTION 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING, noting total price, total value of post-industrial recycled content, total value of post-consumer recycled content, exemptions (a, b, c, or d, as indicated), and comments. Recycled content values may be determined by weight or volume percent, but must be consistent throughout.

2.4 CERTIFICATION OF USDA DESIGNATED ITEMS

Submit the Certification of USDA Designated Items as required by FAR 52-223-1 Bio-based Product Certifications and FAR 52.223-2 Affirmative Procurement of Biobased Products Under Service and Construction Contracts. Include on the certification form the following information: Project name, project number, Contractor name, license number, Contractor address, and certification. The certification will read as follows and be signed and dated by the Contractor. "I hereby certify the information provided herein is accurate and that the requisition/procurement of all materials listed on this form comply with current USDA standards for biobased materials content. The following exemptions may apply to the non-procurement of biobased content materials:

- a. The product does not meet appropriate performance standards;
- b. The product is not available within a reasonable time frame;
- c. The product is not available competitively (from two or more sources);
- d. The product is only available at an unreasonable price (compared with a comparable bio-based content product)."

Record each product used in the project that has a requirement or option of containing biobased content in accordance with SECTION 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING, noting total price, total value of post-industrial recycled content, total value of post-consumer recycled content, exemptions (a, b, c, or d, as indicated), and comments. Biobased content values may be determined by weight or volume percent, but must be consistent throughout.

2.5 PDF AS-BUILT FILES

Provide electronic PDF "plots" of all contract drawings sheets associated with the as-built drawing submittal. Compile and organize the PDF set to match the contract drawings. Bookmark and label the pages of the PDF file.

2.6 REDLINES AND MARKUPS

Provide PDFs of the current working redlines and/or markups complying with the as-builts drawing and markup requirements contained in this specification.

2.7 GEO-DATA-BASE FILES

Provide a SDSFIE/FGDC GeoReferenced personal GeoDataBase. For all information outside of the building walls, provide a personal GeoDataBase in .mdb format using the latest version of Spatial Data Standard for Facilities, Infrastructure, and Environment (SDSFIE) as the database structure. Provide a shell database to define the projection and database structure.

For all drawings within and including the exterior walls, utilize the advanced modeling formats described and referenced herein. Provide a short GeoDataBase read-me file explaining the deliverable. The read-me file will include a description of the software used to create the data, projection, and include the attribute tables used.

2.8 AS-BUILT OR ADVANCED MODELING RE-SUBMISSION REQUIREMENTS

If elements of an as-built submittal or advanced modeling package are rejected, provide the following for each re-submission, in addition to any information required in Section 01 33 00 SUBMITTAL PROCEDURES:

- a. Re-submit all components required under paragraph As-Builts or Advanced Modeling Package, including a new Advanced Modeling Submittal Checklist and updated content in response to Government comments.
- b. Provide a copy of all Government review comments.
- c. Provide a disposition/response to each Government review comment for a back-check of the re-submission deliverable.

PART 3 EXECUTION

3.1 AS-BUILT DRAWINGS

Provide and maintain two black line print copies of the PDF contract drawings for As-Built Drawings. Maintain the as-builts throughout construction as red-lined hard copies on site and red-lined PDF files. Submit As-Built Drawings 30 days prior to Beneficial Occupancy Date (BOD).

3.1.1 Markup Guidelines

Make comments and markup the drawings complete without reference to letters, memos, or materials that are not part of the As-Built drawing. Show what was changed, how it was changed, where item(s) were relocated and change related details. These working as-built markup prints must be neat, legible and accurate as follows:

- a. Use base colors of red, green, and blue. Color code for changes as follows:
 - (1) Special (Blue) - Items requiring special information, coordination, or special detailing or detailing notes.
 - (2) Deletions (Red) - Over-strike deleted graphic items (lines), lettering in notes and leaders.
 - (3) Additions (Green) - Added items, lettering in notes and leaders.
- b. Provide a legend if colors other than the "base" colors of red, green, and blue are used.
- c. Add and denote any additional equipment or material facilities, service lines, incorporated under As-Built Revisions if not already shown in legend.
- d. Use frequent written explanations on markup drawings to describe changes. Do not totally rely on graphic means to convey the revision.
- e. Use legible lettering and precise and clear digital values when marking prints. Clarify ambiguities concerning the nature and application of change involved.
- f. Wherever a revision is made, also make changes to related section views, details, legend, profiles, plans and elevation views, schedules, notes and call out designations, and mark accordingly to avoid conflicting data on all other sheets.
- g. For deletions, cross out all features, data and captions that relate to that revision.
- h. For changes on small-scale drawings and in restricted areas, provide large-scale inserts, with leaders to the applicable location.
- i. Indicate one of the following when attaching a print or sketch to a markup print:
 - (1) Add an entire drawing to contract drawings

(2) Change the contract drawing to show

(3) Provided for reference only to further detail the initial design.

j. Incorporate all shop and fabrication drawings into the markup drawings.

3.1.2 As-Built Drawings Content

Revise red-lined PDF files in accordance with ERDC/ITL TR-12-1. Keep these working as-built markup drawings current on a weekly basis and at least one set available on the job site at all times. Changes from the contract drawings which are made during construction or additional information which might be uncovered in the course of construction must be accurately and neatly recorded as they occur by means of details and notes. Submit the working as-built markup drawings for approval prior to submission of each monthly pay estimate. For failure to maintain the working and final record drawings as specified herein, the Contracting Officer will withhold 10 percent of the monthly progress payment until approval of updated drawings. Show on the as-built drawings, but not limited to, the following information:

- a. The actual location, kinds and sizes of all sub-surface utility lines. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, show by offset dimensions to two permanently fixed surface features the end of each run including each change in direction on the record drawings. Locate valves, splice boxes and similar appurtenances by dimensioning along the utility run from a reference point. Also record the average depth below the surface of each run.
- b. The location and dimensions of any changes within the building structure.
- c. Layout and schematic drawings of electrical circuits and piping.
- d. Correct grade, elevations, cross section, or alignment of roads, earthwork, structures or utilities if any changes were made from contract plans.
- e. Changes in details of design or additional information obtained from working drawings specified to be prepared or furnished by the Contractor; including but not limited to shop drawings, fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment, and foundations.
- f. The topography, invert elevations and grades of drainage installed or affected as part of the project construction.
- g. Changes or Revisions which result from the final inspection.
- h. Where contract drawings or specifications present options, show only the option selected for construction on the working as-built markup drawings.
- i. If borrow material for this project is from sources on Government property, or if Government property is used as a spoil area, furnish a contour map of the final borrow pit/spoil area elevations.

- j. Systems designed or enhanced by the Contractor, such as HVAC controls, fire alarm, fire sprinkler, and irrigation systems.
- k. Changes in location of equipment and architectural features.
- l. Modifications and compliance with FC 1-300-09N procedures.
- m. Actual location of anchors, construction and control joints, etc., in concrete.
- n. Unusual or uncharted obstructions that are encountered in the contract work area during construction.
- o. Location, extent, thickness, and size of stone protection particularly where it will be normally submerged by water.

3.2 RECORD DRAWING FILES

If additional drawings are required, prepare them using the specified electronic file format applying the same graphic standards specified for original drawings. The title block and drawing border to be used for any new final record drawings must be identical to that used on the contract drawings. Accomplish additions and corrections to the contract drawings using CAD files. Provide all program files and hardware necessary to prepare final PDF record drawings. The Contracting Officer will review final PDF record drawings for accuracy and return them to the Contractor for required corrections, changes, additions, and deletions.

3.2.1 Rename the CAD Drawing files

Rename the CAD Drawing files using the contract number as the Project Code field, (e.g., W91238-15-C-10A-102.DWGDGN) as instructed in the Pre-Construction conference. Use only those renamed files for the Marked-up changes. Make all changes on the layer/level as the original item.

- a. For AutoCAD files (DWG), enter all as-built delta changes and notations on the AS-BUILT layer. MicroStation files (DGN), enter all as-built delta changes and notations on:
 - Level #63
 - Level/Layer Name contains: ANNO-REVS
 - Level/Layer Description: Revisions
- b. When final revisions have been completed, show the wording "RECORD DRAWING AS-BUILTS" followed by the name of the Contractor in letters at least 3/16 inch high on the cover sheet drawing. Date RECORD DRAWING AS-BUILTS" drawing revisions in the revision block.
- c. Within 20 days after Government approval of all of the working record drawings for a phase of work, prepare the final CAD record drawings for that phase of work and submit PDF drawing files and two sets of prints for review and approval. The Government will promptly return one set of prints annotated with any necessary corrections. Within 10 days revise the CAD files accordingly at no additional cost and submit one set of final prints for the completed phase of work to the Government. Within 20 days of substantial completion of all phases of work, submit the final record drawing package for the entire project. Submit one set of electronic CAD files, and one set of the approved

working record PDF and or programfiles with two sets of prints. The CAD files must be complete in all details and identical in form and function to the CAD drawing files supplied by the Government. Prepare AutoCAD files for transmittal using e-Transmit. Make any transactions or adjustments necessary to accomplish this. The Government reserves the right to reject any drawing files it deems incompatible with the customer's CAD system. Paper prints, drawing files and storage media submitted will become the property of the Government upon final approval. Failure to submit final record PDF drawing files, CAD files and marked prints as specified will be cause for withholding any payment due under this contract. Approval and acceptance of final record drawings must be accomplished before final payment is made.

3.3 RECORD DRAWINGS

Prepare final record drawings after the completion of each definable phase of work as listed in the Contractor Quality Control Plan (such as Foundations, Utilities, or Structural Steel as appropriate for the project). Transfer the changes from the approved working as-built markup drawings to the original electronic CAD drawing files. Modify the as-built CAD drawing files to correctly show the features of the project as-built by bringing the working CAD drawing set into agreement with approved working as-built markup drawings, and adding such additional drawings as may be necessary. Refer to ERDC/ITL TR-12-1. Jointly review the working as-built markup drawings with printouts from working as-built CAD drawing PDF files for accuracy and completeness. Monthly review of working as-built CAD drawing PDF file printouts must cover all sheets revised since the previous review. These PDF drawing files are part of the permanent records of this project. Any drawings damaged or lost must be satisfactorily replaced at no expense to the Government.

Drawing revisions (include within change order price the cost to change working and final record drawings to reflect revisions) and compliance with the following procedures.

- a. Follow directions in the revision for posting descriptive changes.
- b. The revision delta size must be 5/16 inch unless the area where the delta is to be placed is crowded. Use a smaller size delta for crowded areas.
- c. Place a revision delta at the location of each deletion.
- d. For new details or sections which are added to a drawing, place a revision delta by the detail or section title.
- e. For minor changes, place a revision delta by the area changed on the drawing (each location).
- f. For major changes to a drawing, place a revision delta by the title of the affected plan, section, or detail at each location.
- g. For changes to schedules or drawings, place a revision delta either by the schedule heading or by the change in the schedule.

3.3.1 Final Record Drawing Package

Submit the final record PDF and CAD drawings package for the entire project within 20 days of substantial completion of all phases of work.

Submit one set of ANSI D size PDF and CAD files, two sets of ANSI D size prints and one set of the approved working record drawings. The package must be complete in all details and identical in form and function to the contract drawing files supplied by the Government.

3.4 CONSTRUCTION CONTRACT SPECIFICATIONS

Submit final PDF file record construction contract specifications, including revisions thereto, 30 days after transfer of the completed facility.

3.5 AS-BUILT RECORD OF EQUIPMENT AND MATERIALS

Furnish one copy of preliminary record of equipment and materials used on the project 15 days prior to final inspection. This preliminary submittal will be reviewed and returned 2 days after final inspection with Government comments. Submit two sets of final record of equipment and materials 10 days after final inspection. Key the designations to the related area depicted on the contract drawings. List the following data:

RECORD OF DESIGNATED EQUIPMENT AND MATERIALS DATA				
Description	Specification Section	Manufacturer and Catalog, Model, and Serial Number	Composition and Size	Where Used

3.6 OPERATION AND MAINTENANCE MANUALS

Provide project operation and maintenance manuals as specified in Section 01 78 23 OPERATION AND MAINTENANCE DATA. Provide four electronic copies of the Operation and Maintenance Manual files and one hard copy of the Operation and Maintenance Manuals. Submit to the Contracting Officer for approval within 30 calendar days of the Beneficial Occupancy Date (BOD). Update and resubmit files for final approval at BOD.

3.7 CLEANUP

Provide final cleaning in accordance with ASTM E1971 and submit two copies of the listing of completed final clean-up items. Leave premises "broom clean." Comply with GS-37 for general purpose cleaning and bathroom cleaning. Use only nonhazardous cleaning materials, including natural cleaning materials, in the final cleanup. Clean interior and exterior glass surfaces exposed to view; remove temporary labels, stains and foreign substances; polish transparent and glossy surfaces; vacuum carpeted and soft surfaces. Clean equipment and fixtures to a sanitary condition. Replace filters of operating equipment and comply with the Indoor Air Quality (IAQ) Management Plan. Clean debris from roofs, gutters, downspouts and drainage systems. Sweep paved areas and rake clean landscaped areas. Remove waste and surplus materials, rubbish and construction facilities from the site. Recycle, salvage, and return construction and demolition waste from project in accordance with Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS and 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

SOF Military Working Dog Kennel
Hunter Army Airfield, Georgia

PN 69262

-- End of Section --

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SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-10 Operation and Maintenance Data

O&M Database; G

Training Plan; G

Training Outline; G

Training Content; G

SD-11 Closeout Submittals

Training Video Recording; G

Validation of Training Completion; G

1.2 OPERATION AND MAINTENANCE DATA

Submit Operation and Maintenance (O&M) Data for the provided equipment, product, or system, defining the importance of system interactions, troubleshooting, and long-term preventive operation and maintenance. Compile, prepare, and aggregate O&M data to include clarifying and updating the original sequences of operation to as-built conditions. Organize and present information in sufficient detail to clearly explain O&M requirements at the system, equipment, component, and subassembly level. Include an index preceding each submittal. Submit in accordance with this section and Section 01 33 00 SUBMITTAL PROCEDURES.

1.2.1 Package Quality

Documents must be fully legible. Operation and Maintenance data must be consistent with the manufacturer's standard brochures, schematics, printed instructions, general operating procedures, and safety precautions.

1.2.2 Package Content

Provide data package content in accordance with paragraph SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES. Comply with the data package requirements specified in the individual technical sections, including the content of the packages and addressing each product, component, and system designated for data package submission, except as follows. Use Data Package 4 for commissioned items without a specified data package requirement in the individual technical sections. Provide a Data Package 3 instead of Data Package 1 or 2, as specified in the individual technical

section, for items that are commissioned.

1.2.3 Changes to Submittals

Provide manufacturer-originated changes or revisions to submitted data if a component of an item is so affected subsequent to acceptance of the O&M Data. Submit changes, additions, or revisions required by the Contracting Officer for final acceptance of submitted data within 30 calendar days of the notification of this change requirement.

1.2.4 Commissioning Authority Review and Approval

Submit the commissioned systems and equipment submittals to the Commissioning Authority (CxA) to review for completeness and applicability. Obtain validation from the CxA that the systems and equipment provided meet the requirements of the Contract documents and design intent, particularly as they relate to functionality, energy performance, water performance, maintainability, sustainability, system cost, indoor environmental quality, and local environmental impacts. The CxA communicates deficiencies to the Contracting Officer. Submit the O&M manuals to the Contracting Officer upon a successful review of the corrections, and with the CxA recommendation for approval and acceptance of these O&M manuals. This work is in addition to the normal review procedures for O&M data.

1.3 O&M DATABASE

Develop an editable, electronic spreadsheet based on the equipment in the Operation and Maintenance Manuals that contains the information required to start a preventive maintenance program. As a minimum, provide list of system equipment, location installed, warranty expiration date, manufacturer, model, and serial number.

1.4 OPERATION AND MAINTENANCE MANUAL FILE FORMAT

Assemble data packages into electronic Operation and Maintenance Manuals. Assemble each manual into a composite electronically indexed file using the most current version of Adobe Acrobat or similar software capable of producing PDF file format. Provide compact disks (CD) or data digital versatile disk (DVD) as appropriate, so that each one contains operation, maintenance and record files, project record documents, and training videos. Include a complete electronically linked operation and maintenance directory.

1.4.1 Organization

Bookmark Product and Drawing Information documents using the current version of CSI MasterFormat numbering system, and arrange submittals using the specification sections as a structure. Use CSI MasterFormat and UFGS numbers along with descriptive bookmarked titles that explain the content of the information that is being bookmarked.

1.4.2 CD or DVD Label and Disk Holder or Case

Provide the following information on the disk label and disk holder or case:

- a. Building Number

- b. Project Title
- c. Activity and Location
- d. Construction Contract Number
- e. Prepared For: (Contracting Agency)
- f. Prepared By: (Name, title, phone number and email address)
- g. Include the disk content on the disk label
- h. Date
- i. Virus scanning program used

1.5 TYPES OF INFORMATION REQUIRED IN O&M DATA PACKAGES

The following are a detailed description of the data package items listed in paragraph SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES.

1.5.1 Operating Instructions

Provide specific instructions, procedures, and illustrations for the following phases of operation for the installed model and features of each system:

1.5.1.1 Safety Precautions and Hazards

List personnel hazards and equipment or product safety precautions for operating conditions. List all residual hazards identified in the Activity Hazard Analysis provided under Section 01 35 26 GOVERNMENT SAFETY REQUIREMENTS. Provide recommended safeguards for each identified hazard.

1.5.1.2 Operator Prestart

Provide procedures required to install, set up, and prepare each system for use.

1.5.1.3 Startup, Shutdown, and Post-Shutdown Procedures

Provide narrative description for Startup, Shutdown and Post-shutdown operating procedures including the control sequence for each procedure.

1.5.1.4 Normal Operations

Provide Control Diagrams with data to explain operation and control of systems and specific equipment. Provide narrative description of Normal Operating Procedures.

1.5.1.5 Emergency Operations

Provide Emergency Procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent further damage to systems and equipment. Provide Emergency Shutdown Instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance and procedures for emergency operation of utility systems including required valve positions, valve locations and zones or portions of systems controlled.

1.5.1.6 Operator Service Requirements

Provide instructions for services to be performed by the operator such as lubrication, adjustment, inspection, and recording gauge readings.

1.5.1.7 Environmental Conditions

Provide a list of Environmental Conditions (temperature, humidity, and other relevant data) that are best suited for the operation of each product, component or system. Describe conditions under which the item equipment should not be allowed to run.

1.5.1.8 Operating Log

Provide forms, sample logs, and instructions for maintaining necessary operating records.

1.5.1.9 Additional Requirements for HVAC Control Systems

Provide Data Package 5 and the following for control systems:

- a. Narrative description on how to perform and apply functions, features, modes, and other operations, including unoccupied operation, seasonal changeover, manual operation, and alarms. Include detailed technical manual for programming and customizing control loops and algorithms.
- b. Full as-built sequence of operations.
- c. Copies of checkout tests and calibrations performed by the Contractor (not Cx tests).
- d. Full points list. Provide a listing of rooms with the following information for each room:
 - (1) Floor
 - (2) Room number
 - (3) Room name
 - (4) Air handler unit ID
 - (5) Reference drawing number
 - (6) Air terminal unit tag ID
 - (7) Heating or cooling valve tag ID
 - (8) Minimum cfm
 - (9) Maximum cfm
- e. Full print out of all schedules and set points after testing and acceptance of the system.
- f. Full as-built print out of software program.
- g. Marking of system sensors and thermostats on the as-built floor plan

and mechanical drawings with their control system designations.

1.5.2 Preventive Maintenance

Provide the following information for preventive and scheduled maintenance to minimize repairs for the installed model and features of each system. Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials.

1.5.2.1 Lubrication Data

Include the following preventive maintenance lubrication data, in addition to instructions for lubrication required under paragraph OPERATOR SERVICE REQUIREMENTS:

- a. A table showing recommended lubricants for specific temperature ranges and applications.
- b. Charts with a schematic diagram of the equipment showing lubrication points, recommended types and grades of lubricants, and capacities.
- c. A Lubrication Schedule showing service interval frequency.

1.5.2.2 Preventive Maintenance Plan, Schedule, and Procedures

Provide manufacturer's schedule for routine preventive maintenance, inspections, condition monitoring (predictive tests) and adjustments required to ensure proper and economical operation and to minimize repairs. Provide instructions stating when the systems should be retested. Provide manufacturer's projection of preventive maintenance work-hours on a daily, weekly, monthly, and annual basis including craft requirements by type of craft. For periodic calibrations, provide manufacturer's specified frequency and procedures for each separate operation.

- a. Define the anticipated time required to perform each of each test (work-hours), test apparatus, number of personnel identified by responsibility, and a testing validation procedure permitting the record operation capability requirements within the schedule. Provide a remarks column for the testing validation procedure referencing operating limits of time, pressure, temperature, volume, voltage, current, acceleration, velocity, alignment, calibration, adjustments, cleaning, or special system notes. Delineate procedures for preventive maintenance, inspection, adjustment, lubrication and cleaning necessary to minimize repairs.
- b. Repair requirements must inform operators how to check out, troubleshoot, repair, and replace components of the system. Include electrical and mechanical schematics and diagrams and diagnostic techniques necessary to enable operation and troubleshooting of the system after acceptance.

1.5.3 Repair

Provide manufacturer's recommended procedures and instructions for correcting problems and making repairs for the installed model and features of each system. Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials.

1.5.3.1 Troubleshooting Guides and Diagnostic Techniques

Provide step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.

1.5.3.2 Wiring Diagrams and Control Diagrams

Provide point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job specific wiring and control work. On diagrams, number electrical and electronic wiring and pneumatic control tubing and the terminals for each type, identically to actual installation configuration and numbering.

1.5.3.3 Repair Procedures

Provide instructions and a list of tools required to repair or restore the product or equipment to proper condition or operating standards.

1.5.3.4 Removal and Replacement Instructions

Provide step-by-step procedures and a list of required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings and adjustments required. Use a combination of text and illustrations.

1.5.3.5 Spare Parts and Supply Lists

Provide lists of spare parts and supplies required for repair to ensure continued service or operation without unreasonable delays. Special consideration is required for facilities at remote locations. List spare parts and supplies that have a long lead-time to obtain.

1.5.3.6 Repair Work-Hours

Provide manufacturer's projection of repair work-hours including requirements by type of craft. Identify, and tabulate separately, repair that requires the equipment manufacturer to complete or to participate.

1.5.4 Real Property Equipment

Provide a list of installed equipment furnished under this contract. Include all information usually listed on manufacturer's name plate. In the "EQUIPMENT-IN-PLACE LIST" include, as applicable, the following for each piece of equipment installed: Description of item, location (by room number), model number, serial number, capacity, name and address of manufacturer, name and address of equipment supplier, condition, spare parts list, manufacturer's catalog, and warranty. Submit the final list 30 days after transfer of the completed facility.

Key the designations to the related area depicted on the contract drawings.

1.5.5 Appendices

Provide information required below and information not specified in the preceding paragraphs but pertinent to the maintenance or operation of the product or equipment. Include the following:

1.5.5.1 Product Submittal Data

Provide a copy of SD-03 Product Data submittals documented with the required approval.

1.5.5.2 Certificates

Provide a copy of SD-07 Certificates submittals documented with the required approval.

1.5.5.3 Manufacturer's Instructions

Provide a copy of SD-08 Manufacturer's Instructions submittals documented with the required approval.

1.5.5.4 O&M Submittal Data

Provide a copy of SD-10 Operation and Maintenance Data submittals documented with the required approval.

1.5.5.5 Parts Identification

Provide identification and coverage for the parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without further identification. Provide clear and legible illustrations, drawings, and exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations and separate listing must show the index, reference, or key number that will cross-reference the illustrated part to the listed part. Group the parts shown in the listings by components, assemblies, and subassemblies in accordance with the manufacturer's standard practice. Parts data may cover more than one model or series of equipment, components, assemblies, subassemblies, attachments, or accessories, such as typically shown in a master parts catalog.

1.5.5.6 Warranty Information

List and explain the various warranties and clearly identify the servicing and technical precautions prescribed by the manufacturers or contract documents in order to keep warranties in force. Include warranty information for primary components of the system. Provide copies of warranties required by Section 01 78 00 CLOSEOUT SUBMITTALS.

1.5.5.7 Extended Warranty Information

List all warranties for products, equipment, components, and sub-components whose duration exceeds one year. For each warranty listed, indicate the applicable specification section, duration, start date, end date, and the point of contact for warranty fulfillment. Also, list or reference the specific operation and maintenance procedures that must be

performed to keep the warranty valid. Provide copies of warranties required by Section 01 78 00 CLOSEOUT SUBMITTALS.

1.5.5.8 Personnel Training Requirements

Provide information available from the manufacturers that is needed for use in training designated personnel to properly operate and maintain the equipment and systems.

1.5.5.9 Testing Equipment and Special Tool Information

Include information on test equipment required to perform specified tests and on special tools needed for the operation, maintenance, and repair of components. Provide final set points.

1.5.5.10 Testing and Performance Data

Include completed prefunctional checklists, functional performance test forms, and monitoring reports. Include recommended schedule for retesting and blank test forms. Provide final set points.

1.5.5.11 Field Test Reports and Manufacturer's Field Reports

Provide a copy of Field Test Reports (SD-06) and Manufacturer's Field Reports (SD-09) submittals documented with the required approval.

1.5.5.12 Contractor Information

Provide a list that includes the name, address, and telephone number of the General Contractor and each Subcontractor who installed the product or equipment, or system. For each item, also provide the name address and telephone number of the manufacturer's representative and service organization that can provide replacements most convenient to the project site. Provide the name, address, and telephone number of the product, equipment, and system manufacturers.

1.6 SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES

Provide the O&M data packages specified in individual technical sections. The information required in each type of data package follows:

1.6.1 Data Package 1

- a. Safety precautions and hazards
- b. Cleaning recommendations
- c. Maintenance and repair procedures
- d. Warranty information
- e. Extended warranty information
- f. Contractor information
- g. Spare parts and supply list

1.6.2 Data Package 2

- a. Safety precautions and hazards
- b. Normal operations
- c. Environmental conditions
- d. Lubrication data
- e. Preventive maintenance plan, schedule, and procedures
- f. Cleaning recommendations
- g. Maintenance and repair procedures
- h. Removal and replacement instructions
- i. Spare parts and supply list
- j. Parts identification
- k. Warranty information
- l. Extended warranty information
- m. Contractor information

1.6.3 Data Package 3

- a. Safety precautions and hazards
- b. Operator prestart
- c. Startup, shutdown, and post-shutdown procedures
- d. Normal operations
- e. Emergency operations
- f. Environmental conditions
- g. Operating log
- h. Lubrication data
- i. Preventive maintenance plan, schedule, and procedures
- j. Cleaning recommendations
- k. Troubleshooting guides and diagnostic techniques
- l. Wiring diagrams and control diagrams
- m. Maintenance and repair procedures
- n. Removal and replacement instructions
- o. Spare parts and supply list

- p. Product submittal data
- q. O&M submittal data
- r. Parts identification
- s. Warranty information
- t. Extended warranty information
- u. Testing equipment and special tool information
- v. Testing and performance data
- w. Contractor information
- x. Field test reports

1.6.4 Data Package 4

- a. Safety precautions and hazards
- b. Operator prestart
- c. Startup, shutdown, and post-shutdown procedures
- d. Normal operations
- e. Emergency operations
- f. Operator service requirements
- g. Environmental conditions
- h. Operating log
- i. Lubrication data
- j. Preventive maintenance plan, schedule, and procedures
- k. Cleaning recommendations
- l. Troubleshooting guides and diagnostic techniques
- m. Wiring diagrams and control diagrams
- n. Repair procedures
- o. Removal and replacement instructions
- p. Spare parts and supply list
- q. Repair work-hours
- r. Product submittal data
- s. O&M submittal data

- t. Parts identification
- u. Warranty information
- v. Extended warranty information
- w. Personnel training requirements
- x. Testing equipment and special tool information
- y. Testing and performance data
- z. Contractor information
- aa. Field test reports

1.6.5 Data Package 5

- a. Safety precautions and hazards
- b. Operator prestart
- c. Start-up, shutdown, and post-shutdown procedures
- d. Normal operations
- e. Environmental conditions
- f. Preventive maintenance plan, schedule, and procedures
- g. Troubleshooting guides and diagnostic techniques
- h. Wiring and control diagrams
- i. Maintenance and repair procedures
- j. Removal and replacement instructions
- k. Spare parts and supply list
- l. Product submittal data
- m. Manufacturer's instructions
- n. O&M submittal data
- o. Parts identification
- p. Testing equipment and special tool information
- q. Warranty information
- r. Extended warranty information
- s. Testing and performance data
- t. Contractor information
- u. Field test reports

- v. Additional requirements for HVAC control systems

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 TRAINING

Prior to acceptance of the facility by the Contracting Officer for Beneficial Occupancy, provide comprehensive training for the systems and equipment specified in the technical specifications. The training must be targeted for the building maintenance personnel, and applicable building occupants. Instructors must be well-versed in the particular systems that they are presenting. Address aspects of the Operation and Maintenance Manual submitted in accordance with Section 01 78 00 CLOSEOUT SUBMITTALS. Training must include classroom or field lectures based on the system operating requirements. The location of classroom training requires approval by the Contracting Officer.

3.1.1 Training Plan

Submit a written training plan to the Contracting Officer for approval at least 60 calendar days prior to the scheduled training. Training plan must be approved by the Commissioning Authority (CxA) prior to forwarding to the Contracting Officer. Also, coordinate the training schedule with the Contracting Officer and CxA. Include within the plan the following elements:

- a. Equipment included in training
- b. Intended audience
- c. Location of training
- d. Dates of training
- e. Objectives
- f. Outline of the information to be presented and subjects covered including description.
- g. Start and finish times and duration of training on each subject.
- h. Methods (e.g., classroom lecture, video, site walk-through, actual operational demonstrations, written handouts)
- i. Instructor names and instructor qualifications for each subject.
- j. List of texts and other materials to be furnished by the Contractor that are required to support training.
- k. Description of proposed software to be used for video recording of training sessions.

3.1.2 Training Content

The core of this training must be based on manufacturer's recommendations and the operation and maintenance information. The CxA is responsible for overseeing and approving the content and adequacy of the training. Spend 95 percent of the instruction time during the presentation on the OPERATION AND MAINTENANCE DATA. Include the following for each system training presentation:

- a. Start-up, normal operation, shutdown, unoccupied operation, seasonal changeover, manual operation, controls set-up and programming, troubleshooting, and alarms.
- b. Relevant health and safety issues.
- c. Discussion of how the feature or system is environmentally responsive. Advise adjustments and optimizing methods for energy conservation.
- d. Design intent.
- e. Use of O&M Manual Files.
- f. Review of control drawings and schematics.
- g. Interactions with other systems.
- h. Special maintenance and replacement sources.
- i. Tenant interaction issues.

3.1.3 Training Outline

Provide the Operation and Maintenance Manual Files (Bookmarked PDF) and a written course outline listing the major and minor topics to be discussed by the instructor on each day of the course to each trainee in the course. Provide the course outline 14 calendar days prior to the training.

3.1.4 Training Video Recording

Record classroom training session(s) on video. Provide to the Contracting Officer two copies of the training session(s) in DVD video recording format. Capture within the recording, in video and audio, the instructors' training presentations including question and answer periods with the attendees. The recording camera(s) must be attended by a person during the recording sessions to assure proper size of exhibits and projections during the recording are visible and readable when viewed as training.

3.1.5 Unresolved Questions from Attendees

If, at the end of the training course, there are questions from attendees that remain unresolved, the instructor must send the answers, in writing, to the Contracting Officer for transmittal to the attendees, and the training video must be modified to include the appropriate clarifications.

3.1.6 Validation of Training Completion

Ensure that each attendee at each training session signs a class roster

daily to confirm Government participation in the training. At the completion of training, submit a signed validation letter that includes a sample record of training for reporting what systems were included in the training, who provided the training, when and where the training was performed, and copies of the signed class rosters. Provide two copies of the validation to the Contracting Officer, and one copy to the Operation and Maintenance Manual Preparer for inclusion into the Manual's documentation.

3.1.7 Quality Control Coordination

Coordinate this training with the CxA in accordance with Section 01 45 00.00 10 QUALITY CONTROL.

-- End of Section --

SECTION 01 91 00.15 10

TOTAL BUILDING COMMISSIONING

PART 1 GENERAL

1.1 SUMMARY

Commission the building systems listed herein. Employ the services of an independent Commissioning Firm. The Commissioning Firm must be a 1st tier subcontractor of the General or Prime Contractor and must be financially and corporately independent of all other subcontractors. The Commissioning Firm must employ a Lead Commissioning Specialist that coordinates all aspects of the commissioning process. Conform to the commissioning procedures outlined in this specification.

Lead Commissioning Specialist (CxC): The CxC, also referred to as Contractor's Commissioning Specialist or Commissioning Specialist, shall be an entity employed as a first-tier subcontractor by the construction contractor, independent from the installing contractors, having expertise in the commissioning of facilities of a scope and complexity comparable to the individual project and employed regularly in building commissioning.

Commissioning Specialist for the Government (CxG): The CxG, also referred to as Government Commissioning Authority, is hired/designated by the Government to oversee the Commissioning Process. The CxG shall be the commissioning agent for the project's Third Party Certification requirements.

All commissioning criteria shall be followed and incorporated into the commissioning plan as the project progresses. The most stringent requirement shall apply in the event of a conflict in criteria. The Contractor's CxC shall be the primary party responsible for commissioning activities during construction. The Government Commissioning Firm/Specialist CxG provides a higher level of oversight of the commissioning process/activities in addition to the Contractor provided Commissioning Firm/Specialist. The Contractor and the CxC shall coordinate directly with the Government provided CxG. The presence of the CxG shall not relieve the Contractor or CxC of any requirement or obligation detailed in the various commissioning related criteria in this contract.

1.2 UNIFIED FACILITIES GUIDE SPECIFICATION REFERENCES

This specification section is intended to work in conjunction with the requirements included in the Unified Facilities Guide Specifications (UFGS) referenced within this specification section. Comply with the requirements of the referenced UFGS to the extent specified herein. UFGS can be found at on the Whole Building Design Guide website at: <http://www.wbdg.org/>

1.3 SYSTEMS TO BE COMMISSIONED

Commission the following systems:

Heating, Ventilating, Air Conditioning, and Refrigeration Systems

(HVAC)
Building Automation System
Utility Monitoring and Control System
Lighting Systems
Power Distribution Systems
Power Generation Systems
Service Water Heating Systems
Plumbing Systems
Natural Gas and Laboratory Gas Systems
Water Pumping and Mixing Systems
Compressed Air and Vacuum Systems
Energy and Water Utility Metering Systems and Sub-Meters
Fenestration Control Systems
Building Envelope: Include moisture, thermal integrity, and air tightness for the entire building envelope including systems such as walls, fenestration, roofing, roof openings, floors, slabs-on-grade, and floor assemblies.

Note: See 3.1.6.6.3 of this Specification Section for detailed list of systems to be commissioned.

1.4 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING
ENGINEERS (ASHRAE)

ASHRAE 180 (2012) Standard Practice for Inspection
and Maintenance of Commercial Building
HVAC Systems

ASHRAE 202 (2018) Commissioning Process for Buildings
and Systems

ASSOCIATED AIR BALANCE COUNCIL (AABC)

ACG Commissioning Guideline (2005) Commissioning Guideline

NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)

NEBB Commissioning Standard (2009) Procedural Standards for Whole
Building Systems Commissioning of New
Construction; 3rd Edition

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION
(SMACNA)

ANSI/SMACNA 014 (2013) HVAC Systems Commissioning Manual,
2nd Edition

U.S. ARMY CORPS OF ENGINEERS (USACE)

ER 25-345-1 (2019) Commissioning -- Systems Manual

1.5 COMMUNICATION WITH THE GOVERNMENT

The Lead Commissioning Specialist (CxC) must submit all plans, schedules, reports, and documentation directly to the Contracting Officer Representative concurrent with submission to the CQC System Manager. The Lead Commissioning Specialist must have direct communication with the Contracting Officer's Representative regarding all elements of the commissioning process; however, the Government has no direct contract authority with the Lead Commissioning Specialist.

1.6 SEQUENCING AND SCHEDULING

1.6.1 Sequencing

Complete the following prior to starting Functional Performance Tests of mechanical systems:

- a. All equipment and systems have been completed, cleaned, flushed, disinfected, calibrated, tested, and operate in accordance with contract documents and construction plans and specifications.
- b. Performance Verification Tests of the controls systems have been completed and the Performance Verification Test Report has been submitted and approved in accordance with Specification Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC.
- c. Testing, Adjusting, and Balancing has been completed and the Testing, Adjusting, and Balancing Report, has been submitted and approved in accordance with Specification Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC.
- d. The building envelope is enclosed according to contract documents with final construction completed, the Air Barrier Pressure Tests have been completed and the Air Leakage Test Reports and Diagnostic Test Reports have been submitted and approved in accordance with Specification Section 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS.
- e. The Pre-Functional Checklists have been submitted and approved.
- f. The Certificate of Readiness for mechanical systems has been submitted and approved.

Complete the following prior to starting Functional Performance Tests of the electrical systems:

- a. All electrical, power generation, and lighting equipment and systems have been completed, calibrated, tested, and operate in accordance with contract documents and construction plans and specifications.
- b. The building envelope is enclosed according to contract documents with final construction completed.
- c. Ceiling tiles, floor coverings, and window coverings are in place.
- d. The Certificate of Readiness for electrical systems has been submitted and approved.

1.6.2 Project Schedule

Include the following tasks in the project schedule required by Section 01 32 01.00 10 PROJECT SCHEDULE. Ensure sufficient time is scheduled to accommodate the requirements of this specification section. The order of items listed below is not intended to imply a specified sequence:

- a. Submission and approval of the Commissioning Firm and Commissioning Specialist.
- b. Submission and approval of the Testing, Adjusting, and Balancing (TAB) Firm and TAB Specialist specified in Specification Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC.
- c. Submission of the Design Review Report specified herein.
- d. Submission of the Design Review Report specified in Specification Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC.
- e. Submission and approval of the Construction Phase Commissioning Plan.
- f. Installation of permanent utilities (gas, water, electric).
- g. Building Envelope Construction.
- h. Submission and approval of the Building Envelope Inspection Checklists.
- i. Air Barrier Pressure Tests specified in Specification Section 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS.
- j. Drainage and Vent, Building Sewers, Water Supply Systems and Backflow Prevention Assembly Tests specified in Specification Section 22 00 00 PLUMBING, GENERAL PURPOSE.
- k. Factory Acceptance Testing for each of the systems to be commissioned as required by technical specifications.
- l. Manufacturer's Equipment Start-Up for each of the systems to be commissioned.
- m. Potable Water System Flushing specified in Specification Section 22 00 00 PLUMBING, GENERAL PURPOSE.
- n. Operational Tests of the plumbing system specified in Specification Section 22 00 00 PLUMBING, GENERAL PURPOSE.
- o. Potable Water System Disinfection specified in Specification Section 22 00 00 PLUMBING, GENERAL PURPOSE.
- p. Submission and approval of the TAB Schematic Drawings, Report Forms, and Procedures specified in Specification Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC.
- q. Submission and approval of Duct Air Leakage Test Procedures specified in Specification Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC.
- r. Duct Air Leakage Test Execution specified in Specification Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC.

- s. Submission and approval of the Final Duct Air Leakage Test Report specified in Specification Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC.
- t. Testing, Adjusting, and Balancing (TAB) Field Work required by Specification Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC.
- u. Submission and approval of the TAB Report specified in Specification Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC.
- v. TAB Field Acceptance Testing required by Specification Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC.
- w. Submission and approval of the Start-Up Testing Report specified in Specification Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC.
- x. Submission and approval of the Performance Verification Test Procedures specified in Specification Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC.
- y. Performance Verification Tests required by Specification Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC.
- z. Performance Verification Test Report specified in Specification Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC.
- aa. Pre-Functional Checklist Submittal.
- bb. Functional Performance Testing for each system to be commissioned.
- cc. Integrated Systems Tests.
- dd. Post-Test Deficiency Correction for each system to be commissioned.
- ee. Re-Testing.
- ff. Monitoring-Based Commissioning.
- gg. Training for each of the systems to be commissioned.
- hh. Systems Manual, Maintenance Plan, and Service Life Plan submission and approval.
- ii. Submission and approval of the Commissioning Report.
- jj. Review of As-Built Documents.
- kk. Seasonal Testing.
- ll. Post-Construction Endurance Testing.
- mm. Post-Construction Site Visit.

1.7 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for

information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Commissioning Firm; G RO

Lead Commissioning Specialist; G RO

Technical Commissioning Specialists; G RO

Commissioning Firm's Contract; G RO

SD-06 Test Reports

Design Review Report; G RO

Interim Construction Phase Commissioning Plan; G RO

Final Construction Phase Commissioning Plan; G RO

Template Building Envelope Inspection Checklists; G RO

Building Envelope Inspection Checklists; G RO

Pre-Functional Checklists; G RO

Issues Log

Commissioning Report; G RO

Post-Construction Trend Log Report; G RO

SD-07 Certificates

Certificate of Readiness; G RO

SD-10 Operation and Maintenance Data

Training Plan; G RO

Training Attendance Rosters; G RO

Systems Manual; G RO

Maintenance and Service Life Plans; G RO

SD-11 Closeout Submittals

Final Commissioning Report; S RO

Final Construction Phase Commissioning Plan; S

1.8 COMMISSIONING FIRM

Provide a Commissioning Firm that is certified in commissioning by one of the following: The AABC Commissioning Group (ACG); the National

Environmental Balancing Bureau (NEBB); the International Certification Board/Testing, Adjusting, and Balancing Bureau (ICB/TABB), the Building Commissioning Association (BCA); the Association of Energy Engineers (AEE).

The Commissioning Firm must be certified in all systems to be commissioned to the extent such certifications are available from the certifying body. Describe any lapses in certification or disciplinary action taken by the certifying body against the proposed Commissioning Firm or Lead Commissioning Specialist in detail. Any firm or commissioning professional that has been the subject of disciplinary action by the certifying body within the five years preceding contract award is not eligible to perform any duties related to commissioning.

- a. Submit the Commissioning Firm's certification of qualifications including the name of the firm and certifications no later than 30 calendar days after Notice to Proceed. Submit one hard copy and an electronic copy.
- b. The Commissioning Firm's and Commissioning Specialists' certifications must be maintained for the entire duration of the duties specified herein. If, for any reason, the firm or a specialist loses a certification during this period, immediately notify the Contracting Officer's Representative and submit another Commissioning Firm or Commissioning Specialist for approval. All work specified in this specification section performed by the Commissioning Firm or associated Commissioning Specialists is invalid if the Commissioning Firm or Commissioning Specialist loses its certification prior to contract completion and must be performed by an approved successor.
- c. The Commissioning Firm must oversee and assist the General or Prime Contractor with the work specified herein. Submit the Commissioning Firm's Contract including the Scope of Work associated with the paragraph POST-CONSTRUCTION SUPPORT no later than 30 calendar days after approval of the Commissioning Firm. Submit one hard copy and an electronic copy.
- d. The Commissioning Firm may act as the Pressure Test Agency required by Specification Section 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS provided that all qualification requirements of that specification section are met.

1.8.1 Lead Commissioning Specialist

The Commissioning Firm must provide a Lead Commissioning Specialist (CxC) that has a minimum of five years of commissioning experience, including five projects of similar size and complexity (laboratory or hospital experience, including specialized gas systems and laboratory valves), and that is one of the following: A NEBB qualified Systems Commissioning Administrator (SCA); ACG Certified Commissioning Authority (CxA); ICB/TABB Certified Commissioning Supervisor; BCA Certified Commissioning Professional (CCP); AEE Certified Building Commissioning Professional (CBCP); University of Wisconsin-Madison Qualified Commissioning Process Provider (QCxP); Building Commissioning Professional (BCxP).

- a. Submit the Lead Commissioning Specialist's certification of qualifications including the name of the specialist and firm; certifications; years of experience; and a listing of representative projects of similar size and complexity no later than 30 calendar days after Notice to Proceed. Submit one hard copy and an electronic copy.

- b. The Lead Commissioning Specialists certifications must be maintained for the entire duration of the duties specified herein. If, for any reason, the specialist loses a certification during this period, immediately notify the Contracting Officer's Representative and submit another Lead Commissioning Specialist for approval. All work specified in this specification section to be performed by the Lead Commissioning Specialist is invalid if the Lead Commissioning Specialist loses its certification prior to contract completion and must be performed by an approved successor.
- c. The Lead Commissioning Specialist must lead and oversee the commissioning work specified herein and be the primary point of contact for the Government regarding the commissioning work. One of the Technical Commissioning Specialists may be the Lead Commissioning Specialist provided that all of the qualification requirements are met.

1.8.2 Technical Commissioning Specialists

Technical Commissioning Specialists, employed by the Commissioning Firm and that have the following qualifications, must perform the technical work specified herein associated with each system to be commissioned:

- a. Mechanical Technical Commissioning Specialist: The technical work associated with mechanical systems including Heating, Ventilating, Air Conditioning, and Refrigeration Systems; Building Automation System; Utility Monitoring and Control System; Service Water Heating Systems; Plumbing Systems; Water Pumping and Mixing Systems; Compressed Air and Vacuum Systems; Energy and Water Utility Metering Systems must be performed by a Commissioning Specialist certified by NEBB, ACG, ICB/TABB, AEE, University of Wisconsin-Madison, ASHRAE, or BCA in the commissioning of HVAC systems with five years of experience in the commissioning of HVAC systems.
- b. Electrical Technical Commissioning Specialist: The technical work associated with electrical systems including Lighting Systems; Power Distribution Systems; Power Generation Systems; Electrical Utility Metering Systems must be performed by a Commissioning Specialist certified by NEBB, ACG, ICB/TABB, AEE, University of Wisconsin-Madison, ASHRAE, or BCA in the commissioning of electrical systems with five years of experience in the commissioning of electrical systems or an Electrical Professional Engineer with five years of electrical systems design or construction experience.
- c. Building Envelope Technical Commissioning Specialist: The technical work associated with the Building Envelope system must be performed by a registered architect with five years of building envelope design or construction experience or a professional with training and certification as an Air Barrier Installer from the Air Barrier Association of America (ABAA) or other 3rd party air barrier association. The Building Envelope Technical Commissioning Specialist must have experience coordinating and instructing personnel involved in installation, joining, and sealing of air barrier materials and components. The Commissioning Firm team member with the required experience related to the building envelope may act as the Air Barrier Inspector required by Specification Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM provided that all qualification requirements of that specification section are met. The Commissioning Firm team member with the required experience related to the building envelope may act as the thermographer required by Specification Section 07 05 23

PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS provided that all of the qualification requirements of that specification section are met.

- d. Submit the Technical Commissioning Specialist's certification of qualifications including the name of the specialist and firm; certifications; years of experience; and a listing of representative projects of similar size and complexity no later than 30 calendar days after Notice to Proceed. Submit one hard copy and an electronic copy.

1.8.3 Commissioning Standard

Comply with the requirements of the commissioning standard under which the Commissioning Firm and Specialists qualifications are approved. When the firm and specialists are certified by BCA, AEE, ASHRAE, or the University of Wisconsin-Madison, comply with the requirements of one of the acceptable standards unless otherwise stated herein. The acceptable standards are ACG Commissioning Guideline, NEBB Commissioning Standard, ANSI/SMACNA 014, or ASHRAE 202. Comply with applicable NETA testing standards for electrical systems.

- a. Implement all recommendations and suggested practices contained in the Commissioning Standard and electrical test standards.
- b. Use the Commissioning Standard for all aspects of Commissioning, including calibration of instruments.
- c. Where the instrument manufacturer calibration recommendations are more stringent than those listed in the Commissioning Standard, adhere to the manufacturer calibration recommendations.
- d. All quality assurance provisions of the Commissioning Standard such as performance guarantees are part of this contract.
- e. The Commissioning Specialists must develop commissioning procedures for any systems or system components not covered in the Commissioning Standard.
- f. Use any new requirements, recommendations, and procedures published or adopted prior to contract solicitation by the body responsible for the Commissioning Standard.

1.9 SUSTAINABILITY THIRD PARTY CERTIFICATION (TPC)

The Commissioning Specialists must execute and document the commissioning activities required of the Commissioning Authority for the purposes of complying with the Third Party Certification (TPC) requirements for the project in accordance with Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING. Provide all commissioning documentation required to meet the TPC requirements.

The Commissioning Specialists must provide any additional documentation or perform additional activities required by Leadership in Energy and Environmental Design version 4 (LEEDv4) Fundamental Commissioning and Verification including such documents as the Current Facilities Requirements and Operations and Maintenance Plan. In addition, the Commissioning Specialists must provide any additional documentation and perform additional activities as required by LEEDv4 Enhanced Commissioning Option 1: Path 2 Enhanced and Monitoring-Based Commissioning and Option 2

Envelope Commissioning including such activities as developing and providing an ongoing commissioning plan, developing and implementing a monitoring-based commissioning plan, and compliance with NIBS Guideline 1 for envelope commissioning.

1.10 ISSUES LOG

The Lead Commissioning Specialist must develop and maintain an Issues Log for tracking and resolution of all deficiencies discovered through submittal reviews, inspection, and testing. Include the date of final resolution of issues as confirmed by the Commissioning Specialist. Submit the Issues Log on a monthly basis at a minimum. At any point during construction, any commissioning team member finding deficiencies may communicate those deficiencies in writing to the Commissioning Specialist for inclusion into the Issues Log.

Track construction deficiencies identified in the Issues Log using QCS as specified in Specification Section 01 45 00.15 10 RESIDENT MANAGEMENT SYSTEM CONTRACTOR MODE(RMS CM) .

1.11 CERTIFICATE OF READINESS

Prior to scheduling Functional Performance Tests for each system, issue a Certificate of Readiness for the system certifying that the system is ready for Functional Performance Testing. The Certificate of Readiness must include, for each system to be commissioned, all equipment and system start-up reports; Performance Verification Test Reports; completed Building Envelope Inspection Checklists; completed Pre-Functional Checklists; Testing, Adjusting, and Balancing (TAB) Report; HVAC Controls Start-Up Reports; and the Air Leakage Test Reports and Diagnostic Test Reports to the extent applicable to the system. The Contractor; the Lead Commissioning Specialist; the Contractor's Quality Control Representative; the Mechanical, Electrical, Controls, and TAB subcontractor representatives must sign and date the Certificate of Readiness. Submit the Certificate of Readiness for each system no later than 14 calendar days prior to Functional Performance Tests of that system. Submit one hard copy and an electronic copy. Do not schedule Functional Performance Tests for a system until the Certificate of Readiness for that system receives approval by the Government.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 CONSTRUCTION PHASE

3.1.1 Construction Commissioning Coordination Meeting

The Lead Commissioning Specialist must lead a Construction Commissioning Coordination Meeting no later than 14 days after approval of the Commissioning Firm and Commissioning Specialists to discuss the commissioning process including contract requirements, lines of communication, roles and responsibilities, schedules, documentation requirements, inspection and test procedures, and logistics as specified in this specification section. The Contractor's Superintendent or Project Manager, the Contractor's Quality Control Representative, and the Government must attend this meeting. Invite the User and a Directorate of

Public Works Representative to attend this meeting.

3.1.2 Design Phase Commissioning Plan

A commissioning plan developed during design phase is provided as Appendix C for information only. The design phase commissioning plan does not form a part of this contract and is provided for commissioning review purposes only.

3.1.3 Construction Phase Commissioning Plan

3.1.3.1 Interim Construction Phase Commissioning Plan

The Lead Commissioning Specialist (CxC) must prepare the Interim Construction Phase Commissioning Plan. Submit the Interim Construction Phase Commissioning Plan no later than 30 calendar days after the Construction Commissioning Coordination Meeting and no later than 14 days prior to the start of construction of the building envelope. Submit one hard copy and an electronic copy.

Identify the commissioning and testing standards and outline the overall commissioning process, the commissioning schedule, the commissioning team members and responsibilities, lines of communication, documentation requirements for the construction phase of the project, and Template Building Envelope Inspection Checklists in the Interim Construction Phase Commissioning Plan.

3.1.3.1.1 Checklists

Download example Building Envelope Inspection Checklists, Pre-Functional Checklists, Integrated Systems Test Checklists, and Functional Performance Test Checklists for specification section 01 91 00.15 10 TOTAL BUILDING COMMISSIONING at the following location:

<http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/forms-graphic>

The checklists submitted in the Interim and Final Construction Phase Commissioning Plans must contain the same level of detail shown in the examples. The submitted checklists are not required to match the format of the examples.

3.1.3.1.2 Template Building Envelope Inspection Checklists

The Building Envelope Technical Commissioning Specialist must develop the Template Building Envelope Inspection Checklists. Include all items that verify the building materials and construction maintain the required thermal and moisture integrity and air tightness of the building envelope system in the Building Envelope Inspection Checklists.

3.1.3.2 Final Construction Phase Commissioning Plan

The Lead Commissioning Specialist (CxC) must prepare the Final Construction Phase Commissioning Plan. Submit the Final Construction Phase Commissioning Plan no later than 30 calendar days prior to the start of Pre-Functional Checks. Submit one hard copy and an electronic copy. Once approved, file the approved plan in the Sustainability eNotebook.

Include the information provided in the Interim Construction Phase Commissioning Plan. In addition, the Technical Commissioning Specialist must develop the Pre-Functional Checklists, Integrated Systems Test Checklists, and Functional Performance Test Checklists for each building,

for each system required to be commissioned, and for each component for inclusion in the Final Construction Phase Commissioning Plan.

3.1.3.2.1 Pre-Functional Checklists

The Pre-Functional Checklists must include items for physical inspection or testing that demonstrate that installation and start-up of equipment and systems is complete. Refer to paragraph Pre-Functional Checks for more information.

3.1.3.2.2 Functional Performance Test Checklists

Functional Performance Test Checklists must include procedures that explain, step-by-step, the actions and expected results that will demonstrate that the system performs in accordance with the contract. Refer to paragraph Functional Performance and Integrated Systems Tests for more information. Include the following sections and details appropriate to the systems being tested in the Functional Performance Test Checklists:

- a. Notable system features including information about controls to facilitate understanding of system operation.
- b. Conclusions and recommendations. Conclusions must clearly indicate if system does or does not perform in accordance with contract requirements. Recommendation must clearly indicate that the system should or should not be accepted by the Government.
- c. Test conditions including date, beginning and ending time, and beginning and ending outdoor air conditions.
- d. Attendees.
- e. Identification of the equipment involved in the test.
- f. Control system feature identification.
- g. Point-to-point observations including demonstrating system flow meters and sensors have been calibrated and are correctly displayed on the Operator work station.
- h. Actuator operation observations demonstrating actuator responses to commands from the control system.
- i. As-found condition of the system operation.
- j. List of test items with step numbers along with the corresponding feature or control operation, intended test procedure, expected system response, and pass/fail indication.
- k. Space for comments for each test item.

3.1.3.2.3 Integrated Systems Test Checklists

Integrated Systems Test Checklists must include test procedures that explain, step-by-step, the actions and expected results that will demonstrate that the interactive operations between systems performs in accordance with the contract. Refer to paragraph Functional Performance and Integrated Systems Tests for more information. Include the following sections in the Integrated Systems Test Checklists:

- a. Notable features of the interconnected systems organized by discipline including information to facilitate understanding of system operation.
- b. Conclusions and recommendations. Conclusions must clearly indicate if the systems do or do not perform in accordance with contract requirements. Recommendation must clearly indicate that the systems should or should not be accepted by the Government.
- c. Test conditions including date and beginning and ending time.
- d. Attendees.
- e. Identification of the equipment and systems involved in the test.
- f. List of test items with step numbers along with the corresponding feature or control operation, intended test procedure, expected system response, and pass/fail indication.
- g. Space for comments for each test item.

3.1.4 Design Review

The Lead Commissioning Specialist and Technical Commissioning Specialists must review the construction contract plans and specifications, the Owner's Project Requirements Document, and the Basis of Design. The Owner's Project Requirements Document is attached as Appendix A. The Basis of Design is attached as Appendix B. The Owner's Project Requirements Document and Basis of Design documents are not contract documents and are provided for commissioning review purposes only.

- a. Advise the Contracting Officer's Representative of any discrepancies between the Basis of Design and Owner's Project Requirements, deficiencies of the design to comply with the Owner's Project Requirements or Basis of Design, and deficiencies that would prevent the building systems and features from operating or performing effectively and from being adequately maintainable.
- b. The Commissioning Specialists must provide a Design Review Report individually listing each deficiency and the corresponding proposed corrective action necessary for proper system operation or performance. Submit one hard copy and an electronic copy of the report to the Contracting Officer's Representative no later than 14 days after approval of the Commissioning Specialists.
- c. The Lead Commissioning Specialist must participate in a meeting to discuss any items contained in the report no later than 14 calendar days after submission of the report.

3.1.5 Construction Submittals

Provide all submittals associated with the systems to be commissioned, including shop drawings; equipment submittals; test plans, procedures, and reports; and resubmittal's to the Commissioning Specialists. The Technical Commissioning Specialist must review the submittals to the extent necessary to verify that the equipment and system installation will comply with the contract requirements and the requirements of the Basis of Design and the Owner's Project Requirements Document. The Technical Commissioning Specialist shall review these submittals prior to official

submission to the Government.

3.1.6 Inspection and Testing

Demonstrate that all system components have been installed, that each control device and item of equipment operates, and that the systems operate and perform, including interactive operation between systems, in accordance with contract documents and the Owner's Project Requirements. Requirements in related specification sections are independent from the requirements of this section and do not satisfy any of the requirements specified in this specification section. Provide all materials, services, and labor required to perform the Pre-Functional Checks, Building Envelope Inspection, Integrated Systems Tests, and Functional Performance Tests.

3.1.6.1 Commissioning Team

Provide a commissioning representative for each subcontractor associated with the systems to be commissioned. Each commissioning representative is responsible for coordination of their respective subcontractor's execution of the commissioning activities and participation in the inspection and testing required by this specification section. The designers listed below are the designers of record for their respective systems. Substitutes must be approved by the Contracting Officer's Representative.

3.1.6.1.1 Building Envelope Inspections Team

The following team members must participate in building envelope inspections:

Designation	Function
CxG	Commissioning Specialist for the Government
CxB	Building Envelope Technical Commissioning Specialist
QAR	Contracting Officer's Quality Assurance Representative
CQC	Contractor's Quality Control Personnel
BEC	Contractor's Building Envelope Commissioning Representative

3.1.6.1.2 Mechanical System Pre-Functional Checks Team

The following team members must participate in Pre-Functional checks of mechanical systems:

Designation	Function
CxM	Mechanical System Technical Commissioning Specialist
QAR	Contracting Officer's Quality Assurance Representative

Designation	Function
CQC	Contractor's Quality Control Personnel
MC	Contractor's Mechanical Commissioning Representative
EC	Contractor's Electrical Commissioning Representative
CC	Contractor's Controls Commissioning Representative
TABC	Contractor's TAB Commissioning Representative
PC	Contractor's Plumbing Commissioning Representative

3.1.6.1.3 Electrical System Pre-Functional Checks Team

The following team members must participate in Pre-Functional checks of electrical systems:

Designation	Function
CxE	Electrical System Technical Commissioning Specialist
QAR	Contracting Officer's Quality Assurance Representative
CQC	Contractor's Quality Control Personnel
EC	Contractor's Electrical Commissioning Representative

3.1.6.1.4 Mechanical Systems Test Team

The following team members must participate in Functional Performance, Seasonal, and Integrated Systems Testing of mechanical systems:

Designation	Function
CxG	Commissioning Specialist for the Government
CxM	Mechanical System Technical Commissioning Specialist
QAR	Contracting Officer's Quality Assurance Representative
CQC	Contractor's Quality Control Personnel
MC	Contractor's Mechanical Commissioning Representative
EC	Contractor's Electrical Commissioning Representative
CC	Contractor's Controls Commissioning Representative
TABC	Contractor's TAB Commissioning Representative

Designation	Function
PC	Contractor's Plumbing Commissioning Representative
MR	Equipment Manufacturers Representative (DOAS & AHUs)

3.1.6.1.5 Electrical Systems Test Team

The following team members must participate in Functional Performance and Integrated Systems Testing of electrical systems:

Designation	Function
CxG	Commissioning Specialist for the Government
CxE	Electrical System Technical Commissioning Specialist
QAR	Contracting Officer's Quality Assurance Representative
CQC	Contractor's Quality Control Personnel
EC	Contractor's Electrical Commissioning Representative

3.1.6.1.6 Other Pre-Functional and Functional Performance Participants

The following may participate as team members during Pre-Functional Checks and Functional Performance Testing:

Designation	Function
DPW	Directorate of Public Works Representative
User	Using Agent's Representative

3.1.6.2 Building Envelope Inspection

Document building envelope inspection by the commissioning team using the approved Template Building Envelope Inspection Checklists. Indicate commissioning team member inspection and acceptance of each Building Envelope Inspection Checklist item by initials at the time they are inspected and found to be in conformance with contract requirements. Inspect checklist items before they become hidden as construction progresses.

- a. Submit the completed and initialed Building Envelope Inspection Checklists no later than 7 calendar days after completion of inspection of all checklist items. Submit one hard copy and an electronic copy.
- b. The Building Envelope Technical Commissioning Specialist must make at least two site visits to the site to observe construction of the building envelope in-progress. On each visit, the Building Envelope

Commissioning Specialist must review the Contractor's in-progress checklists to ensure that the commissioning team is inspecting the building envelope as required.

- c. The Building Envelope Technical Commissioning Specialist must witness the building envelope pressure tests and diagnostic tests specified in Specification Section 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS. The Building Envelope Technical Commissioning Specialist must review the resulting reports and provide recommendations for correction of any deficiencies or further testing.

3.1.6.3 Pre-Functional Checks

Pre-Functional Checklists from the approved Final Construction Phase Commissioning Plan must be completed by the commissioning team. Complete one Pre-Functional Checklist for each individual item of equipment or system for each system required to be commissioned including, but not limited to, ductwork, piping, equipment, fixtures (lighting and plumbing), and controls. Indicate commissioning team member inspection and acceptance of each Pre-Functional Checklist item by initials. Acceptance of each Pre-Functional Checklist item by each team member indicates that item conforms to the construction contract requirements in their area of responsibility. Technical Commissioning Specialist acceptance of each Pre-Functional Checklist item indicates that each item has been installed correctly and in accordance with contract documents and the Owner's Project Requirements. Submit the completed and initialed Pre-Functional Checklists no later than 7 calendar days after completion of inspection of all checklists items for each system. Submit one hard copy and an electronic copy. Include manufacturer start-up checklists associated with equipment with the submission of the Pre-Functional Checklists.

- a. The Technical Commissioning Specialist must make at least six visits to the site during construction to observe in-progress installation of building system equipment. On each visit, the Technical Commissioning Specialist must review the Contractor's in-progress checklists to ensure that the commissioning team is inspecting the building system equipment as required. The Technical Commissioning Specialists must document any identified deficiencies and proposed corrective action.

3.1.6.4 Testing, Adjusting, and Balancing (TAB) Report and Field Acceptance Testing

The Mechanical System Technical Commissioning Specialist must review the pre-final TAB Report required by Specification Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC. Identify any deficiencies to the Contracting Officer's Representative and the Contractor's Quality Control Personnel. Resolve all deficiencies prior to TAB Field Acceptance Testing.

The Mechanical System Technical Commissioning Specialist must witness the TAB Field Acceptance Testing specified by Specification Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC. Include a certification by the Mechanical Technical Specialist that no outstanding deficiencies exist in the systems relative to Testing, Adjusting, and Balancing with the final TAB Report submittal.

3.1.6.5 HVAC Controls Test Reports

The Mechanical System Technical Commissioning Specialist must review the Start-Up Testing Report and the PVT Procedures and Reports required by

Specification Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC. Include a certification by the Mechanical System Technical Commissioning Specialist that the submittals contain no deficiencies or that the submittals do not indicate any deficiencies in the HVAC systems or HVAC control systems with each of these submittals.

3.1.6.6 Tests

3.1.6.6.1 Functional Performance and Integrated Systems Tests

Schedule Functional Performance Tests for each system only after the Certificate of Readiness has been approved by the Government for the system. Correct all deficiencies identified through any prior review, inspection, or test activity before the start of Functional Performance Tests. Perform Integrated Systems Tests only after the Functional Performance Tests for each associated system are completed with all deficiencies resolved and after the related Functional Performance Test Checklists have been signed by each commissioning team member.

- a. Functional Performance Tests and Integrated Systems Tests must be performed with the Contracting Officer's Quality Assurance Representative present.
- b. Abort Functional Performance Tests or Integrated Systems Tests when any system deficiency prevents the successful completion of the test.
- c. Technical Commissioning Specialists must lead and document all Functional Performance Tests and Integrated Systems Tests for the systems to be commissioned with the Contractor and appropriate sub contractors performing the Functional Performance Tests and Integrated Systems Tests. The representatives listed in the paragraph Commissioning Team must attend the tests. Abort Functional Performance Tests or Integrated Systems Tests when any required commissioning team member is not present for the test.

3.1.6.6.1.1 Checklist

Use the Functional Performance Test and Integrated Systems Test Checklists from the approved Final Construction Phase Commissioning Plan to guide the Functional Performance Tests and Integrated Systems Tests. Functional Performance Tests must be performed for each item of equipment and each system required to be commissioned and verify all sensor calibrations, control responses, safeties, interlocks, operating modes, sequences of operation, capacities, lighting levels, and all other performance requirements comply with construction contract regardless of the specific items listed within the Functional Performance Test and Integrated Systems Test Checklists provided. Testing must progress from equipment or components to subsystems to systems to interlocks and connections between systems. Integrated Systems Tests must be performed for the interactive operation between systems such as HVAC systems, back-up electrical supply, energy generation systems, and other systems, and verify correct interactive operation, acceptable speed of response, and other contract requirements for both normal and failure modes. Examples of Integrated Systems Tests include the correct operation of HVAC systems during emergency system activation, correct operation of uninterruptible power supplies or energy generators and connected systems, or lighting system operation during power outage or emergency system activation. The order of components and systems to be tested must be determined by the Technical Commissioning Specialists.

3.1.6.6.1.2 Acceptance

Indicate acceptance of each item of equipment and systems tested by signature of each commissioning team member for each Functional Performance Test or Integrated Systems Test Checklist. The Contractor's Quality Control Representative and the Technical Commissioning Specialists must indicate acceptance after the equipment and systems are free of deficiencies.

3.1.6.6.2 HVAC Test Methods

Perform Functional Performance Tests in accordance with the following:

3.1.6.6.2.1 Prior to Testing

Prior to testing operating modes, sequences of operation, interlocks, and safeties, complete control point-to-point observations, test sensor calibrations, and test actuator commands.

3.1.6.6.2.2 Simulating Conditions

Over-writing control input values through the controls system is not acceptable, unless approved by the Contracting Officer's Representative. Identify proposed exceptions in a protocol submitted to the Contracting Officer's Representative for approval. Before simulating conditions, overwriting values (if approved), or changing set-points, calibrate all sensors, transducers and devices. Below are several examples of exceptions that would be considered acceptable:

- a. When varying static pressures inside ductwork can not be simulated within the duct, and where a sensor signals the controls system to initiate sequences at various duct static pressures, it is acceptable to simulate the various pressures with a Pneumatic Squeeze-Bulb Type Signaling Device with gauge temporarily attached to the sensing tube leading to the transmitter. It is not acceptable to reset the various set-points, nor to simulate an electric analog signal (unless approved as noted above).
- b. Dirty filter pressure drops can be simulated using sheets of cardboard at filter face.
- c. Freeze-stat safeties can be simulated by packing portion of sensor with ice.
- d. High outside air temperatures can be simulated with a hair blower.
- e. High entering cooling coil temperatures can be used to simulate entering cooling coil conditions.
- f. Do not use signal generators to simulate sensor signals unless approved by the Contracting Officer's Representative, as noted above, for special cases.
- g. Control set points can be altered. For example, to see the air conditioning compressor lockout work at an outside air temperature below 55 degrees F, when the outside air temperature is above 55 degrees F, temporarily change the lockout set point to be 0 degrees F above the current outside air temperature. Caution: Set points are

not to be raised or lowered to a point such that damage to the components, systems, or the building structure and/or contents will occur.

- h. Test duct mounted smoke detectors in accordance with the manufacturer's recommendations. Perform the tests with air system at minimum airflow condition in ductwork.
- i. Test current sensing relays used for fan and pump status signals to control system to indicate unit failure and run status by resetting the set point on the relay to simulate a lost belt or unit failure while the unit is running. Confirm that the failure alarm was generated and received at the control system. After the test is conducted, return the set point to its original set-point or a set-point as indicated by the Contracting Officer's Representative.

3.1.6.6.2.3 Setup

Perform each test under conditions that simulate actual conditions as close as is practically possible. Provide all necessary materials and system modifications to produce the necessary flows, pressures, temperatures, and other conditions necessary to execute the test according to the specified conditions. At completion of the test, return the affected building equipment and systems to their pre-test condition.

3.1.6.6.3 Sample Strategy

Perform Functional Performance Tests using the following sample strategy. Prepare and complete a Functional Performance Test Checklist for each item of equipment or system to be tested. For sample sizes less than 100 percent for all similar equipment, the Government will select the specific equipment or system to be tested during testing. Equipment Identifiers are as indicated on the design drawings:

HVAC Systems	Sampling Rate (%)	Notes
Air Handling Units (AHU)	100	1
Dedicated Outdoor Air System (DOAS)	100	1
Heat Pumps (HP)	100	1
Ductless Split Systems (DSCU, DSFCU)	100	1
Variable Air Volume Boxes (VAV)	100	1
Exhaust Fans (EF)	100	1
Ceiling Fans (CF)	100	1
Plumbing Systems	Sampling Rate (%)	Notes

Water Heaters (WH)	100	1
Recirculation Pump (RP)	100	1
Thermostatic Mixing Valve (TMV)	100	1
Electrical Systems	Sampling Rate (%)	Notes
Lighting (Interior/Exterior, Emergency Lighting, Occupancy Sensors, Daylight Harvesting)	100	1
Power Distribution Systems	100	1
Stand-By Natural Gas Generator	100	1
Automatic Transfer Switch (ATS)	100	1
Uninterruptible Power Supply (UPS)	100	1
Breaker Coordination	100	1
Building Envelope	Sampling Rate (%)	Notes
Whole Building Air Leakage Testing (performed by test agency) in conjunction with diagnostic testing (thermography and additional diagnostic tests as necessary); Witness Testing and review Testing Report.	-	2
Thermal Envelope Continuity; Witness Testing and review Testing Report.	-	2
Fluid Applied Air Barrier; Construction Mock-up, Witness Testing or Review of Testing Reports, and Construction Site Visits.	-	2
Exterior Joint Sealants; Construction Mock-Up, Witness or Review of Testing Reports, and Construction Site Visits.	-	2
Roofing Systems; Submittal Review and Site Visits.	-	2
Glazing, Skylights, Doors, and Translucent Panels; Submittal Review and Construction Site Visits.	-	2

General Systems	Sampling Rate (%)	Notes
Building Automation System (BAS)	100	1
Utility Monitoring and Control System	100	1
Energy, Gas, and Water Utility Metering Systems	100	1
Testing, Adjusting and Balancing Verification	10	-

Notes:

1. CxC shall create PFCs and FPTs to document installation and functionality of these systems. CxC shall execute PFCs and CxG shall track their completion. CxC shall direct and document FPTs, under the oversight of the CxG.
2. CxC shall create Building Envelope Checklists per specifications. CxC shall witness and document the completion of Building Envelope Checklists as well as review completed Test Reports. CxG shall track completion of Building Envelope Checklists and testing.

Perform Functional Performance Tests and Integrated Systems Tests for all equipment and systems. Prepare and complete a Functional Performance Test Checklist for each item of equipment or system. Prepare and complete an Integrated Systems Test Checklist for each item of equipment or system.

3.1.6.6.4 Seasonal Tests

3.1.6.6.4.1 Initial Functional Performance Tests

Perform Initial Functional Performance Tests as soon as all contract work is completed, regardless of the season. Develop and implement means of artificial loading to demonstrate, to a reasonable level of confidence, the ability of the HVAC systems to handle peak seasonal loads.

3.1.6.6.4.2 Full-Load Conditions

In addition to the Initial Functional Performance Tests, perform Functional Performance Tests of HVAC systems under full-load conditions during peak heating and cooling seasons during outdoor air condition design extremes.

Schedule Seasonal Functional Performance Tests in coordination with the Government.

3.1.6.6.4.3 System Acceptance

Systems may be partially accepted by the Government prior to seasonal testing if they comply with all construction contract that can be tested during initial Functional Performance Tests. All Functional Performance Test procedures must be completed prior to full systems acceptance.

3.1.6.6.5 Aborted Tests and Re-Testing

Abort Functional Performance Tests, Integrated Systems Tests, or Seasonal

Tests if any deficiency prevents successful completion of the test or if any required commissioning team member is not present for the test. Reimburse the Government for all costs associated with effort lost due to re-testing due to test failures and aborted tests. These costs must include salary, travel costs, and per diem for Government commissioning team members. Re-test only after all deficiencies identified during the original tests have been corrected.

3.1.6.6.5.1 100 Percent Sample

Systems or equipment for which 100 percent sample size are tested fail if one or more of the test procedures results in discovery of a deficiency and the deficiency cannot be resolved within 5 minutes during the test.

Re-test to the extent necessary to confirm that the deficiencies have been corrected without negatively impacting the performance of the rest of the system.

3.1.6.6.6 Monitoring Based Commissioning

The Lead Commissioning Specialist (CxC) shall develop monitoring-based procedures to assess the performance of energy and water consuming systems. This includes, but is not limited to, identifying points to be measured and evaluated, determining limits of acceptable values for tracked points and metered values (where appropriate), and determining the frequency and duration of trend monitoring. The CxC shall use this data to evaluate the performance and operation of systems components and develop energy and water usage profiles for applicable systems. The CxC shall identify and document operational errors and deficiencies. The appropriate subcontractor shall take corrective measures, and the CxC shall verify that deficiencies have been corrected. Upon completion of Monitoring Based Commissioning, the CxC shall update the systems manual, with any modifications or new settings, and give the reason for any modifications from the original design.

3.1.7 Training Plan

Develop a training plan which identifies all training required by specification sections associated with commissioned systems. Include a matrix listing each training requirement, content of the training, the trainer name, trainer contact information, and schedule and location of training. Submit one hard copy and an electronic copy of the Training Plan to the Commissioning Specialists and the Government no later than 30 calendar days prior to the associated training.

Document training attendance using training attendance rosters and provide completed attendance rosters to the Commissioning Specialists and the Government no later than 7 calendar days following the completion of training for each system to be commissioned. Submit one hard copy and an electronic copy.

3.1.8 Systems Manual

Prepare and submit a Systems Manual including a signed certification or letter from the Technical Commissioning Specialists and the Lead Commissioning Specialist stating that the Systems Manual is complete, clear, and accurate. The Systems Manual, for all commissioned systems, must conform to Appendix A SYSTEMS MANUAL ORGANIZATION AND CONTENT to ER 25-345-1, available at the USACE Publications website at the following

location:

<https://www.publications.usace.army.mil/USACE-Publications/Engineer-Regulations/>.
Update and resubmit the Systems Manual based on any corrective action taken during the warranty period.

Submit Systems Manual no later than 30 calendar days following completion of Functional Performance Tests and Integrated Systems Tests. Submit three hard copies and an electronic copy.

3.1.9 Maintenance and Service Life Plans

3.1.9.1 Maintenance Plan

Prepare and submit a Maintenance Plan for the project mechanical, electrical, and plumbing systems. Prepare the HVAC and refrigeration sections of the Maintenance Plan in accordance with ASHRAE 180. Develop required inspection and maintenance tasks similar to Section 5 of ASHRAE 180 for the other commissioned systems. The Maintenance Plan must include a list of recommended spare parts for routine or expected maintenance of commissioned systems. The list of spare parts and associated maintenance criteria shall be in the form of a spreadsheet.

Submit the Maintenance Plan no later than 30 calendar days following the completion of Functional Performance Tests and Integrated Systems Tests. Submit three hard copies and an electronic copy.

3.1.9.2 Service Life Plan

Prepare and submit a Service Life Plan for the building envelope, structural systems, and site hardscape that includes the following for each assembly or component:

- a. A description of each including the materials or products.
- b. The estimated service life, in years.
- c. The estimated maintenance frequency and description of maintenance tasks.
- d. The point of maintenance access for the components with estimated service life less than service life of the building.

Submit the Service Life Plan no later than 30 calendar days following the completion of Functional Performance Tests and Integrated Systems Tests. Submit three hard copies and an electronic copy.

3.2 COMMISSIONING REPORT

Following the completion of Functional Performance Tests and Integrated Systems Tests, with the exception of Seasonal Tests, the Lead Commissioning Specialist must prepare a Commissioning Report.

- a. Include an executive summary describing the overall commissioning process, the results of the commissioning process, any outstanding deficiencies and recommended resolutions, and any seasonal testing that must be scheduled for a later date. Indicate, in the executive summary, whether the systems meet the requirements of the construction contract and the Owner's Project Requirements.

- b. Detail any deficiencies discovered during the commissioning process and the corrective actions taken in the report. Include the completed Building Envelope Inspection Checklists, Pre-Functional Checklists, Functional Performance Test Checklists, Integrated Systems Test Checklists, the Commissioning Plans, the Issues Log, Performance Verification Test Reports, Training Attendance Rosters, the Design Review Report, the final TAB Report.
- c. Submit the Commissioning Report no later than 14 calendar days following commissioning team acceptance of all Functional Performance Tests and Integrated Systems Tests with the exception of Seasonal Tests. Submit three hard copies and an electronic copy.
- d. Following any Seasonal Tests or Post-Construction Activities, update the Final Commissioning Report to reflect any changes and resubmit. File the approved, updated, Final Commissioning Report in the Sustainability eNotebook.

3.3 POST-CONSTRUCTION SUPPORT

3.3.1 Post-Construction Endurance Test

Perform an Endurance Test in accordance with the paragraph Endurance Test in Specification Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC once during the peak heating season and once during the peak cooling season during outdoor air condition extremes with the exception that network bandwidth usage measurement and recording is not required. Use the Temporary Trending Hardware, if necessary, in accordance with Specification Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC.

The Mechanical System Commissioning Specialists must review the trend logs from the Endurance Tests to ensure that the systems have stable operation and operate as required by the construction contract, and the Owner's Project Requirements Document. The Commissioning Specialists must provide a Post-Construction Trend Log Report that identifies any deficiencies noted in operation, recommendations for correction, and includes a graphical representation of the trends. Provide one Trend Log Report for the peak cooling season and one Trend Log Report for the peak heating season. Submit one hard copy and one electronic copy of the Post-Construction Trend Log Reports no later than 14 calendar days following receipt of the trend log data by the Commissioning Specialist.

3.3.2 Post-Construction Site Visit

The Commissioning Specialists must visit the building site concurrent with the 9 month warranty inspection to inspect building system equipment and review building operation with the building operating/maintenance staff. The Commissioning Specialists must identify any deficiency of the building systems to operate in accordance with the contract requirements and the Owner's Project Requirements. The Commissioning Specialists must advise the Contracting Officer's Representative of any identified deficiencies and the proposed corrective action. Submit an updated commissioning report and systems manual documenting the results of the post-construction inspection.

3.3.3 As-Built Documents

Provide all As-Built documents associated with the commissioned systems to the Commissioning Specialists. The Technical Commissioning Specialists

must review the As-Built documents for accuracy and confirmation that installed equipment and systems are properly reflected and documented on the As-Built documents. The Technical Commissioning Specialist shall review the As-Built Documents prior to official submission to the Government.

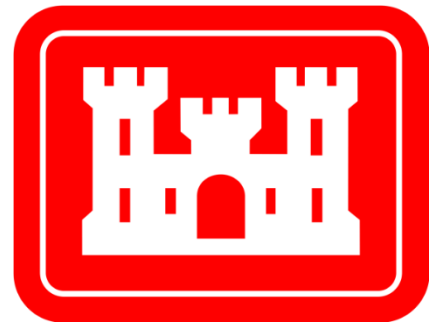
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APPENDIX A - OWNER'S PROJECT REQUIREMENTS DOCUMENT

NOT A CONTRACT DOCUMENT – FOR COMMISSIONING PURPOSES ONLY

Owner's Project Requirements for the
Military Working Dog Kennel

Hunter Army Airfield Savannah, Georgia



US Army Corps of Engineers Savannah District

Project No. 189618

Corrected Final Design Submittal

December 2025

OWNER'S PROJECT REQUIREMENTS

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I Project

A. Project Description

Currently, 1/75th Ranger Battalion MWD Program occupies Building 1030 at HAAF. Building 1030 was adapted as an interim fix to support the new MWD mission operations for the 1/75th Ranger Battalion. This existing facility does not adequately meet the mission requirements and many of the architectural and engineering systems need upgrades or repair. This existing structure was originally constructed in the 1950's as a radio transmitter and communications building. The original facility was never envisioned to support MWD mission operations in accordance with current MWD design standards. The facility has undergone several renovations up to present day including the conversion of the facility to a kennel in the 2007-2008 timeframe.

Building 1030 has significant moisture problems that include water infiltration in the building's slab, a leaking roof, inadequate drainage in the interior and exterior of the facility and clogging and backflow of kennel drains. The building is subject to seasonal flooding due to building elevation. Low water pressure within the facility plumbing system inhibits kennel cleaning. The facility is not constructed to house the programmed number of canines which increases the risk of spread of infectious disease. The quantity of dog runs, and canine break areas is inadequate for the current number of canines within the facility. The current kennel layout does not allow for visual or physical separation between canines which poses substantial safety risks for the dogs and handlers. Renovating existing facilities or a combination of new and renovated facilities has been analyzed and deemed not viable for mission requirements.

Per the DD1391, the MWD Kennel will include kennel administration offices, veterinary exam and surgical suite, TA-50 locker area, latrines with showers, tack room, food preparation and storage areas, indoor and outdoor kennels, and building utility support areas. Fire detection and suppression, energy management control, unclassified and classified communications networks, intrusion detection, surveillance, and access control systems will be provided. Supporting facilities include all related site-work and utilities (electrical, water, gas, sanitary sewer, and information systems distribution), lighting, parking, curb and gutter, sidewalks, storm drainage, landscaping, antiterrorism/force protection measures (AT/FP), obedience course with apparatuses, exercise and break areas, mobility equipment storage, and other site improvements. Special construction includes sustainable construction features complying with Leadership in Energy and Environmental Design LEED "Silver". The AT/FP measures include perimeter barriers, access control, mass notification system, laminated glass, and minimum stand-off distances. Access for people with disabilities will be provided in the kennel administration area. Comprehensive building and furnishings related interior design and audio-visual services are required. The project will include the demolition of building 1030 (9,851 SF). The new building air conditioning is estimated to be 70 kW (20 tons). The facilities will be designed to a minimum life span of 40 years in accordance with DoD's Unified Facilities Criteria (UFC 1-200-02), including energy efficiencies, building envelope and integrated building systems performance.

Per an updated DD1391, dated 11 February 2022, the project calls for a 11,183 SF MWD Kennel with a 500 SF of Unheated Storage Building and a 560 SF Outdoor Break Area. The revised, estimated start of construction is FY2026. Design has proceeded under a directive from USACE Savannah District assuming a new PA of \$15.75M, which would require 1391 to be revised from its current 11 February 2022 date.

II Goals

A. Overall Project Goals

There are several requirements which are critical to the success of the project. These include:

1. Project is completed on time and within budget. "Punch List" items should be expedited for fast completion. No punch list items remain upon occupancy of the facility.
2. System accessibility and maintainability - the design and construction of the building must be energy efficient to operate and maintain. The new building systems must be easily maintainable by staff maintenance personnel, with sufficient access to systems for routine maintenance. Warranty calls should be minimal during the first year of occupancy.
3. Heating and cooling - the heating, ventilating, and air conditioning systems shall provide the appropriate thermal comfort for its occupants while maintaining an environmentally sound and energy efficient status. The systems must provide consistent and individually controllable temperature, humidity, and airflow.
4. Energy efficiency goals – achieve energy use reduction as compared to the ASHRAE 90.1-2013 baseline.
5. Environmental and safety goals – meet all environmental and safety regulations.
6. Quality - use high-quality building materials. Maintain a high-level of construction quality throughout the project by utilizing construction supervision. Select equipment with lowest life cycle costs.
7. Cost of operating facility should be at a minimum. The cost to operate the systems, including utilities, manpower and materials.
8. Warranty of the facility does not start until the substantial completion date.

B. Occupant Comfort

Occupant Comfort is critical to a productive and efficient work environment. Occupant comfort is a key requirement of this project. Comfort is defined as:

1. Temperature – consistent temperature within the space and from space to space.
2. Humidity – control the humidity levels in the space and do not allow the humidity level to achieve levels that causes occupant complaints.
3. Common space – there are open areas with flexibility in use to accommodate various functions and activities
4. Lighting – use of individual task lighting that is adjustable and directional.
5. Controllability of total environment – occupants can control local comfort of temperature, airflow, noise, and seat position.
6. No drafts – consistent airflow throughout the space with no "drafts" or "dead spots".
7. Good flooring – the flooring is aesthetically pleasing, highly durable, and comfortable to walk upon.
8. No glare – there is no glare from outdoor natural lighting. Add manual shades, as necessary.

C. Indoor Air Quality

Better indoor air quality reduces health risks and promotes occupant productivity. Strategies include a no smoking policy, outside air ventilation rates above ASHRAE 62.1 minimums with automatic controls, and reduction of indoor pollutants. IAQ management during construction and before occupancy reduces air quality problems resulting from the construction process. Pollutant source control, increased filtration at outside air supply, and the use of low-emitting interior finishes contribute to a healthier indoor environment.

The following are known activities or conditions that generate or contribute pollutants in/near the facility that impact the HVAC system. HVAC system design must address the following concerns to assure the system provides good health, hygiene, and indoor environmental quality.

1. Poor circulation – build-up of pollutants due to a lack of air circulation.
2. Dumpster – the trash within the dumpster. Provide a garbage staging area in a location to not allow odors into facility. Place outside if necessary.
3. Outdoor air contaminants – build-up of dust, dirt, and other outdoor contaminants within the ventilation system (outdoor air intake).
4. Pests – no pests from outdoors.

5. Smoking – no byproducts of smoking.
6. Noise – noise from adjacent spaces and outdoors.
7. Cleaning – chemicals and materials utilized during the cleaning process
8. Lavatories – restroom byproducts.
9. Mold – growth from water and humidity build-up on materials.
10. Dirty filters – allowing dust and dirt to bypass filtration.

D. Sustainability:

UFC 1-200-02 High Performance and Sustainable Building Requirements is organized around the “Guiding Principles for Sustainable Federal Buildings” to guide transformation in performance of the DOD facility inventory. Design approaches and technologies focus on compliance with the Guiding Principles including sustainable site development, water savings, energy efficiency, materials and resources selection and indoor environmental quality specific to the site, mission, and programmatic needs of the MWD Kennel.

1. Integrated Design
2. Commissioning
3. Optimize Energy Performance
4. Protect and Conserve Water
5. Indoor Environmental Quality
6. Environmental Impact of Materials
7. Climate Change Risk

The project will use LEED v4 Silver to validate compliance with the Guiding Principles and will be registered on LEED Online and submitted for third party certification.

III Functional Uses

A. Building Functional Uses

The overall design, includes the main MWD Facility, accompanied by two support buildings – MWD Break Area and Storage, and a prefabricated Ammo/Explosives Storage structure. The main MWD Facility is approximately 11,123 square feet and is comprised of two primary functions, the administrative areas and the indoor/outdoor kennels. A portion of the administrative areas are located within an access-controlled perimeter, to include the Kennel Master, Trainer, Locker Room, Multi-purpose Handlers, and Telecom spaces. Electronic key card access is located at perimeter doors of the controlled area, and the surrounding walls are built to a sound attenuation rating (STC) of 50. Electronic key card access is located at all exterior doors of the MWD Facility, however those without access to the controlled area of the building enter at the North Hall, and those with authorized access may enter at the main entrance on the plan East side of the facility.

The two support spaces accompanying the MWD Facility includes the MWD Break Area and Storage. The Break Area includes 16 individual kennels that rest on a covered, 2,200 square foot concrete pad. Each kennel is separated by 8 feet high 8 inch sealed CMU block walls, with a wire mesh partition and gate door on the entry side into each kennel, and a wire mesh cap across the top. The kennels are covered by a standing seam metal roof canopy. The additional Storage facility is a 529 square foot pre-engineered metal building, with a double door entrance on the plan East side.

IV Project Requirements:

A. Design Requirements:

The intent of this project is to construct a new Military Working Dog (MWD) Kennel at Hunter Army Airfield, Georgia. The size of the facility is approximately 11,123 square feet in size and is programmed in accordance with DD1391 dated 08 February, 2022 for the SOF Military Working Dog (MWD) Kennel.

B. Building Systems Requirements:

1. Performance & Benchmarking Requirements:

- a. Better than ASHRAE Standard 90.1 – building systems perform better than the baseline requirements in ASHRAE Standard 90.1-2013.
- b. Avoid system degradation – avoid degradation of systems that leads to reduced energy efficiency.
- c. # hot/cold calls per year – track the number of annual comfort complaints to verify that non - energy criteria are not compromised by focusing solely on energy efficiency.
- d. Use of low energy equipment – plug loads reduced each year through acquisition of more energy efficient office equipment.
- e. Actual compared to budget – compare the actual to the budget to verify assumptions and identify opportunities to improve.
- f. Owner expects a high level of material and construction quality.
- g. Durability – high durability with resistance to damage by ambient conditions, users or operation and maintenance personnel.
- h. Time expectancy between failures – no equipment failures are expected during the first five years of operation.

2. HVAC System Requirements:

a. General Ductwork Design:

Air intakes for ventilating and air-conditioning will be located at least ten feet above the ground, except where inside a fenced-in enclosure.

Overhead items such as suspended ductwork, piping, and equipment will be braced laterally as required by DoD Antiterrorism for Buildings Standard. Specifically, mountings will be designed to resist forces equal to 1.5 times the component weight in the downward direction and 0.5 times the component weight in any other direction.

Toilets, and tack room will be provided with transfer air from adjacent spaces to makeup exhaust air requirements in addition to dedicated conditioned air systems.

Air distribution will be provided by air handling units, and exhaust fans. Conditioned air will be supplied or returned to the spaces via externally wrapped metal ductwork connected to diffusers or supply grilles. Exhaust air in the admin areas will be exhausted through uninsulated metal ductwork connected to exhaust registers or grilles. Exhaust air in the indoor kennel space will be returned to the DOAS unit via externally wrapped metal ductwork connected to grilles for heat recovery purposes. Transfer air will be transferred through internally lined metal ductwork connected to diffusers or grilles.

All ductwork will be constructed of galvanized sheet metal or stainless steel, as the application requires. Ductwork will be constructed and installed in accordance with SMACNA requirements. Fire dampers will be provided for all rated walls as required.

b. Cooling and Heating System:

Cooling to the Administrative and Veterinary Treatment / Surgery areas will be provided with cooling and heating through a direct-expansion, air-cooled, split system heat pump with a variable speed compressor. The administrative area will have VAV electric reheat boxes.

Cooling for the Indoor Kennel Area will be provided by a packaged, direct-expansion, air-cooled heat pump.

Heating for the Administrative area will be provided mechanically through the use of an air-cooled heat pump split system combined with electric reheat VAV boxes.

Heating for the Veterinary Treatment and Surgery areas will be provided mechanically through the use of an air-cooled heat pump split system.

Heating for the Indoor Kennel areas will be provided mechanically through the use of a packaged, air-cooled, heat pump with natural gas heat back up.

c. Ventilation System:

Exhaust fans will be in-line centrifugal fans. Discharge air will be through wall louvers and roof gravity hoods. Outside air will be provided by the louvers with motorized dampers during occupied hours for the Administrative and Veterinary Treatment and Surgery areas.

Exhaust for the indoor kennel area will be ducted to the DOAS unit for energy recovery. Quarantine kennel exhaust will be provided by a separate exhaust fan and will not be returned to the DOAS unit for energy recovery. 100% outside air will be delivered to the indoor kennel space through the packaged outdoor unit.

Additional in-line axial exhaust fans will be utilized in the indoor and outdoor kennels to provide emergency smoke evacuation. Smoke exhaust system and associated dampers will be controlled through the fire alarm panel. Smoke exhaust fans are sized based on calculations provided by the QFPE. Limit switches and flow switches will provide positive confirmation of activation back to the fire alarm panel. Make up air will be provided through gravity hood when system is activated.

d. Energy Recovery:

It was determined that energy recovery is not required for the administration area per ASHRAE 90.1 – 2013 Table 6.5.6.1-1. This portion of the facility will be occupied less than 8000 hours a year and will have a maximum of 48% outside air with both units being less than 5500 cfm indicating that no energy recovery is required. The largest source of exhaust will occur in the locker room, tack room and vet treatment/surgery areas.

For the indoor kennel portion of the building it was determined that energy recovery is required per ASHRAE 90.1 – 2013 Table 6.5.6.1-2. This unit is 100% outside air and is providing conditioned air to the space requiring energy recovery to be utilized. An energy recovery wheel is utilized to transfer heat between the outgoing exhaust air and the incoming outside air.

e. Economizer:

ASHRAE 90.1 – 2013 requires economizers for all air handling units of cooling capacity greater than 54,000 Btu/h for climate zone 2A. However, the Administrative area systems exceed the 17% improved efficiency per Table 6.5.1-3, therefore no economizers for the admin areas are required.

UFC 3-410-01-3-6.3 states "For Army and Air Force projects, air economizers must not be used in ASHRAE climate zones 1, 2, 3a, and 4a." Therefore, economizers on the indoor kennel DOAS unit will not be used.

Offices, Toilets, Mother's Room, Multi-purpose Rooms, Tack Room, Locker Room, Corridors, and Food Storage

These areas will be air-conditioned. Corresponding VAV air handling unit (VAV AHU) will be located in the corresponding mechanical room. AHU will have a mixing box section, MERV 8 and MERV 13 filters, DX-cooling/heating coil, and supply fan section. Shut-off type VAV boxes with electric reheat coils will provide zone control. Return air will be ducted from the spaces to the air handling unit. Outside air will be provided through intake louvers with a motorized control damper and will be in accordance with UFC 4-010-01.

f. Veterinary Treatment and Surgery:

These areas will be air-conditioned. Corresponding VAV AHU will be located in the mechanical room. AHU will have a mixing box section, MERV 8 and MERV 13 filters, DX-cooling/heating coil, and supply fan section. Return air will be ducted from the spaces to the air handling unit. Outside air will be provided through intake louvers with a motorized control damper and will be in accordance with UFC 4-010-01.

g. Indoor Kennels:

This area will be air-conditioned. Corresponding constant volume packaged DOAS unit will be located outside the building near the mechanical room. The DOAS unit will have energy recovery section, MERV 8 and MERV 13 filters, DX cooling coil and a natural gas heating. Unit will be equipped with hot gas reheat for dehumidification cycle.

h. Outdoor Kennels:

Outdoor kennels will be unconditioned and open to the elements. This space will have a smoke evacuation system. Ceiling fans will be provided in each outdoor kennel.

i. Mechanical, Electrical and Telecom Rooms:

DX cooling will be provided via ductless, non-CFC refrigerant, split-system units for the telecom, mechanical and electrical rooms. Remote air-cooled condensing units will be pad mounted on the exterior of the building in close proximity for heat rejection, while indoor evaporator coils will be in the respective communication rooms. Mechanical room ductless split will be a heat pump to provide heating and cooling.

j. Toilet Rooms, Locker Room, Tack Room, Veterinary Treatment and Surgery:

Rooms will be exhausted via in-line exhaust fans discharging to the exterior through the exterior building wall louver with interlocked motor operated damper or through a roof hood with interlocked motor operated damper.

k. Control Systems:

Building will have new BACnet Direct Digital Control (DDC) System connected throughout a supervisory module. The system will use BACnet MS/TP protocol. A touch screen human-machine interface (HMI) will be provided with all the factory installed DDC controllers for the building controls. Touch screen HMI will be located within the DDC panel.

The DDC controls will be stand-alone type and have the option to be interfaced with an existing base Utility Management and Control System (UMCS) in the future. The DDC system will be "user friendly", should have good graphics and touch screen operation.

l. Training:

Training by factory certified technicians will be required for all HVAC systems. Training in a classroom type setting will include proper operating and maintenance procedures,

troubleshooting procedures, routine and overhaul maintenance, testing and balancing, and calibration.

m. Test and Balance:

Building systems will be tested, balanced, and adjusted in accordance with SMACNA and IGCC-2018 requirements for commissioning and for measurement and verification credits to verify that the systems are designed, installed, and calibrated to operate effectively.

n. Outdoor Design Conditions:

Summer Conditions	95.6°F dry bulb (0.4% dry condition) 77.3°F wet bulb (0.4% dry condition) 83.6°F dry bulb (0.4% humid condition) 80.3°F wet bulb (0.4% humid condition)

Winter Conditions	27.9°F dry bulb

Location:	N. Latitude 32.017° W. Longitude 81.133°

Elevation	41 feet

ASHRAE Climate Zone	2A

o. Indoor Design Conditions:

Offices, Mother's Room, Multi- purpose Room, Restrooms, TA-50 Locker Room, Tack Room, Food Storage, Veterinary Treatment, Surgery, and Corridors	78°F dry bulb – cooling condition 40-60% Relative Humidity 68°F dry bulb – heating condition

Telecom Room	78°F dry bulb – cooling condition 40-60% Relative Humidity 68°F dry bulb – heating condition

Indoor Kennels	78°F dry bulb – cooling condition 40-60% Relative Humidity 65°F dry bulb – heating condition

Outdoor Kennels	Unconditioned

Electrical & Mechanical Rooms	55°F dry bulb – heating condition 80°F dry bulb – cooling condition

p. Ventilation Air Rates:

Toilet Rooms	50 cfm per fixture (water closet, urinal, or shower head)

TA-50 Lockers	0.5 cfm per ft ²

Tack Room	0.9 cfm per ft ²

Indoor Kennels	10 air changes per hour

q. Conditioned Outside Air Rates:

Offices, Mother's room, Admin, Multi-purpose Room, Restrooms, TA-50 Locker Room, Food Storage	0.06 cfm per ft ² and 5 cfm per person
Veterinary Treatment	2 ACH (ASHRAE 170-2017)
Surgery	3 ACH (ASHRAE 170-2017)
Tack Room	0.18 cfm per ft ² and 7.5 cfm per person
Corridors	0.06 cfm per ft ² – per AHRAE 62.1-2016

3. HVAC General Requirements:

- a. Take appropriate measures to verify sensors are calibrated.
- b. Provide high efficiency motors and variable frequency drives where appropriate.
- c. Verify filter pressure setpoints are documented.
- d. Mechanical system shall be selected based on life cycle cost analysis.
- e. Mechanical system shall be designed in accordance with ASHRAE.
- f. Provide local overrides for lights and HVAC operation.
- g. Provide adequate space for access to above ceiling equipment. Label ceiling tiles with equipment locations.
- h. Equipment provided should include technical support and training from startup technician.
- i. Provide condensate pans with float switch cutout.

4. Plumbing System Requirements:

a. Sanitary Sewer:

Sanitary sewer piping will be designed to provide waste removal from the building water closets, urinals, lavatories, sinks, water coolers, trench drains and floor drains. System will gravity drain to the site sanitary sewer system. Floor drains will have a trap primer connection.

b. Domestic Water:

A 3" domestic water connection will be provided to the facility from the utility provider. Domestic water velocity will not exceed 4 feet per second. Water entrance will be provided with a water meter (independent of utility meter) and reduced pressure zone backflow preventer, located inside the mechanical room. The water meter will have a display for direct visual reading of the meter and will be able to communicate to the building DDC. A pressure calculation was performed, and the building has adequate pressure, therefore a booster pump will not be provided. A 1-1/2" domestic water line will continue from the mechanical room to the outdoor break kennels. Four (4) yard hydrants will be provided at the outdoor break kennels.

The domestic water heating system was evaluated based on a life cycle cost analysis (LCCA) for the facility. Solar hot water heating was evaluated against standard natural gas water heaters and found not life cycle cost effective. See domestic "DHW Solar System Life Cycle Cost Analysis" report for further information.

Domestic hot water will be provided by two 100-gallon storage type natural gas condensing water heaters, each sized for ~50% of the load. Water will be stored at 140°F. A thermostatic mixing valve will reduce the building hot water supply to 131°F. Point-of-use thermostatic mixing valves will be provided at each plumbing fixture to further reduce the water temperature to 110°F. The clothes washer will be provided with 131°F water. A domestic hot water recirculation loop with pump will be provided to keep hot water at remote fixtures throughout the building.

A non-potable protected domestic water system will be provided from the building domestic water system for trench drain washdown connections.

Domestic water piping exposed to ambient conditions in the kennel area will be heat traced for freeze protection.

A water softener will not be provided.

c. Roof Drainage:

Roof drainage will be provided by exterior gutters and downspouts with splash blocks; no internal roof drains are required.

d. Natural Gas:

Natural gas will be provided in the building to serve the water heaters and the mechanical gas fired heating systems. Site natural gas piping will be covered in Civil documents.

e. Piping Systems:

Sanitary waste and vent piping aboveground will be hub-less service weight cast iron; underground piping will be service weight bell and spigot cast iron.

Domestic hot and cold-water piping will be copper tube or steel pipe and will be per UFGS standards (including insulation). Piping will be exposed in the mechanical room and kennel areas and concealed in all other areas.

Condensate piping will be DWV copper pipe.

Above ground natural gas piping will be schedule 40 steel with welded fittings.

f. Building Plumbing Fixtures:

Cast-iron floor drains will be provided for all necessary mechanical room HVAC equipment and in each indoor kennel. Floor drains will also be provided in various locations throughout the facility as needed. Automatic trap primers will be provided on all floor drains within the admin portion of the building. A trench drain with washdown connection will be provided in the outside corridor on each side of the kennel. Area drains in the kennel areas will have a sediment basket to catch debris. Deep seal traps and trap guards will be placed in the kennel area floor drains.

A mop basin will be provided in room 114 - Tack Room for janitorial service. An animal bath will be provided, with drainage directed to a nearby floor drain incorporating a sediment basket for the collection of hair and other debris. In room 111 – Veterinary Treatment, a floor sink will be provided below the exam table. A stainless steel surgeon's scrub sink will also be provided with touch-less activation.

Freeze-proof wall hydrants will be provided on the exterior of the facility at intervals of 100 feet or less and will be located to minimize lawn hoses from being laid across walkways.

Restrooms will be provided with wall-mounted, manual flush valve water closets; wall-mounted, manual flush valve urinals, and wall-mount, vitreous china lavatories with manual fixtures and floor drains with trap primer connections. Fixtures will include low-flow water closets (1.28 gpf), urinals (0.125 gpf) and lavatories (0.35 gpm). Showers will be complete with trench drains, mixing valves and low-flow (1.5 gpm) shower heads.

A stainless steel, double-bowl, filtered electric water cooler with bottle filling station will be provided in the main corridor.

Stainless steel, undermount, double and single compartment sinks will be provided where shown with low-flow (1.5 gpm) faucets.

All restroom fixtures, break area sinks, showers and electric water cooler will be ADA compliant.

The kennel area will be provided with surface mounted cold water hose-bibbs and hot/cold wall faucets with 3/4" garden hose connection.

Water hammer arresters will be provided in the distribution system.

5. Lighting System Requirements:

a. Interior Lighting:

Lighting levels will be designed to meet illuminance values recommended in the UFC 3-530-01 and IES Lighting Handbook. The basic fixtures, not necessarily all fixtures, that will be provided are:

1. 1' x 4' industrial fixtures in unfinished areas
2. 2' x 2' fixtures in transitional spaces, vestibules
3. 2' x 4' fixtures for finished offices, administrative areas, classrooms, conference rooms
4. Linear indirect type fixtures in laboratories and open office areas.
5. low bay light fixtures
6. 6 or 8 inch downlights

Lighting in general throughout the facility will consist primarily of recessed and suspended or pendant mounted LED fixtures. LED color temperature will be 4000 degrees K and the color rendering index (CRI) will be greater than 80. All interior lighting for the facility will be 120V. LED lighting will be provided with 10 year manufacturer's warranty per UFC 3-530-01.

Lighting power densities will be included in the "Calculations" of each submittal demonstrating compliance with ASHRAE 90.1-2013

b. Exterior Lighting:

Exterior lighting shall be LED type and designed per, UFC 3-530-01 requirements and IESNA standards. Exterior lighting fixtures for the roadways and parking lots will be pole mounted. All poles and pole mounted fixtures will be provided by CEMC. Exterior lighting fixtures for the building will be wall mounted. All exterior lighting will be automatically controlled by photocells or by a programmable lighting control panel with astronomical timeclock.

Computer generated photometric calculations will be analyzed to optimize the lighting distribution.

c. Emergency Egress and Exit Lighting:

Emergency lighting will be in accordance with the NEC, NFPA 101, International Building Code, and UFC. The facility will be equipped with a stand-by generator and a separate automatic transfer switch for life-safety loads. Lighting fixtures designated as emergency egress lighting will have an integral battery connected to them. Red LED-type illuminated exit signs will have a 90-minute integral battery as well.

d. Lighting Controls:

Lighting controls will be provided per ASHRAE 189.1-2014 and 90.1-2013. No complex systems controlled by mobile devices are allowed. Dual level lighting will be installed in presentation rooms and other areas accepted as general practice in the industry.

Occupancy sensors will be provided for automatic controls, reduce energy costs and to address LEED criteria. The occupancy sensors will be dual-technology (ultrasonic and infrared) and will be ceiling or wall mounted in open office areas, administrative areas,

lobby entrance, corridors, vestibules, and other rooms that are not kennel or veterinary type spaces. Automatic lighting controls will not be provided in kennel or utility spaces.

6. Electrical System Requirements:

a. Demolition:

Existing building will be demolished. Existing service feed to existing building will be removed back to transformer.

b. Primary Power Distribution System:

The primary electrical distribution system is owned and operated by Canoochee Electric Membership Corporation (CEMC). The proposed primary tie-in location will be at the nearest manhole/handhole or pole. The underground primary ductbank, conductors, pad mounted transformer, transformer pad and primary terminations at the transformer will be provided and installed by CEMC. The new transformer will be sized to meet the calculated electrical loads of the new facility.

c. Secondary Power Distribution System:

The secondary duct bank, secondary conductors will be provided and installed by the Contractor. The secondary terminations will be completed by CEMC. Service entrance conductors will extend from the pad-mounted transformer through new electrical duct bank to the 208Y/120V Main Distribution Panel (MDP) located in the electrical room. The service entrance conductors will be copper with type XHHW insulation. The main distribution panel will be a 208Y/120V, 3-phase, 4-wire and will be provided with digital metering capable of transmitting energy usage.

Feeders will extend from the MDP to large load mechanical equipment, lighting panel, and smaller load panels. 120-volt branch circuits will have dedicated neutrals (no shared neutrals.) All panel neutrals will be 100% rated.

A special standby panel 208Y/120V will be provided to serve the Veterinary Treatment room. The special standby panel will feed Un-interruptible Power Supply (UPS) system and critical panel 208Y/120V for surgery operations equipment. Refer to paragraphs 10.4.4 Backup Power Systems and 10.4.5 Un-interruptible Power Supply (UPS) system for more information.

Panelboards and associated feeders will be sized for 20 percent spare capacity. All panelboards will contain 20 percent spare circuit breakers and surge protection device (SPD) modules. Voltage drop will be limited to 2 percent from main distribution panelboard to panelboard and 3 percent from panelboard to load for a maximum total of 5 percent.

d. Site Grounding:

Grounding will consist of a bare copper ground counterpoise with ¾-inch x 10-foot copper-clad steel ground rods around the building. This counterpoise system will be connected to building columns, derived source transformer secondary neutrals, service entrance equipment, main grounding bar, telecommunication main grounding bar, and the lightning protection system. All connections will be exothermic welded connections. The building ground will be designed for 5 ohms or less.

e. Standby Backup Power Systems:

A standby generator system will be provided and will provide standby power for Veterinary Treatment / Vet Surgical Procedures rooms, the (4) exhaust fans within the kennel area, and the fire panel.

Uninterruptible Power Supplies (UPS) will be provided and will provide power for the Veterinary Treatment/Vet surgical procedure room.

Generator will be natural gas fueled, 208Y/120V, 3-phase, 4-wire and will be installed in a sound attenuated, weatherproof enclosure. Generator shall be TIER 4 permitted for air quality to comply with Federal, state, and local regulations.

An automatic transfer switch (ATS) will be provided for switch between normal power and generator for standby panel, UPS, and critical panel.

f. Interior Grounding:

Grounding will be provided in accordance with the NEC. All feeder and branch circuits will have a "green" insulated equipment ground conductor in addition to the conduit being used as a grounding path.

A main ground bar will be provided in the main electrical room. A primary bonding busbar will be provided in the communication room. A ground conductor will be routed from the main grounding bar to the primary bonding busbar as well as a ground conductor from the main ground bar to the building counterpoise system. This ground counterpoise will be connected to building columns, service entrance equipment, and the lightning protection system.

g. UPS System:

An Uninterruptible Power Supply (UPS) will be provided to power critical surgical procedure equipment during generator startup period.

h. Lightning Protection Systems:

A traditional franklin rod type Lightning Protection System (LPS) in accordance with NEC, NFPA 780 and UFC 3-575-01 will be provided for the facility. An array of roof mounted air terminals, roof conductors and down conductors will be included with the system. The lightning protection system will be interconnected to the building counterpoise system. Test wells will be provided for the grounding system. The lightning protection system will be installed under the supervision of an LPS certified master installer. The LPS will be required to obtain a UL Master label per UL96A.

7. Architectural Requirements:

a. Overview:

The overall design, includes the main MWD Facility, accompanied by two support buildings – MWD Break Area and Storage, and a prefabricated Ammo/Explosives Storage structure. The main MWD Facility is approximately 11,123 square feet and is comprised of two primary functions, the administrative areas and the indoor/outdoor kennels. A portion of the administrative areas are located within an access-controlled perimeter, to include the Kennel Master, Trainer, Locker Room, Multi-purpose Handlers, and Telecom spaces. Electronic key card access is located at perimeter doors of the controlled area, and the surrounding walls are built to a sound attenuation rating (STC) of 50. Electronic key card access is located at all exterior doors of the MWD Facility, however those without access to the controlled area of the building enter at the North Hall, and those with authorized access may enter at the main entrance on the plan East side of the facility.

The two support spaces accompanying the MWD Facility includes the MWD Break Area and Storage. The Break Area includes 16 individual kennels that rest on a covered, 2,200 square foot concrete pad. Each kennel is separated by 8 feet high 8 inch sealed CMU block walls, with a wire mesh partition and gate door on the entry side into each kennel, and a wire mesh cap across the top. The kennels are covered by a standing

seam metal roof canopy. The additional Storage facility is a 529 square foot pre-engineered metal building, with a double door entrance on the plan East side.

b. MWD Facility Exterior Wall Construction:

The exterior wall assembly surrounding the administrative portion of the building consists of an 8' high brick veneer water table to align with the Base Installation Planning Standards, capped with a 4" high precast concrete cap. The upper portion of the exterior wall consists of prefinished metal panels. This façade is installed over a 2" air space, 2" rigid insulation (R-10) over a fluid applied air barrier on 5/8" fiberglass reinforced gypsum sheathing over 6" metal studs with batt insulation (R-21) and finished with 5/8" type 'X' gypsum wall board on the interior.

The exterior wall assembly at the Indoor/Outdoor Kennel portion of the building consists of a 4' high CMU block wall, with a 4" high precast concrete cap, and a thin brick veneer adhered to the face of the CMU block. The mid-portion of this exterior wall consists of a 2'-8" high opening with a prefabricated wire mesh partition, secured with steel framing per the pre-engineered metal building manufacturer. The upper portion of the wall consists of prefinished metal panels on the exterior over fiberglass reinforced gypsum sheathing on a steel framing per the pre-engineered metal building manufacturer and finished with 5/8" gypsum wall board on the interior and 1/2" metal panel.

The prefinished metal paneling on each portion of the facility extends to the roof above. All finishes on the exterior wall construction align with the Fort Stewart Hunter Army Airfield Installation Planning Standards.

c. MWD Break Area Exterior Wall Construction:

The Break Area consists of 16 separate outdoor kennels. The exterior wall assembly at the Break Area consists of 8' high, 8" sealed CMU block walls that divide each kennel. The partition upon entry into each individual kennel consists of galvanized steel wire mesh partition with grill panel design, and gate door for access.

d. MWD Storage Facility Exterior Wall Construction:

The MWD Storage Facility is a pre-engineered metal building. The exterior wall assembly consists of metal framing with prefinished metal paneling on the exterior.

Roof (MWD Facility):

The roof system will consist of Steel Standing Seam Metal Roof, over underlayment over R-30 rigid insulation over air barrier and fiberglass reinforced gypsum sheathing over structural steel decking supported by steel roof trusses. Roof type will be a gable roof. All roof slopes to be 3/12. Roof soffit overhang is 2 feet deep max, with a prefinished metal fascia. The gutter discharges to exposed downspouts that are connected to the underground stormwater system.

The structural steel decking within the facility differs between the admin and indoor/outdoor kennels. The two areas are separated by an isolation joint. The structural steel decking within the admin area is a fluted, galvanized steel deck with G90 coating. Because of sounds stemming from the adjacent range and within the kennel itself, noise reduction is prioritized in this design. The Indoor/Outdoor Kennel area (to include Quarantine) is designed with a perforated acoustical galvanized steel deck with acoustical insulation batts within the fluted deck. A fluted, cellular deck in conjunction with the polyisocyanurate roof insulation has a noise reduction value (NRC) of 0.85.

e. Break Area Roof:

The roof system consists of a gable roof with 3/12 slope, steel standing seam metal roof, over structural steel decking supported by light gauge roof trusses. The canopy is held up with structural columns, with an eave height of 11 feet 6 inches.

f. Storage Facility Roof:

The roof system consists of a steel standing seam metal roof, over structural steel decking supported by light gauge roof trusses. Overhangs are not a typical eave condition for a pre-engineered metal building. Creating an atypical pre-engineered metal building condition increases the risk of water intrusion due to the added complexity and deviates from the standard warranty, therefore the storage facility is designed without overhangs.

g. Doors:

The exterior personnel doors on the MWD Kennel and MWD Storage Facility will be extra heavy duty, flush insulated hollow metal and set in heavy gage steel hollow-metal door frames. All exterior doors into the facility are designed with electronic key card access. Electronic keycard access is also provided on doors located around the perimeter of the controlled access area. The main entrance on the east side of the facility will be an aluminum storefront assembly with side-lites and full-lite glazed door (insulated). Hardware and locksets will be heavy duty type and keyed per base standards. Interior personnel doors will be heavy-duty hollow metal types. Hollow metal doors will be narrow-lite or flush and set in heavy gage steel door frames. The thermal, sound transmission, fire separation, and security performance characteristics of each door will conform to the characteristics of the partition in which the door is installed.

The indoor and outdoor individual kennels within the MWD Facility and MWD Break Area will receive a hinged, gate door keyed per base standards. The indoor kennels will receive a gate door consisting of a 6 ft high solid stainless-steel panel, with 2 ft of stainless-steel grill panel design, wire mesh partition above. The solid steel panel is meant to obstruct the view of the dogs across from one another in the interior kennels. The outdoor kennels will receive a gate door consisting of stainless-steel wire mesh in its entirety. The indoor and outdoor kennels are connected with an insulated, aluminum faced guillotine door. The guillotine door tracks are mounted on the face of the sealed CMU wall of the interior kennel wall and is operated by a pulley system.

h. Building Air Barrier System:

The roof air barrier system consists of a membrane air barrier over structural steel decking and continues over top and down roof eave blocking. The portion of the roof covering the Indoor, Outdoor and Quarantine Kennels of the facility also consists of a membrane air barrier over structural steel decking, however rather than extending out over the Outdoor Kennels, a steel bent plate provides a break in the roof structure. This allows the air barrier to fold over the bent plate and down to meet the metal deck so that the air barrier remains continuous with that of the fluid applied air barrier installed vertically on the CMU wall below.

In the administrative portion of the MWD Facility, the wall system is comprised of a continuous fluid applied air barrier over fiberglass reinforced gypsum sheathing. The

indoor/outdoor kennel portion of the facility is not insulated and therefore does not contain an air barrier system.

i. Interior Walls:

All partition walls along the perimeter of the administrative controlled access area of the MWD Facility are designed as STC 50 minimum and extend to the structural metal deck above. Partition walls outside of the controlled access portion of the administrative areas will extend to the structural metal deck in order to decrease sound transmission within the facility with a minimum sound transmission rating (STC) of 45. Walls located around the perimeter of the Veterinary Treatment and Surgery require a 1 HR fire rating and will also extend to the structural metal deck above.

In the indoor/outdoor kennel portion of the facility, interior partitions extending from floor to the deck above to separate the indoor kennel, outdoor kennel, and quarantine, consist of 8" sealed CMU walls. Partition walls that separate each individual kennel consists of 6 ft high 8 inch sealed CMU walls with 2 ft of wire mesh partition with grill panel design secured above to create an 8 ft high partition (6 ft CMU, 2 ft wire mesh). The concrete floor slab in the indoor kennel and connecting outdoor kennel has a 0.25/12 slope. The connecting Kennel Corridor located at the Outdoor Kennel also has a 0.25/12 slope. The two slopes are joined by and slope toward a continuous trench drain within the Kennel Corridor.

Quarantine kennels exist adjacent to the indoor/outdoor kennel. The Quarantine portion of the facility is separated from the rest of the facility by a sealed 8" CMU wall extending from the floor slab to the structural metal deck above to avoid contamination between sick dogs housed in the quarantine area and healthy dogs housed in the indoor/outdoor kennels. The concrete floor slab in the Indoor Quarantine Kennel and connecting Outdoor Quarantine Kennel has a 0.25/12 slope. The connecting Quarantine Corridor has a 0.25/12 slope. The two slopes are joined by and slope toward a continuous trench drain within the Quarantine Corridor. This trench drain is separate from the Kennel Corridor to avoid contamination between the two areas.

j. Interior Ceilings:

Ceilings will either be open to deck, drywall, or suspended ceiling types. Open ceilings are provided in utility spaces and outdoor kennels. Utility open ceilings are exposed metal deck and open web truss, painted. Suspended ceilings are provided throughout the rest of the facility, consisting of 2' x 2' acoustical ceiling tiles. The Indoor Kennel consists of 2' x 2' perforated acoustical ceiling tiles with insulation as an additional measure to control sound attenuation within the Kennel. Drywall type ceilings are provided in all restrooms, and the mothers room. These ceilings will be 5/8" moisture-resistant Gypsum wall board, painted.

C. Construction Process Requirements:

1. Quality Management

As in other quality management systems, achieving or increasing the level of quality is accomplished by every team member and worker on the project. This means that when anyone on the project identifies opportunities for improvement, or a potential problem, it should be brought to the immediate attention of the project manager or a member of the commissioning team. It may not be possible to incorporate every good idea on this project,

but the knowledge gained shall be beneficial to future projects. Potential problems that can be avoided are to everyone's benefit. Quality Management Requirements are as follows:

- a. Provide schedule updates in a timely manner.
- b. All contractors should exhibit a high level of integrity in their work and about the entire project.
- c. Project communications should have a clear "chain of command" to be followed.
- d. Conduct regular meetings and/or conference calls to keep entire team informed on the status of project.
- e. Provide an FTP site or submittal sharing software with access for all members of construction and design team.
- f. Leave premises "broom clean".
- g. All work conforms to current OSHA safety standards with a published goal of an injury-free project. Signage shall be posted during construction noting the number of injury free workdays on the project.
- h. All HVAC equipment shall be installed per specifications and manufacturers recommendations and requirements.

D. Operation & Maintenance Requirements:

1. Maintainability Requirements:

- a. Provide Equipment Inventory Lists.
- b. Training shall be provided and videotaped to be available for all OM staff or facility occupants. Video-taped training should be provided.
- c. Provide accessibility to equipment and routine maintenance procedures.
- d. Provide adequate workspace for maintenance staff to work and store material.
- e. Involve maintenance personnel in construction walkthroughs.
- f. Provide OM Manuals and training to staff before substantial completion.
- g. Create a warranty manual for use by the maintenance staff.
- h. Provide contact information list of original contractors for project.

2. Project Documentation Requirements

To properly install, start-up, operate, troubleshoot, and maintain the HVAC systems for the life of the facility, accurate and accessible documentation is required. The owner requires all documentation to be tailored to the specific components installed. For HVAC systems, the following documentation shall be submitted prior to substantial completion:

- a. Provide very detailed startup report rather than check the box. Record setpoints and programming parameters.
- b. O&M manuals shall include necessary documentation to describe the processes, activities, tools, and standards involved with operating, administering, and maintaining any system.
- c. As-built drawings shall show the modifications made by contractors to the design during construction. The drawings shall be accurate and understandable so that the Building Maintenance Staff can perform routine maintenance and system adjustments.
- d. Test & Balance report shall be submitted by the TAB contractor and kept on site for reference.
- e. A troubleshooting matrix should be provided for typical issues anticipated for the system.
- f. Accurate start-up and shutdown procedures provide the Facility Maintenance Staff with instructions on how to enable and disable systems.
- g. Detailed sequence of operations on any low voltage system with software logic diagrams.
- h. Technical support numbers should be available to easily located technical support telephone numbers and contact information.
- i. Maintenance schedule matrix detailing what is required when, and why.
- j. Valve chart that details where each valve is located, its number, and its operation.
- k. Parts list and contact information on obtaining the parts.

3. Training Criteria:

Training needs to contain a variety of sessions that operations and maintenance personnel and building occupants shall attend. The sessions shall be digitally recorded and retained for long-term availability to changing staff. The following defines what is considered successful training:

- a. Develop a detailed training plan from each discipline. Verify O&Ms and As-Builts have been submitted and approved 2 weeks prior to scheduling training.
- b. O&M (for users and O&M staff) training for building systems (HVAC, plumbing, fire alarms, emergency power, lighting controls, security, switchboards, etc.) – different levels of training for both users and O&M staff.
- c. HVAC building automation system – detailed instruction on use of the building automation system in troubleshooting and fixing problems.
- d. Training with an operational plan – provide training around an operational management plan on how the building shall actually be managed to provide direct context to the training.
- e. Safety training on building systems for O&M – include safety training for the O&M staff relative to such items as confined spaces, Lock Out Tag Out, handling of chemicals, emergency response, etc.
- f. Energy systems along with related mechanical system – training on the interaction of the mechanical systems relative to the energy efficiency of the facility.
- g. Training for O&M staff by space areas – specific attention paid to the unique needs of each area, including contact person introduction and communication procedures.
- h. Training for contractors on installing special systems/equipment – provide training by the manufacturer on the proper installation and start-up of systems and equipment.
- i. Troubleshooting on building systems – a session on typical problems that shall likely be encountered in operating the facility and guidance (matrix) on how to troubleshoot and resolve the problem.

V OPR Version History:

The changes made to this OPR document throughout the Design, Construction, and Occupancy and Operations Phases are summarized in the following table. Tracking of this information is critical in that it enables future operators and design professionals an understanding of the trade-offs made during the project and the resulting impact on the facility and achievement of the OPR.

Rev. No.	Date	Description of Revisions
0	May 2022	65% Submittal
1	Sept 2022	95% Submittal
2	Dec 2022	Corrected Final Submittal
3	Dec 2025	Corrected Final Re-Submittal
4		

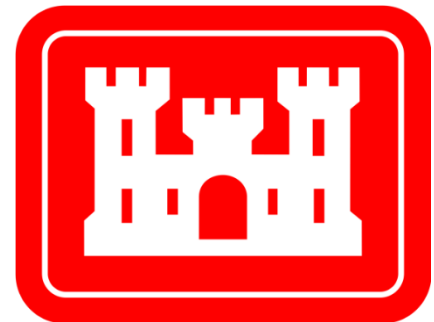
END

APPENDIX B - BASIS OF DESIGN

NOT A CONTRACT DOCUMENT – FOR COMMISSIONING PURPOSES ONLY

Basis of Design for the
Military Working Dog Kennel

Hunter Army Airfield Savannah, Georgia



US Army Corps of Engineers Savannah District

Project No. 189618

Corrected Final Design Submittal

December 2025

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Part 1

Executive Summary

Part 1: Executive Summary

1.1 Authority

Under Contract Number W912HN-18-D-2002, Burns & McDonnell was authorized to complete the 65% Preliminary through 100% Final Design of the new Military Working Dog (MWD) Kennel at Fort Stewart-Hunter Army Airfield, Savannah, Georgia. The project number associated with this DD 1391 is PN69262. The Ready to Advertise was submitted on 27 April 2023. The project went to bid, and pricing exceeded funding, therefore the project paused for re-bidding to occur in 2026.

To support rebidding, a modification under contract Number W912HN25F2021 was issued to Burns & McDonnell in August 2025 to perform a life safety code and criteria review and submit a new corrected final design and Ready to Advertise submittal reflecting changes required from the life safety code and criteria review.

1.2 Kick-Off Meeting

In support of the modification for the life safety code and criteria review, a kickoff meeting was held on 9 September 2025.

Under the previous contract, a project kick-off meeting was held as a teleconference on 3 March 2022 to provide an open forum for exchange of ideas to obtain an understanding of the project needs, identify issues and provide solutions. During the kick-off meeting, project requirements were further reviewed, using the 35% Concept as the basis of design, and adjusted to meet the needs of the users and the budget constraints. The 65% submittal followed for submission on 12 May 2022. A 65% design review meeting was held on 2 June 2022 to review government comments and determine the path forward for further design development. The 95% design submittal was prepared and submitted 16 September 2022. A 95% design review meeting was held on 9 November 2022 to review government comments. The 100% corrected design submittal was provided 12 December 2022.

Participants in all meetings included representatives from 1/75th Ranger Battalion, Fort Stewart-Hunter Army Airfield (HAAF) Department of Public Works, USACE – Savannah District, United States Army Special Operations Command, and Burns & McDonnell Design Team.

1.3 Project Summary

Currently, 1/75th Ranger Battalion MWD Program occupies Building 1030 at HAAF. Building 1030 was adapted as an interim fix to support the new MWD mission operations for the 1/75th Ranger Battalion. This existing facility does not adequately meet the mission requirements and many of the architectural and engineering systems need upgrades or repair. This existing structure was originally constructed in the 1950's as a radio transmitter and communications building. The original facility was never envisioned to support MWD mission operations in accordance with current MWD design standards. The facility has undergone several renovations up to present day including the conversion of the facility to a kennel in the 2007-2008 timeframe.

Building 1030 has significant moisture problems that include water infiltration in the building's slab, a leaking roof, inadequate drainage in the interior and exterior of the facility and clogging and backflow of kennel drains. The building is subject to seasonal flooding due to building elevation. Low water pressure within the facility plumbing system inhibits kennel cleaning. The facility is not constructed to house the programmed number of canines which increases the risk of spread of infectious disease. The quantity of dog runs, and canine break areas is inadequate for the current number of canines within the facility. The current kennel layout does not allow for visual or physical separation between canines which poses substantial safety risks for the dogs and handlers. Renovating existing facilities or a combination of new and renovated facilities has been analyzed and deemed not viable for mission requirements.

Per the DD1391, the MWD Kennel will include kennel administration offices, veterinary exam and surgical suite, TA-50 locker area, latrines with showers, tack room, food preparation and storage areas, indoor and outdoor kennels, and building utility support areas. Fire detection and suppression, energy management control, unclassified and classified communications networks, intrusion detection, surveillance, and access control systems will be provided. Supporting

facilities include all related site-work and utilities (electrical, water, gas, sanitary sewer, and information systems distribution), lighting, parking, curb and gutter, sidewalks, storm drainage, landscaping, antiterrorism/force protection measures (AT/FP), obedience course with apparatuses, exercise and break areas, mobility equipment storage, and other site improvements. Special construction includes sustainable construction features complying with Leadership in Energy and Environmental Design LEED "Silver". The AT/FP measures include perimeter barriers, access control, mass notification system, laminated glass, and minimum stand-off distances. Access for people with disabilities will be provided in the kennel administration area. Comprehensive building and furnishings related interior design and audio-visual services are required. The project will include the demolition of building 1030 (9,851 SF). The new building air conditioning is estimated to be 70 kW (20 tons). The facilities will be designed to a minimum life span of 40 years in accordance with DoD's Unified Facilities Criteria (UFC 1-200-02), including energy efficiencies, building envelope and integrated building systems performance.

Per an updated DD1391, dated 11 February 2022, the project calls for a 11,183 SF MWD Kennel with a 500 SF of Unheated Storage Building and a 560 SF Outdoor Break Area. The revised, estimated start of construction is FY2026. Design has proceeded under a directive from USACE Savannah District assuming a new PA of \$15.75M, which would require 1391 to be revised from its current 11 February 2022 date.

1.4 Environmental

Geo-Hydro Engineers, Inc. completed the Pre-Demolition Asbestos Survey and Lead-Based Paint Screen for the Military Working Dog Kennel property located at Fort Stewart - Hunter Army Airfield. The subject property consists of a 9,000-square foot Working Dog Kennel and occupied veterinarian areas. The purpose of the pre-demolition asbestos survey and lead-based paint screen is to identify asbestos containing materials (ACMs) and lead-based paint (LBP) that will require special handling during demolition.

The asbestos containing building materials laboratory analyses detected regulated concentrations of asbestos in 3 of the 82 samples analyzed. The results of the asbestos laboratory analysis are presented in Appendix G. The quantities of ACM noted are estimates only and are not to be used for asbestos abatement cost estimates. Asbestos contractors are expected to calculate their own ACM quantities for cost estimating and regulatory notification purposes.

The lead-based paint laboratory analyses detected lead above 0.5% by weight in one of the 11 paint chip samples collected from the subject property. Lead was detected at 0.605% by weight in the white paint within sample DKL-10, collected from an interior metal window (Plate 11).

Prior to demolition, a licensed asbestos abatement contractor should remove and dispose of the asbestos containing materials identified by the report that will be disturbed during demolition. The Georgia Environmental Protection Division requires notifications for demolition or renovation of ACMs. Additionally, ACMs encompassing at least 10 square feet are regulated by the U.S. Environmental Protection Agency (USEPA) under the National Emissions Standards for Hazardous Air Pollutants and by the Occupational Safety and Health Administration (OSHA) under its worker protection regulations. These regulations require special handling and disposal procedures when asbestos containing materials are disturbed.

Regarding lead remediation, the United States Department of Housing and Urban Development (HUD) defines "lead-based paint" as paint containing more than 0.5% lead by dry weight of the paint. Based on the HUD's lead-based paint definition, paint chip laboratory analyses did detect lead-based paint associated with one paint chip sample collected. It's recommended that the demolition contractor make a specific composite sample of the demolition debris for Toxic Characteristic (TC) analysis for lead. Demolition debris from commercial projects consisting of components painted with lead-based paint requires TC analysis for lead. When the demolition debris does not exhibit TC for lead that exceeds the regulatory threshold of 5 milligrams per kilogram as a hazardous waste, then the waste may be disposed in a permitted municipal solid waste landfill or a permitted construction and demolition debris landfill. Materials containing lead-based paint are regulated by the OSHA under its worker protection regulations.

1.5 **Cost Estimate**

The current DD Form 1391 programmed amount (rounded) for the Military Working Dog is \$10,100,000. As of July 17, 2022, the government submitted a request for PA increase to \$15.75M. Design was allowed to continue assuming a new PA of \$15.75M. The target Construction Cost Limit (CCL) for the project is \$14.175M; 90% of programmed amount.

A detailed parametric design estimate for the 100% Corrected Final Design submittal was provided December 2022. The previously submitted 100% Corrected Final Design submittal had a current working estimate (CWE) of \$14,571,482 compared to the PA of \$15.75M.

A revised cost estimate will be provided upon issue of the Ready to Advertise submittal, and at completion of the revised corrected final that reflects the life safety code and criteria review updates to the design. The estimated construction cost issued with specific instructions dated 16 July 2025, and for this modification indicates an estimated construction cost of \$14.276M.

1.6 **Design Schedule**

<u>Milestone</u>	<u>Date</u>
Contract NTP-65% Preliminary through 100% Corrected Final	19 JAN 2022
Design Kick-Off Meeting	3 MAR 2022
Submit Kick-Off Meeting Minutes	14 MAR 2022
65% Preliminary Design Submittal	12 May 2022
Complete Govt. Review	26 May 2022
AE Response to Gov't Review Comments	30 May 2022
65% Preliminary Design Review Meeting (Virtual)	2 June 2022
95% Design Submittal	16 Sept 2022
Complete Design Review	29 Sept 2022
AE Responses to Gov't Review Comments	6 Oct 2022
95% Design Review Meeting (Virtual)	9 Nov 2022
100% Corrected Final Design Submittal	22 Dec 2022
Ready to Advertise Submittal	27 April 2023

MODIFICATION UNDER W912HN25F2021

Kick off call	9 September 2025
Code and Criteria Review	26 September 2025
Revised Corrected Final Design Submittal	17 December 2025
Government Review Complete	6 January 2026
Ready to Advertise Submittal	29 January 2026

Part 2

Civil

Part 2: Civil

2.1 Technical Criteria and Standards

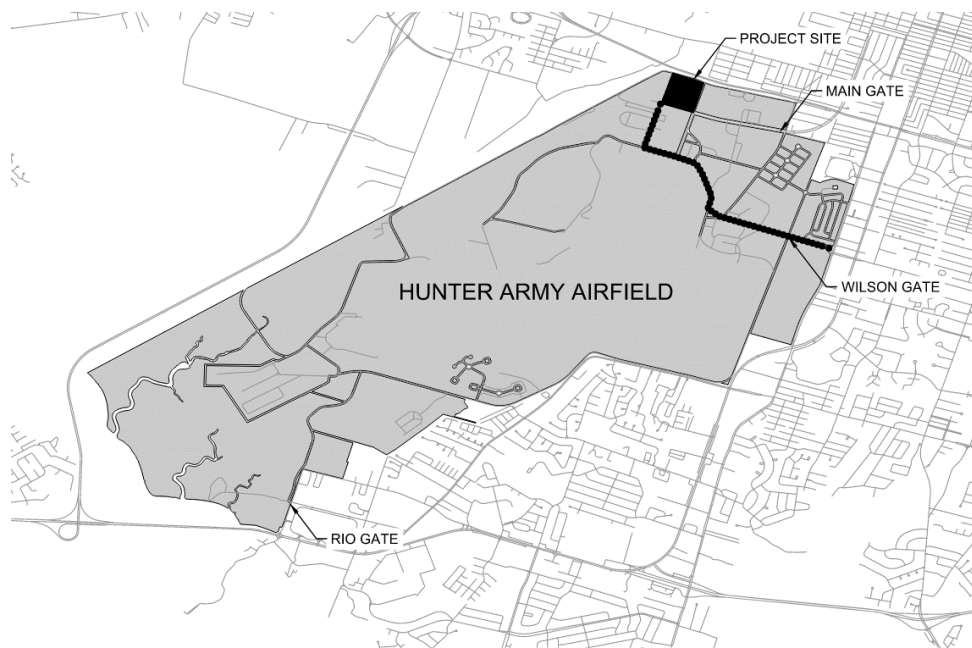
ADA/ABAAG	Americans with Disabilities Act
EISA Section 438	Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act
MUTCD	Federal Highway Administration (FHWA), Manual on Uniform Traffic Control Devices (MUTCD)
NPDES	National Pollutant Discharge Elimination System (NPDES) for Construction Activities
Hunter Army Airfield Installation Design Guide	
SDDCTEA Pamphlet 55-17	Better Military Traffic Engineering
UFC 1-200-02	High Performance and Sustainable Building Requirements
UFC 3-101-01	Architecture
UFC 3-201-01	Civil Engineering
UFC 3-201-02	Landscape Architecture
UFC 3-210-10	Low Impact Development
UFC 3-210-02	POV Site Circulation and Parking
UFC 3-220-08FA	Engineering Use of Geotextiles
UFC 3-250-01FA	Pavement Design for Roads, Streets, Walks, and Open Storage Areas
UFC 3-250-03	Standard Practice Manual for Flexible Pavements
UFC 3-250-04	Standard Practice for Concrete Pavements
UFC 3-600-01	Fire Protection Engineering for Facilities
UFC 4-010-01	DoD Minimum Antiterrorism Standards for Buildings
UFC 4-010-02	DoD Minimum Antiterrorism Standoff Distances for Buildings
UFC 4-022-03	Security Fences and Gates

2.2 Site Layout

The proposed MWD Kennel Project is to be sited on an approximately 3-acre site located within the controlled perimeter of Hunter Army Airfield in Savannah, Georgia. The proposed site is bound by Perimeter Road and WM F Lynes Parkway to the North and Stephen Douglas Street to the West. The existing kennel building (Bldg. 1030), outdoor kennels, and obedience yard bounds the site to the East. Springfield Canal bounds the site to the South. Approximately 2 acres of the site is currently undeveloped, forested area.



Hunter Army Airfield Location Map



Installation Map

The facility will be oriented to generally face in the southern direction with frontage along Stephen Douglas Street. The proposed facility requires 14 POV parking spaces within the kennel security fence and two visitor spaces outside of the fence. A manual cantilever slide gate will control access to the facility and POV parking lot. A dumpster pad / recycling center is sited outside of the kennel security fence for ease of access.

The proposed building has been sited to meet standoff and unobstructed space requirements per UFC 4-010-01. This project is located within a controlled perimeter which has the ability to demonstrate the capability to search for and detect explosives. A proposed unobstructed space of 33 feet was utilized for the POV parking and roadways within the controlled perimeter and 141 feet clear zone to the controlled perimeter. All existing electrical and mechanical equipment within the unobstructed space will be enclosed within the proposed fenceline.

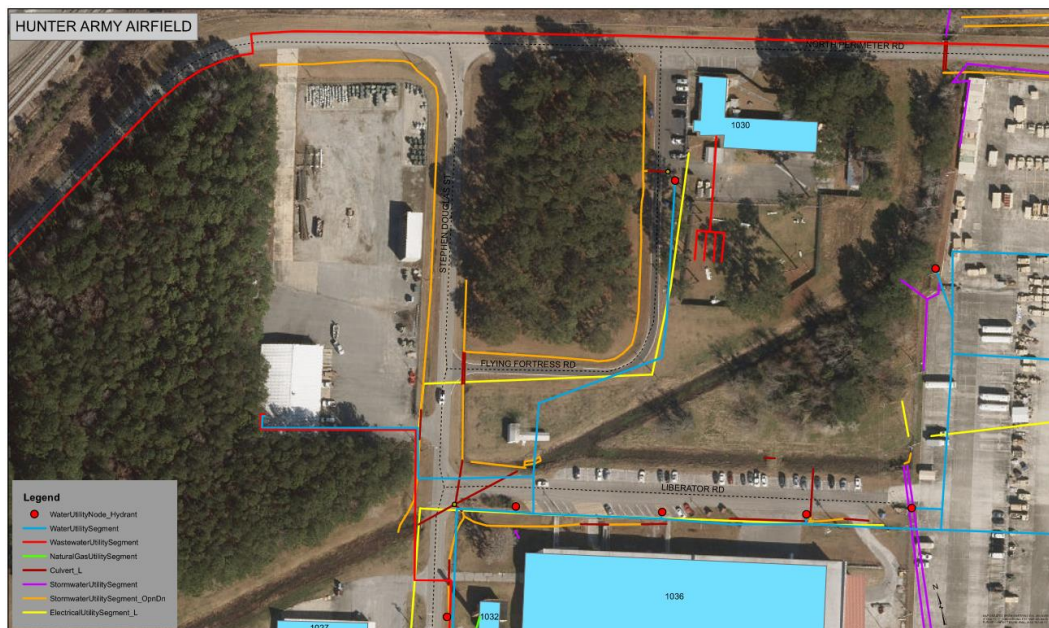
Sidewalks and ADA accessible ramps have been incorporated to accommodate pedestrian movement from the pedestrian entrances and adjacent facilities. All sidewalks interrupted by vehicle rights-of-way will have a pedestrian crosswalk, pavement markings, and signage. Sidewalks will have a minimum width of 5-feet except for portions of the sidewalk network connecting to the main building entrances have been widened to be 10-feet to accommodate multiple personnel movements. Sidewalks not in vehicular movement areas will consist of a minimum of 4-inches of PCC on compacted subgrade. Sidewalks will be light broom finish. ADA accessible ramp types will be provided with detectable warning surface system. A prominent entrance with a courtyard is designed for the building entrance with colored concrete and circular bench seating.

2.3 Subsurface Investigation

A subsurface investigation was performed by USCOE in June 2020 for this project and included in the Appendix of the design analysis. Topsoil was encountered in the soil test borings with an average thickness of 3 inches. Underlying the topsoil, sandy lean clay (CL) was encountered to depths as great as 9 feet below existing grade.

2.4 Topographical Survey

A topographical survey was completed for the project by Lowe Engineers in March 2020. The horizontal datum is Georgia State Plane (East Zone) NAD83 and the vertical datum is NAVD 1988.



2.5 Site Demolition

The existing kennel facility (Bldg. 1030) and sheds will be demolished and removed. Utilities impacted by the construction activities and actively serving adjacent facilities will be relocated. Abandoned or inactive utilities will be demolished and removed. The existing outdoor kennels, obedience yards, asphalt pavement, and concrete pavement are to be protected and remain on site.

2.6 Access Drives and Roads

An asphalt access roadway (two-lane; 26' wide) will be provided from Stephen Douglas Street to the POV parking lot. A fire access and maintenance asphalt driveway (one-lane, 20' wide) will continue from the POV parking lot to Perimeter Street.

2.7 Parking

The parking areas have been designed to meet NFPA 1, Chapter 18 for Fire Department Access. The parking lot consists of 16 parking spaces: 1 van accessible handicap, 2 visitor POV spaces. The parking lot drive aisles are 26 feet wide and the parking spaces are 9 feet wide by 18.5 feet long. The entrance driveways radii at the entrance and exit intersections will be designed to accommodate 25 ft. turning radii. All traffic related signing and pavement markings will be designed in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) and Georgia Department of Transportation (GDOT) requirements.

The drive aisles will be constructed of standard duty asphalt pavement; while access roadways that are expecting heavy duty trucks loading and unloading, such as the garbage truck route to access the dumpster pad will be constructed of heavy-duty asphalt or Portland concrete pavement.

2.8 Pavement Design

New Portland cement concrete will be designed in accordance with UFC 3-260-02 design requirements and PCASE software. All asphalt pavements will meet UFGS 32 12 16 and concrete pavements will meet UFGS 32 13 13.06. The proposed pavement sections are shown in the summary table below:

Proposed Pavement Design Summary Table:

Pavement Type	Traffic Pattern	Traffic Type	Pavement Section
Portland Cement Concrete	Custom Fleet Mix	Road Areas	9.5" PCC / 4" Drainage Layer / Geotextile / 12" Compacted subgrade / select fill
Asphalt Pavement	Custom Fleet Mix	Road Areas	3" AC / 4" Drainage Layer / 4" Compacted Graded ABC / Geotextile / 12" compacted subgrade / select fill

The following variables will be used as part of the pavement designs using PCASE:

1. A Geotechnical Investigation of the site was performed. The following pavement design parameters were utilized:
 - a. CBR: 8
 - b. k-Value: 150 pci

2. Estimated Design Life Passes based on 20-year design life.

Concrete Mix Design

The concrete mix design will be as follows.

1. 650 psi minimum flexural strength.
2. Type I or II, low-alkali cement
3. Maximum allowed slump of 2-inch for the exterior concrete pavement.
4. Air entrainment will be required for the exterior paving. Air content by volume will be 6.0% plus or minus 1.5% in accordance with ASTM C231.
5. w/c ratio of 0.45 max for exterior concrete

2.9 Pavement Jointing and Reinforcement

Pavement joints will be designed in rigid pavement to allow for contraction and expansion of concrete pavements and for load transfers between pavements. The rigid pavement jointing and reinforcement layout was established based on the following criteria:

Construction joints have been designed where the anticipated physical limits of concrete placement will occur at the beginning, end, and edges of a placement lane and where new pavement abuts existing concrete pavement.

Doweled construction joints have been designed to provide load transfer in the pavement where heavy loads or traffic is expected to transfer loads from adjoining slabs.

Doweled construction joints specifically occur at the intersections of new and old concrete with the same thickness and joint spacing. This is a practical alternative to accomplish load transfer from new pavement to existing pavement without the need of undercutting and special juncture with the existing concrete pavement.

2.10 Site Grading and Building Finish Floor Elevation

The site is to be graded to provide positive drainage away from the proposed building. To promote positive drainage, a minimum slope of 5 percent for the first 10 feet will be used around the proposed facility. The site grading will provide at least 6 inches below finished floor elevation around the perimeter of the building. The parking lot is proposed to drain surface flow to the stormwater management facilities and utilize a grassed swale on the south side. Minimum slopes for the parking lot is 2% and minimum slopes within drainage swales of 1% will be used. Side slopes for stormwater management facilities will utilize a 4:1 side slope as much as possible for maintainability.

The facility minimum finished floor elevation and mechanical/electrical equipment pads must be above the 100-year flood elevation as indicated on the Flood Insurance Rate Maps (FIRM) published by the Federal Emergency Management Agency (FEMA). According to FIRM Panel 13051C0142G, last revised 8/16/2018, the site is located within Zone AE with a Base Flood Elevation of 14 for the 100-year storm event. The site is also within the 500-year flood plain (estimated at Elevation 16). Per BCE, the FFE was set at 1' above the 500-year flood plain elevation (FFE = 18.0).

2.11 Storm Water Drainage

The site will be designed to meet UFC 3-210-10 Low Impact Development (LID) and Georgia Stormwater Management Manual requirements, which will help to maintain the site hydrology and mitigate the adverse impacts of stormwater runoff and non-source point pollution generated by this project.

LID requires that post development discharge rate, volume, and temperature be less than or equal to predevelopment conditions. To meet this requirement the LID guidelines require the retention of the 95th percentile 24-hour design storm onsite through the use of retention, infiltration, or rainwater harvesting. Per Table 8 of the UFC, the 95th percentile

rainfall depth for Savannah, Georgia is 2.03 inches. Georgia Stormwater Management Manual (GSWMM) also requires water quality treatment similar to that specified by the UFC LID guidelines. However, the volume specified by GSWMM for bio-retention systems requires retention of the 1.2 inches and channel protection (1-year) volume. The UFC requires that local or State requirements be met; however, when the local requirements are in conflict with the UFC, the most stringent shall apply. Due to a redevelopment of the impervious area to the site, the UFC-LID criteria will be less stringent than the GSWMM water quality sizing criteria. Therefore, for water quality treatment, the GSWMM criteria listed above will be utilized. The GSWMM has additional stormwater requirements that must be met in addition to the water quality treatment, including the peak flow attenuation of the 25-year 24-hour, and 100-year design storms

The proposed drainage system utilizes “rain gardens” or bio-retention areas for retaining the water quality volume for UFC requirements as well as meeting peak flow attenuation requirements. These requirements can be accomplished by designing a multi-staged outlet control structure with two-staged weir or orifices, which allow the treatment volume to percolate through the soils while rainfalls above the 95th percentile will be allowed to flow through an overflow weir system.

The existing topographic data indicates the site has one primary drainage basins, designated as Basin A. Basin A currently discharges to Springfield Canal to the south.

The proposed grading and drainage improvements will not change the existing drainage patterns from the site. A proposed retention pond with underdrain system will be used to treat water quality as well as attenuate post developed flows from Basin A to pre-developed conditions.

2.12 Erosion and Sediment Control

Fort Stewart and Hunter Army Airfield are a local issuing authority (LIA) for Ga EPD in administering a general permit program that targets construction activities that result in land disturbance of one acre or more. GAR10001 General Permit is intended to reduce pollutants, principally sediment, which are a result of soil erosion and other activities associated with land-disturbing activities. A notice of intent (NOI), a stormwater pollution prevention plan (SWPPP) and erosion and sediment control (E&SC) plans will be developed and submitted for a land disturbance permit.

2.13 Permitting

Typical permits required for MILCON projects are shown below:

1. Dig Permit
2. Air Quality Permit
3. Stormwater / Construction Stormwater

An erosion control permit and Stormwater Construction permit is required from Chatham County, GA.

Part 3

Utilities

Part 3: Utilities

3.1 Technical Criteria and Standards

UFC 3-230-01

Water Storage, Distribution, and Transmission (1 Nov 2012)

UFC 3-240-01

Wastewater Collection (1 Nov 2012)

WEF Manual of Practice No FD-5

Water Environment Federation and American Society of Civil Engineers Manual of Practice MOP FD-5/ASCE MOP 60, Gravity Sanitary Sewer Design and Construction

3.2 Utilities

Existing water, sanitary sewer, natural gas, and storm drainage networks are generally throughout the project site or are immediately adjacent to the new Facility. The existing utilities are government owned and maintained except for electrical power is owned and maintained by Canoochee Electric.

3.3 Utility Demolition and Relocation

All existing utilities that are within the proposed footprint of the Facility that will present a conflict for future structure and utility installation will be removed to the nearest tee, valve, or logical location and plugged or capped, to accommodate construction of the proposed facility, but a minimum of 10 feet from the building foundation. Existing utilities impacted by the proposed building include fire water, domestic water, sanitary sewer, and storm drainage. Utilities not identified as being demolished and removed will be abandoned-in-place and filled with flowable fill.

Removal and relocation of utilities will need to be coordinated with Canoochee and the Department of Public Works to coordinate utility shutdowns for adjacent facilities or main trunks for the base wide utility network.

3.4 Water Distribution System

The existing base water distribution system is fed off the Hunter Army Airfield potable water system. This system serves both the potable water and fire protection services required to support base operations and personnel. The overall condition of the water system is good and there is adequate water supply for the domestic system. See Part 9 for additional details concerning existing system pressure.

Proposed separate lines for domestic supply and fire protection water have been provided to the new facility. All domestic water main piping will be specified as C900 or C905 PVC with ductile valves and will be buried to the minimum depth or 36" below grade. Valves will be located on service line branches from utility mains and elsewhere as needed on the utility distribution network to isolate certain sections and routings of utilities. Concrete thrust and anchor blocks are required for all bends, tees, and elbows on pressurized piping.

All fire water piping will be specified as C900 or C905 PVC and will be buried to a minimum depth of 36" below grade. All fire hydrants will be connected to the domestic water system, located a minimum of 3-feet away from other structures, and maintain a 36-inch clear space around the front of the hydrant. Proposed fire hydrants around the facility will ensure a maximum of 300-feet spacing. Interconnect fire suppression piping between the three buildings will be installed in a precast concrete utility trench. The trench and solid lids will be H20 vehicle rated. Each trench box will have openings in the bottom section to allow for drainage. A continuous underdrain beneath the trench boxes will collect and convey the water to the site stormwater drainage system.

Construction separation distances will be incorporated to ensure against utility cross-contamination between water and sanitary sewer utility lines. All proposed sanitary sewer and water lines will be located with at least 10-feet clearance horizontally. In areas where the proposed utility layout may require a sewer to cross above a water line, the sanitary sewer line will be concrete encased for 10-feet in both directions from the crossing. Within these distances there will be no occurrence of water pipe joints.

3.5 Sanitary Wastewater Collection System

The sanitary sewer from the proposed facility will flow to a packaged pump station. A new pump station will be co-located with another packaged pump station serving the existing kennel facility. HAAF DPW determined to keep the existing kennel pump station and connect the new pump station to the existing 2-inch PVC force main. For new gravity main, the minimum flow velocity for building laterals will be 2 feet-per-second and the maximum velocity will be 10 feet-per-second.

Collection System Piping

Sanitary sewer main piping will be specified as PVC. The daily sanitary sewer flow will be collected at the building by multiple sewer service connections. The minimum size of the sanitary sewer service line from the building to the sanitary main will be 6-inches. Precast sanitary sewer manholes will be located wherever there is a direction change or intersection of sanitary sewer piping, with a maximum interval of 400-feet between manholes, per UFC criteria.

Wastewater collection systems shall be designed in accordance with the Water Environment Federation and American Society of Civil Engineers Manual of Practice MOP FD-5/ASCE MOP 60 Gravity Sanitary Sewer Design and Construction.

3.6 Gas Distribution System

An existing natural gas line runs along Stephen Douglas Street that serves Building 1032. No information for this line has been provided; however, it is anticipated a service line will branch from this utility main and serve new Facility. The gas main piping will be specified as High Density Polyethylene Pipe (HDPE) and will be buried a minimum of 36-inches below grade. Valves will be located on service line branches from utility mains and elsewhere as need on the utility distribution network to isolate certain sections and routings of utilities.

3.7 Storm Drainage System

Any storm drainage structures, and piping networks will be sized to accommodate the 10-year, 24-hour storm SCS storm design event for the proposed attributing watershed. The minimum pipe size for storm drainage piping will be 15-inches. Storm drainage piping will be Class III RCP for areas subject to vehicle loading and PVC for roof drain downspout boot connections, unless noted otherwise on the drawings or specifications. Standard concrete flared end sections will be used for all inlets and outlets as shown on the plans. Outlet control structures will be concrete designed and constructed in accordance with ASTM C913. For additional stormwater and drainage information, see Part 2 Civil.

3.8 Cathodic Protection

The base currently does not provide cathodic protection systems for existing utilities. However, the geotechnical report will determine if the soil is corrosive or if cathodic protection is required.

3.9 Utility Structures

All landside utility structures, lids, frames, and grates will be specified as H-20 rated.

Part 4

Architectural

Part 4: Architectural

4.1 Technical Criteria and Standards

ABA - Architectural Barriers Act - ABA Accessibility Standard for Department of Defense Facilities – 2015

International Building Code, 2018

NFPA 101, Life Safety Code, 2018

UFC 1-200-01, General Building Requirements, Change 1, 01 Oct. 2020

UFC 1-200-02, High Performance and Sustainable Building Requirements, Change 01, 03 Jan. 2022

UFC 3-101-01, Architecture, Change 1, 05 Jan. 2021

UFC 3-110-03, Roofing, with Change 5, 12 June, 2020

UFC 3-120-01 Design: Sign Standards, 01 March 2014 with Change 3, 12 December 2017

UFC 3-120-10 Interior Design, Change 2, 15 June 2021

UFC 3-600-01, Fire Protection Engineering for Facilities, Change 6, 06 May 2021

UFC 4-010-01, DoD Minimum Antiterrorism Standards for Buildings, Change 1, 19 August 2020

UFC 4-010-05, Sensitive Compartmented Information Facilities Planning, Design and Construction 01 Oct. 2013

Fort Stewart Hunter Army Airfield Installation Planning Standards, 2 June, 2015

4.2 Overview

The intent of this project is to construct a new Military Working Dog (MWD) Kennel at Hunter Army Airfield, Georgia. The size of the facility is approximately 11,123 square feet in size and is programmed in accordance with DD1391 dated 08 February, 2022 for the SOF Military Working Dog (MWD) Kennel.

4.3 Architectural Compatibility Narrative

The overall design, includes the main MWD Facility, accompanied by two support buildings – MWD Break Area and Storage, and a prefabricated Ammo/Explosives Storage structure. The main MWD Facility is approximately 11,123 square feet and is comprised of two primary functions, the administrative areas and the indoor/outdoor kennels. A portion of the administrative areas are located within an access-controlled perimeter, to include the Kennel Master, Trainer, Locker Room, Multi-purpose Handlers, and Telecom spaces. Electronic key card access is located at perimeter doors of the controlled area, and the surrounding walls are built to a sound attenuation rating (STC) of 50. Electronic key card access is located at all exterior doors of the MWD Facility, however those without access to the controlled area of the building enter at the North Hall, and those with authorized access may enter at the main entrance on the plan East side of the facility.

The two support spaces accompanying the MWD Facility includes the MWD Break Area and Storage. The Break Area includes 16 individual kennels that rest on a covered, 2,200 square foot concrete pad. Each kennel is separated by 8 feet high 8 inch sealed CMU block walls, with a wire mesh partition and gate door on the entry side into each kennel, and a wire mesh cap across the top. The kennels are covered by a standing seam metal roof canopy. The additional Storage facility is a 529 square foot pre-engineered metal building, with a double door entrance on the plan East side.

Rooms and Sizes:

The following program areas are located within the Non-Secure portion of the MWD Facility:

Program Area	Net SF
Mens Toilet	168
Female Toilet	99
Electrical	115
Mechanical	324
Veterinary Treatment	463
Surgery	99
Food Storage	264
Tack Room	298
Mothers Room	61
Hall	418

The following program areas are located within the Secure portion of the MWD Kennel Facility:

Program Area	Net SF
Telecom	171
Multi-purpose Handlers	857
Trainer	203
Kennel Master	201
Locker Room	956
Corridor	161
Vestibule	147

4.4 Building Systems/Components Description

The following is a general description of the basic building systems/components for the MWD Facility, Break Area, and Storage Facility, and Ammo/Explosives Storage structure:

MWD Facility Exterior Wall Construction:

The exterior wall assembly surrounding the administrative portion of the building consists of an 8' high brick veneer water table to align with the Base Installation Planning Standards, capped with a 4" high precast concrete cap. The upper portion of the exterior wall consists of prefinished metal panels. This façade is installed over a 2" air space, 2" rigid insulation (R-10) over a fluid applied air barrier on 5/8" fiberglass reinforced gypsum sheathing over 6" metal studs with batt insulation (R-21) and finished with 5/8" type 'X' gypsum wall board on the interior.

The exterior wall assembly at the Indoor/Outdoor Kennel portion of the building consists of a 4' high CMU block wall, with a 4" high precast concrete cap, and a thin brick veneer adhered to the face of the CMU block. The mid-portion of this exterior wall consists of a 2'-8" high opening with a prefabricated wire mesh partition, secured with steel framing per the pre-engineered metal building manufacturer. The upper portion of the wall consists of prefinished metal panels on the exterior over fiberglass reinforced gypsum sheathing on a steel framing per the pre-engineered metal building manufacturer and finished with 5/8" gypsum wall board on the interior and ½" metal panel.

189618 Corrected Final

HAAF Kennel Code, Hunter Army Airfield, Savannah, GA

The prefinished metal paneling on each portion of the facility extends to the roof above. All finishes on the exterior wall construction align with the Fort Stewart Hunter Army Airfield Installation Planning Standards.

MWD Break Area Exterior Wall Construction:

The Break Area consists of 16 separate outdoor kennels. The exterior wall assembly at the Break Area consists of 8' high, 8" sealed CMU block walls that divide each kennel. The partition upon entry into each individual kennel consists of galvanized steel wire mesh partition with grill panel design, and gate door for access.

MWD Storage Facility Exterior Wall Construction:

The MWD Storage Facility is a pre-engineered metal building. The exterior wall assembly consists of metal framing with prefinished metal paneling on the exterior.

Roof (MWD Facility):

The roof system will consist of Steel Standing Seam Metal Roof, over underlayment over R-30 rigid insulation over air barrier and fiberglass reinforced gypsum sheathing over structural steel decking supported by steel roof trusses. Roof type will be a gable roof. All roof slopes to be 3/12. Roof soffit overhang is 2 feet deep max, with a prefinished metal fascia. The gutter discharges to exposed downspouts that are connected to the underground stormwater system.

The structural steel decking within the facility differs between the admin and indoor/outdoor kennels. The two areas are separated by an isolation joint. The structural steel decking within the admin area is a fluted, galvanized steel deck with G90 coating. Because of sounds stemming from the adjacent range and within the kennel itself, noise reduction is prioritized in this design. The Indoor/Outdoor Kennel area (to include Quarantine) is designed with a perforated acoustical galvanized steel deck with acoustical insulation batts within the fluted deck. A fluted, cellular deck in conjunction with the polyisocyanurate roof insulation has a noise reduction value (NRC) of 0.85.

Roof (Break Area):

The roof system consists of a gable roof with 3/12 slope, steel standing seam metal roof, over structural steel decking supported by light gauge roof trusses. The canopy is held up with structural columns, with an eave height of 11 feet 6 inches.

Roof (Storage Facility):

The roof system consists of a steel standing seam metal roof, over structural steel decking supported by light gauge roof trusses. Overhangs are not a typical eave condition for a pre-engineered metal building. Creating an atypical pre-engineered metal building condition increases the risk of water intrusion due to the added complexity and deviates from the standard warranty, therefore the storage facility is designed without overhangs.

Doors:

The exterior personnel doors on the MWD Kennel and MWD Storage Facility will be extra heavy duty, flush insulated hollow metal and set in heavy gage steel hollow-metal door frames. All exterior doors into the facility are designed with electronic key card access. Electronic keycard access is also provided on doors located around the perimeter of the controlled access area. The main entrance on the east side of the facility will be an aluminum storefront assembly with side-lites and full-lite glazed door (insulated). Hardware and locksets will be heavy duty type and keyed per base standards. Interior personnel doors will be heavy-duty hollow metal types. Hollow metal doors will be narrow-lite or flush and set in heavy gage steel door frames. The thermal, sound transmission, fire separation, and security performance characteristics of each door will conform to the characteristics of the partition in which the door is installed.

The indoor and outdoor individual kennels within the MWD Facility and MWD Break Area will receive a hinged, gate door keyed per base standards. The indoor kennels will receive a gate door consisting of a 6 ft high solid stainless-steel panel, with 2 ft of stainless-steel grill panel design, wire mesh partition above. The solid steel panel is meant to obstruct the view of the dogs across from one another in the interior kennels. The outdoor kennels will receive a gate

door consisting of stainless-steel wire mesh in its entirety. The indoor and outdoor kennels are connected with an insulated, aluminum faced guillotine door. The guillotine door tracks are mounted on the face of the sealed CMU wall of the interior kennel wall and is operated by a pulley system.

Building Air Barrier System:

The roof air barrier system consists of a membrane air barrier over structural steel decking and continues over top and down roof eave blocking. The portion of the roof covering the Indoor, Outdoor and Quarantine Kennels of the facility also consists of a membrane air barrier over structural steel decking, however rather than extending out over the Outdoor Kennels, a steel bent plate provides a break in the roof structure. This allows the air barrier to fold over the bent plate and down to meet the metal deck so that the air barrier remains continuous with that of the fluid applied air barrier installed vertically on the CMU wall below.

In the administrative portion of the MWD Facility, the wall system is comprised of a continuous fluid applied air barrier over fiberglass reinforced gypsum sheathing. The indoor/outdoor kennel portion of the facility is not insulated and therefore does not contain an air barrier system.

Interior walls:

All partition walls along the perimeter of the administrative controlled access area of the MWD Facility are designed as STC 50 minimum and extend to the structural metal deck above. Partition walls outside of the controlled access portion of the administrative areas will extend to the structural metal deck in order to decrease sound transmission within the facility with a minimum sound transmission rating (STC) of 45. Walls located around the perimeter of the Veterinary Treatment and Surgery require a 1 HR fire rating and will also extend to the structural metal deck above.

In the indoor/outdoor kennel portion of the facility, interior partitions extending from floor to the deck above to separate the indoor kennel, outdoor kennel, and quarantine, consist of 8" sealed CMU walls. Partition walls that separate each individual kennel consists of 6 ft high 8-inch sealed CMU walls with 2 ft of wire mesh partition with grill panel design secured above to create an 8 ft high partition (6 ft CMU, 2 ft wire mesh). The concrete floor slab in the indoor kennel and connecting outdoor kennel has a 0.25/12 slope. The connecting Kennel Corridor located at the Outdoor Kennel also has a 0.25/12 slope. The two slopes are joined by and slope toward a continuous trench drain within the Kennel Corridor.

Quarantine kennels exist adjacent to the indoor/outdoor kennel. The Quarantine portion of the facility is separated from the rest of the facility by a sealed 8" CMU wall extending from the floor slab to the structural metal deck above to avoid contamination between sick dogs housed in the quarantine area and healthy dogs housed in the indoor/outdoor kennels. The concrete floor slab in the Indoor Quarantine Kennel and connecting Outdoor Quarantine Kennel has a 0.25/12 slope. The connecting Quarantine Corridor has a 0.25/12 slope. The two slopes are joined by and slope toward a continuous trench drain within the Quarantine Corridor. This trench drain is separate from the Kennel Corridor to avoid contamination between the two areas.

Interior ceilings:

Ceilings will either be open to deck, drywall, or suspended ceiling types. Open ceilings are provided in utility spaces and outdoor kennels. Utility open ceilings are exposed metal deck and open web truss, painted. Suspended ceilings are provided throughout the rest of the facility, consisting of 2' x 2' acoustical ceiling tiles. The Indoor Kennel consists of 2' x 2' perforated acoustical ceiling tiles with insulation as an additional measure to control sound attenuation within the Kennel. Drywall type ceilings are provided in all restrooms, and the mother's room. These ceilings will be 5/8" moisture-resistant Gypsum wall board, painted.

4.5 Accessibility for the Disabled

The facility is fully accessible and is designed to comply with ABA Architectural Barriers Act - ABA Accessibility Standard for Department of Defense Facilities – 2015.

4.6 Structural Interior Design (SID)

The facility will provide an interior environment that supports the technical requirements, security requirements and the physical needs of the occupants.

4.7 Functional Finishes

The functional aspects of the interior finishes and products that are used in this environment are extremely important. Due to the function of the building, the interior finish materials are selected to represent the most durable performance for the function of the areas within the facility. The interior finishes selected are to be easily maintainable as well as durable and cost efficient over the life of the building. Future finish material updates are made easier by strategic planning. Finishes which are permanent construction (doors or tile floors) are to be neutral in color.

To achieve the goals set forth for LEED, all interior finish products and methods of installation are to be GREENGUARD certified or inherently environmentally sensitive to support a healthy building environment.

4.8 Interior Finish Assignment (SID)

Finish materials are based on facilities function and requirements. Most of the floors are a three-part epoxy. The Veterinary Treatment and Surgery space will receive seamless sheet vinyl flooring with an integral base. Ceilings include acoustical ceiling tiles in the office spaces, clean room acoustical ceiling tiles in the veterinary treatment and surgery spaces, moisture resistant gypsum board in the restroom/shower spaces and a perforated metal acoustical ceiling tile in the kennel space.

Additional requirements include providing interior identification signage as required. Signage is to meet requirements per UFC 3-120-01, Sign Standards. Interior signage includes identification, directional and informational signage utilizing permanent and changeable systems.

Millwork is to include wall and base cabinets with plastic laminate finishes for the break space and Mother's room. These cabinets are to be a minimum custom grade construction to AWI standards. Wall and base cabinets in the Food Storage and Tack Room to be stainless steel. The wall and base cabinets in the Veterinary Treatment and Surgery space to be medical quality stainless steel cabinets. Countertops are to be finished with solid-surface material for enhanced durability in the break space, Mother's room, and Restrooms. Countertops are to be stainless steel in the Food Storage, Tack Room, Veterinary Treatment and Surgery space.

4.9 Furniture, Fixtures and Equipment (FF&E)

The FF&E has been split into two packages and are created so it can be put out for solicitation. The packages are split by an Office FF&E package and a Medical Equipment package. The products are listed with the required salient characteristics and are not proprietary. Finishes will be selected after the vendor has been selected from their finish selections to match the building interior finishes. The FF&E for the project is funded with O&M monies.

4.10 Design Intent

This facility requires furnishings that respond to the physical demands of the constant utilization by different users in the facility. Furnishings must be durable, easy to maintain, have limited parts and pieces to manage and have universal modularity to respond to unknown future changes. The furnishings must integrate seamlessly with the building electrical and data systems with easily accessible wire management capability. Equally important to the function of the furnishings, ergonomic support and features will be incorporated to support a healthy work environment to the users. The furnishing size and adjustability features will accommodate a minimum of 95% of the facility population size. Other healthy / ergonomic furniture features include:

1. Integrated task light provide light in task areas to help avoid eye strain.
2. Seating for all users will be specified with easily adjustable mechanism for height, arms, and back, breathable fabric for comfort and seat pan front edges that will not cut off circulation while sitting.

3. Selecting furnishings from manufacturers that utilize sustainable manufacturing processes and produce products that are GREENGUARD or Scientific Certification Systems (SCS) Certified, with recycled content materials. When possible, furnishings will be provided that achieve the “Cradle to Cradle” environmental status to reduce future landfill use.

All furnishings will be analyzed against these criteria in combination with a cost analysis to determine the “Best Value”.

4.11 FF&E Interior Furnishings Styles and Types

The facility is to be transitional in style with clean lines and simple forms that function efficiently for the users and are cohesive with the interior finishes of the facilities. Furnishings to be included in the FF&E package are to be as follows:

Kennel Master and Trainer office will include:

1. L-shaped desk with metal construction and laminate worksurface
2. Overhead closed storage units
3. Integral task light below overhead with occupancy sensor
4. Fabric tack panel
5. File Storage
6. Ergonomic mesh task chair with lumbar support
7. Two guest chairs with metal frames with upholstered seat and back

Multi-Purpose handlers space will include:

1. 48”W x 24” D workstations
2. File storage
3. Integral task light with occupancy sensor
4. Fabric tack panel interior side of work surface
5. Ergonomic mesh task chair with lumbar support
6. Large Conference table and chairs
7. Break Space appliances: Refrigerator/Freezer, coffee machine, microwave.

Tack Room will include:

1. Metal storage shelving for storage
2. Washer and Dryer
3. Refrigerator/Freezers
4. Metal storage cabinet

Food Storage will include:

1. Metal storage shelving for storage
2. Ice machine
3. Refrigerator/Freezers
4. Microwave

5. Food prep table
6. Kitchen grade shelving
7. Veterinary Treatment will include:
8. Lab Stool
9. Undercounter refrigerator
10. Veterinary Treatment and Surgery Laboratory Equipment

Mothers Room will include:

1. Soft Seating Side Chair with tablet arm
2. Undercounter refrigerator

Accessories throughout the building include:

1. Trash receptacles
2. Recycling receptacles
3. Clocks

4.12 Government Furnished, Government Installed (GFGI) Equipment

Equipment is not included in MILCON or in the FF&E package. The following items will be procured by the government. They are indicated by halftone and dashed items with an "EQ" item code in the drawings in order to coordinate space and required building infrastructure:

1. Safes
2. Multi-function machines
3. Shredders
4. Flat panel displays

Part 5

Structural

Part 5: Structural

5.1 Technical Criteria and Standards

ACI 318-19	<i>Building Code Requirements for Structural Concrete</i>
AISI S100 - 17	<i>North American Specification for the Design of Cold-formed Steel Structural Members</i>
AISC 360-22	<i>Specification for Structural Steel Buildings</i>
ASCE 7-22	<i>Minimum Design Loads for Buildings and Other Structures</i>
AWS D1.1	<i>Structural Welding Code – Steel</i>
AWS D1.4	<i>Structural Welding Code - Reinforcing Steel Including Metal Inserts and Connections in Reinforced Concrete Construction</i>
TMS 402/602-16	<i>Building Code Requirements for Masonry Structures</i>
IBC 2018	<i>International Building Code</i>
UFC 1-200-01	<i>DoD Building Code with Change 1, 2020</i>
UFC 3-301-01	<i>Structural Engineering with Change 1, 2022</i>
UFC 4-010-01	<i>DoD Minimum Antiterrorism Standards for Buildings with Change 1, 2020</i>

5.2 General

The MWD Kennel building is a one-story, metal building system comprised of two independent structures overall measuring approximately 65'-0" x 192'-0". The administrative (admin) space is located on the south side of the building and the kennel space is located on the north side of the building. A covered break area will be a metal building system measuring approximately 28'-0" x 77'-0", located on the north side of the kennel building, along with a 22'-0" x 22'-0" storage building.

5.3 Framing System

The primary structural framing for all three structures, listed above, is comprised of metal building system rigid frames, portal frames, and rod bracing. The roof deck is supported on cold-formed steel purlins spanning between the rigid frames. Both the indoor/outdoor kennel/admin building and military working dog (MWD) break structure utilize portal frames perpendicular to main building frames for lateral support. The storage building utilizes rod bracing perpendicular to main building frames for lateral support. All frames have pinned bases.

The exterior wall construction in the admin area consists of brick veneer with cold-formed steel stud backup extending from the slab on grade to the roof eave. The exterior wall construction in the kennel space consists of brick veneer and metal panels with reinforced concrete masonry backup extending up from the slab on grade approximately 4'-4" on the north and south side and full height on the east side. Chain-link fencing extends from 4'-4" above finished floor to metal panels on cold-formed metal studs on girts up to the eave. The MWD break area is an open area, building walls, but with masonry demising walls between kennels. The storage building exterior wall construction consists of metal panels attached to horizontal girts.

5.4 Foundation

The foundation system for each building consists of shallow spread footings with a continuous turn-down footing around the perimeter. The reinforced slab on grade is typically 5 inches thick. All slabs are underlain with a vapor barrier and 4 inches of capillary water barrier consisting of open graded stone. Concrete curbs provide a level surface for masonry walls to bear at sloping floors. Kennel slabs are reinforced to avoid the use of slab control joints.

Interior masonry walls are on thickened slabs. Concrete curbs are used to provide level surfaces for masonry.

The following values are used for design.

1. Allowable Bearing Pressure: 1,500 psf
2. Unit Weight: 120 pcf
3. Water Table Depth: 7 feet
4. Modulus of subgrade reaction: 125 pci
5. Frost depth: 0"

5.5 Fire Resistance Statement

The kennel/admin building is sprinklered and does not require fireproofing of the structure. The MWD break area and storage building are not sprinklered.

5.6 Outstanding Structural Information

The MWD kennel is located more than 50 feet within the installation perimeter of Hunter Army Airfield with a 33' unobstructed space around the buildings.

Per ASCE/SEI 7-16, seismic design category D exempts mechanical and electrical components that are positively attached to the structure and within weight limitations indicated in Section 13.1.4. Other nonstructural components must meet seismic design and bracing requirements.

5.7 Loads

The facility is designed in accordance with UFC 3-301-01 and ASCE/SEI 7-22.

1. Building Classification: Risk Category II
2. Dead and Collateral Loads
3. Roof: per building materials
4. Admin Ceiling: 2 psf
5. Kennel/Office Fire Protection Piping: 3 psf
6. Lighting and Electrical: 3 psf
7. Kennel/Office Mechanical/Piping: 5 psf typical
8. Miscellaneous: 5 psf
9. Live Loads
 - a. Roof: 20 psf, reducible, 750 lb concentrated load concurrent with live load at Kennel/Admin only.
 - b. Floor:
 - i. Unless Noted Otherwise – 100 psf, 2000 lb concentrated load nonconcurrent.
 - ii. Mechanical Equipment (General) & Electrical Rooms – 150 psf
 - iii. Storage – 125 psf

10. Wind Loads
 - a. Basic wind speed: 134 mph
 - i. Enclosed: Admin and Storage
 - ii. Partially Enclosed: Kennel
 - iii. Open: Break Area
 - iv. Exposure category: C
 - v. $k_{zt}=1.00$
11. Snow Loads
 - a. Ground snow load: 0 psf
12. Earthquake Loads
 - a. Site Seismicity: $S_s=0.43$ g, $S_1=0.12$ g
 - b. Soil Site Class: E
 - c. Design Earthquake Spectral Response Accelerations: $S_{DS} = 0.25$ g, $S_{D1} = 0.14$ g
 - d. Seismic Design Category: C
 - e. Seismic Response Coefficient: $C_s=.071$
13. Antiterrorism/Force Protection Requirements: see Antiterrorism Force Protection

5.8 Serviceability Criteria

1. Foundation Settlement Limit: 1" total, 1/2" differential settlement, maximum (assumed)
2. Beam/Girder/Frame Deflection Limit: L/240 For Live Load, L/180 for Dead+Live load
3. Masonry Veneer/Stud Wall Vertical Deflection Limit: L/600
4. Overall Structure Drift Limit: H/480 based on a 10-year MRI wind speed (UFC 3-301-01).

5.9 Materials

1. Reinforced Concrete
 - a. Concrete f'_c : 5,000 psi UNO
 - b. Reinforcing Steel f_y : 60,000 psi
 - c. Maximum Slab Joint Spacings
 - d. Construction/Control joints: 14 ft max
 - i. No joints in kennel and break areas
2. Concrete Masonry, f'_m : 2,000 psi
3. Structural Steel
 - a. Rolled shapes and plates - ASTM A36, $F_y = 36$ ksi, UNO
 - b. Wide flange shapes and tees - ASTM A992/A572-50, $F_y=50$ ksi
 - c. Structural Rectangular HSS sections - ASTM A500, Gr C, $F_y=50$ ksi
 - d. Steel Connections

- i. Anchor Rods: ASTM F1554 Grade 55, $F_y=55$ ksi
 - ii. Welding Electrode: E70XX
- e. Connection bolts: ASTM F3125 Grade A325

Part 6

Antiterrorism Force Protection

Part 6: Antiterrorism/Force Protection

6.1 Technical Criteria and Standards

UFC 4-010-01

DoD Minimum Antiterrorism Standards for Buildings, 12 December 2018

UFC 4-021-01

Design and O&M: Mass Notification Systems, 1 January 2010

6.2 Overview

All new Department of Defense (DoD) inhabited buildings are required to meet the minimum antiterrorism standards of UFC 4-010-01. This document lists these standards as they pertain to the site, structural, architectural, mechanical, and electrical design. Standards are intended to provide baseline antiterrorism protection where no known threat currently exists. Many of these standards are in place to give flexibility to the facility if the threat were ever to escalate.

The MWD Kennel will be located more than 50 feet within the installation perimeter of Hunter Army Airfield.

6.3 Site Planning

Any exterior electrical and/or mechanical equipment within the 33' unobstructed space is located in visible areas around the facility and has locked access panels to deny the opportunity for concealment of explosive devices with a size greater than or equal to a 6-inch cube. The proposed trash dumpster or recycle area will be located outside the unobstructed space.

6.4 Standards Summary

The table below indicates how each applicable standard will be met.

C – Conforming: the standard applies to the design and the design complies.

NA – Not Applicable: the standard does not apply to the design.

UFC 4-010-01 Standards Compliance Matrix			
Standard	C	NA	Comments
SITE PLANNING			
1. Standoff Distances	X		Building is located more than 50 feet within an installation perimeter.
2. Unobstructed Space	X		Landscaping, equipment, and other features within 33 feet of the building will not allow for concealment of a 6-inch cube.
3. Parking Beneath Buildings or on Rooftops		X	No parking beneath buildings or on rooftops.
STRUCTURAL DESIGN			
4. Progressive Collapse Resistance		X	Building is only one story.
5. Structural Isolation		X	Entire building is considered inhabited.
6. Building Overhangs and Breezeways		X	No overhangs or breezeways.

UFC 4-010-01 Standards Compliance Matrix			
Standard	C	NA	Comments
7. Exterior Masonry Walls	X		Exterior masonry walls are adequately reinforced.
ARCHITECTURAL DESIGN			
8. Glazing	X		Exterior glazing will have 1/4-inch nominal laminated glass in the innermost pane with structural silicone sealant or glazing tape.
9. Building Entrance Layout	X		Main entrance will not face uncontrolled vantage points.
10. Exterior Doors	X		Exterior doors that swing will open outwards.
11. Mail Rooms and Loading Docks		X	Mail and packages will be screened at a central sorting facility.
12. Roof Access		X	Roof access will not be provided
13. Overhead Mounted Architectural Features	X		Overhead features weighing 31 pounds or more will be mounted to resist appropriate horizontal and downward forces.
ELECTRICAL AND MECHANICAL DESIGN			
14. Air Intakes	X		Intakes to HVAC systems designed to move air throughout the building will be located at least 10 feet above the ground.
15. Mail Room and Loading Dock Ventilation		X	Mail and packages will be screened at a central sorting facility.
16. Emergency Air Distribution Shutoff	X		Switches will be provided at accessible locations with a maximum travel distance of 200 feet.
17. Equipment Bracing	X		Overhead utilities and other fixtures weighing 31 pounds or more will be mounted to resist appropriate horizontal and downward forces.
18. Under Building Access		X	No under building access.
19. Mass Notification	X		Mass notification system will be provided in accordance with UFC 4-021-01.

Part 7

Plumbing

Part 7: Plumbing

7.1 Technical Criteria and Standards

SDDMMC	Savannah District Design Manual for Military Construction
ASHRAE Handbooks	2019 HVAC Applications
ASHRAE 90.1-2013	Energy Standard for Buildings Except Low-Rise Residential Buildings
ASME A112.19-2018	Ceramic Plumbing Fixtures
ASPE	American Society of Plumbing Engineers Data Books – Volumes 1, 2, 3, and 4
EPACT 2005	Energy Policy Act of 2005
IBC-2018	International Building Code
IGCC	International Green Construction Code
IPC-2018	International Plumbing Code
NSF/ANSI 61-2019	Drinking Water System Components – Health Effects
PDI WH201-2017	The Plumbing and Drainage Institute: Water Hammer Arrestors
UFC 1-200-01	DoD Building Code with Change 1, 1 October 2020
UFC 1-200-02	High Performance and Sustainable Building Requirements with Change 1, 3 January 2022
UFC 3-400-02	Design: Engineering Weather Data; 20 September 2018
UFC 3-420-01	Plumbing Systems, 1 April 2021
UFC 3-450-01	Noise and Vibration Control; 15 May 2003
UFC 4-010-01	DoD Minimum Antiterrorism Standards for Buildings with Change 1, 19 August 2020
UFGS	Unified Facilities Guide Specifications

7.2 Scope of Work

The plumbing system design is in accordance with the IPC, UFCs, and the Installation Standards.

7.3 System Descriptions

Sanitary Sewer

Sanitary sewer piping will be designed to provide waste removal from the building water closets, urinals, lavatories, sinks, water coolers, trench drains and floor drains. System will gravity drain to the site sanitary sewer system. Floor drains will have a trap primer connection.

Domestic Water

A 3" domestic water connection will be provided to the facility from the utility provider. Domestic water velocity will not exceed 4 feet per second. Water entrance will be provided with a water meter (independent of utility meter) and reduced pressure zone backflow preventer, located inside the mechanical room. The water meter will have a display for direct visual reading of the meter and will be able to communicate to the building DDC. A pressure calculation was performed, and the building has adequate pressure, therefore a booster pump will not be provided. A 1-1/2" domestic water line

will continue from the mechanical room to the outdoor break kennels. Four (4) yard hydrants will be provided at the outdoor break kennels.

The domestic water heating system was evaluated based on a life cycle cost analysis (LCCA) for the facility. Solar hot water heating was evaluated against standard natural gas water heaters and found not life cycle cost effective. See domestic “DHW Solar System Life Cycle Cost Analysis” report for further information.

Domestic hot water will be provided by two 100-gallon storage type natural gas condensing water heaters, each sized for ~50% of the load. Water will be stored at 140°F. A thermostatic mixing valve will reduce the building hot water supply to 131°F. Point-of-use thermostatic mixing valves will be provided at each plumbing fixture to further reduce the water temperature to 110°F. The clothes washer will be provided with 131°F water. A domestic hot water recirculation loop with pump will be provided to keep hot water at remote fixtures throughout the building.

A non-potable protected domestic water system will be provided from the building domestic water system for trench drain washdown connections.

Domestic water piping exposed to ambient conditions in the kennel area will be heat traced for freeze protection.

A water softener will not be provided.

Roof Drainage

Roof drainage will be provided by exterior gutters and downspouts with splash blocks; no internal roof drains are required.

Natural Gas

Natural gas will be provided in the building to serve the water heaters and the mechanical gas fired heating systems. Site natural gas piping will be covered in Civil documents.

7.4 Piping Systems

Sanitary waste and vent piping aboveground will be hub-less service weight cast iron; underground piping will be service weight bell and spigot cast iron.

Domestic hot and cold-water piping will be copper tube or steel pipe and will be per UFGS standards (including insulation). Piping will be exposed in the mechanical room and kennel areas and concealed in all other areas.

Condensate piping will be DWV copper pipe.

Above ground natural gas piping will be schedule 40 steel with welded fittings.

7.5 Building Plumbing Fixtures

Cast-iron floor drains will be provided for all necessary mechanical room HVAC equipment and in each indoor kennel. Floor drains will also be provided in various locations throughout the facility as needed. Automatic trap primers will be provided on all floor drains within the admin portion of the building. A trench drain with washdown connection will be provided in the outside corridor on each side of the kennel. Area drains in the kennel areas will have a sediment basket to catch debris. Deep seal traps and trap guards will be placed in the kennel area floor drains.

A mop basin will be provided in room 114 - Tack Room for janitorial service. An animal bath will be provided, with drainage directed to a nearby floor drain incorporating a sediment basket for the collection of hair and other debris. In room 111 – Veterinary Treatment, a floor sink will be provided below the exam table. A stainless steel surgeon's scrub sink will also be provided with touch-less activation.

Freeze-proof wall hydrants will be provided on the exterior of the facility at intervals of 100 feet or less and will be located to minimize lawn hoses from being laid across walkways.

Restrooms will be provided with wall-mounted, manual flush valve water closets; wall-mounted, manual flush valve urinals, and wall-mount, vitreous china lavatories with manual fixtures and floor drains with trap primer connections.

Fixtures will include low-flow water closets (1.28 gpf), urinals (0.125 gpf) and lavatories (0.35 gpm). Showers will be complete with trench drains, mixing valves and low-flow (1.5 gpm) shower heads.

A stainless steel, double-bowl, filtered electric water cooler with bottle filling station will be provided in the main corridor.

Stainless steel, undermount, double and single compartment sinks will be provided where shown with low-flow (1.5 gpm) faucets.

All restroom fixtures, break area sinks, showers and electric water cooler will be ADA compliant.

The kennel area will be provided with surface mounted cold water hose-bibbs and hot/cold wall faucets with $\frac{3}{4}$ " garden hose connection.

Water hammer arresters will be provided in the distribution system.

Part 8

HVAC

Part 8: HVAC

8.1 Technical Criteria and Standards

SDDMMC Construction	Savannah District Design Manual for Military
ASHRAE Handbooks	2017 Fundamentals Volume, 2015 HVAC Applications, 2016 HVAC Systems and Equipment
ASHRAE Standard 55-2013	Thermal Environmental Conditions for Human Occupancy
ASHRAE Standard 62.1-2016	Ventilation for Acceptable Indoor Air Quality
ASHRAE Standard 90.1-2013	Energy Standard for Buildings Except Low -Rise Residential Buildings
ASHRAE Standard 183	Peak Cooling and Heating Load Calculations in Buildings Except Low-Rise Residential Buildings
ASHRAE Guideline 0	The Commissioning Process
ASTM Standards	American Society of Testing and Materials
ETL 01-1	Reliability and Maintainability Design Checklist
ETL 11-1	Civil Engineer Industrial Control System Information Assurance Compliance
EPACT 2005	Energy Policy Act of 2005
FM 3-19.17	Military Working Dogs
IBC-2018	International Building Code
IGCC-2018	International Green Construction Code
IMC-2018	International Mechanical Code
MIL-HDBK-1190	Facility Planning and Design Guide
USACE	US Army Corps of Engineers, Design Manual
NFPA 72	National Fire Alarm and Signaling Code
NFPA 90A	Installation of Air Conditioning and Ventilating Systems
SMACNA Guidelines	Sheet Metal and Air-conditioning Contractors' National Association
UFC 1-200-01	DoD Building Code with Change 1, 1 October 2020
UFC 1-200-02	High Performance and Sustainable Building Requirements, with Change 1, 3 January 2022
UFC 3-400-02	Design: Engineering Weather Data, 20 September 2018
UFC 3-401-01	Mechanical Engineering with Change 1, 1 October 2015

UFC 3-410-01	Heating, Ventilating, and Air Conditioning Systems, with Change 8, 21 July 2021
UFC 3-410-01	Heating, Ventilating, and Air Conditioning Systems, 28 July 2025 (Section 3-2.10 only)
UFC 3-410-02	Direct Digital Control for HVAC and Other Local Building Control Systems with Change 2, 12 April 2021
UFC 3-450-01	Noise and Vibration Control, 15 May 2003
UFC 4-010-01	DoD Minimum Antiterrorism Standards for Buildings with Change 1, 19 August 2020
UFC 4-010-06	Cybersecurity of Facility-Related Control Systems, Change 1, 18 January 2017

8.2 Design Requirements

8.2.1 Outdoor Design Conditions

Summer Conditions:	95.6°F dry bulb (0.4% dry condition)
	77.3°F wet bulb (0.4% dry condition)
	83.6°F dry bulb (0.4% humid condition)
	80.3°F wet bulb (0.4% humid condition)
Winter Conditions:	27.9°F dry bulb
Location:	N. Latitude 32.017°
W. Longitude	81.133°
Elevation	41 feet
ASHRAE Climate Zone	2A

8.2.2 Indoor Design Conditions

Offices, Mother's Room, Multi- purpose	78°F dry bulb – cooling condition
Room, Restrooms, TA-50 Locker	40-60% Relative Humidity
Room, Tack Room, Food Storage, Veterinary Treatment, Surgery, and Corridors	68°F dry bulb – heating condition
Telecom Room	78°F dry bulb – cooling condition
40-60% Relative Humidity	
68°F dry bulb – heating condition	
Indoor Kennels	78°F dry bulb – cooling condition
	40-60% Relative Humidity
	65°F dry bulb – heating condition
Outdoor Kennels	Unconditioned
Electrical & Mechanical Rooms	55°F dry bulb – heating condition

189618 Corrected Final

HAAF Kennel Code, Hunter Army Airfield, Savannah, GA

80°F dry bulb – cooling condition

8.2.3 Ventilation Air Rates

Toilet Rooms	50 cfm per fixture (water closet, urinal or shower head)
TA-50 Lockers	0.5 cfm per ft ²
Tack Room	0.9 cfm per ft ²
Indoor Kennels	10 air changes per hour
	Smoke exhaust rates determined by QFPE

8.2.4 Conditioned Outside Air Rates

Offices, Mother's room, Admin, Multi-purpose Room, Restrooms, TA-50 Locker Room, Food Storage	0.06 cfm per ft ² and 5 cfm per person – per ASHRAE 62.1-2016
Veterinary Treatment	2 ACH (ASHRAE 170-2017)
Surgery	3 ACH (ASHRAE 170-2017)
Tack Room	0.18 cfm per ft ² and 7.5 cfm per person
Corridors	0.06 cfm per ft ² – per ASHRAE 62.1-2016

8.3 Building Envelope

New walls and roof R-values will be in accordance with UFC 3-400-01 and modified per the Energy Analysis using approved software.

The proposed design values are:

Fenestration Assembly	U=0.28 Btu/h·ft ² ·°F SHGC=0.2
Above Grade Wall Assembly	U=0.092 Btu/h·ft ² ·°F
Roof/Ceiling Assembly	U=0.028 Btu/h·ft ² ·°F
Slab on Grade Floor	F=0.73 Btu/h·ft·°F

The glazing will be low “e” tinted double-glazing, using ¼-inch glass panes with a ½-inch insulated air space.

8.4 Systems Evaluated in Life Cycle Cost Analysis

Mechanical System Alternatives

Envelope and mechanical systems were evaluated as per UFC 1-200-02. The HVAC systems were selected based on a life cycle cost analysis (LCCA) for this facility. The LCCA included a building envelope load, mechanical systems first cost, energy usage and cost, maintenance effort and cost, life cycle equipment replacements, coordination with other trades, coordination with existing site utilities, acoustics, system flexibility and any other site specifics that could potentially influence the outcome of the LCCA. BMcD evaluated four HVAC system alternatives along with baseline:

Alternative 1: This alternative utilizes an indoor Variable Air Volume (VAV) Air Handling Unit (AHU) to provide cooling and heating to the space. VAV terminal units control airflow to each zone and include electric reheat coils for space heating. Cooling / Heating Coil is direct expansion (DX) with remote, outdoor heat pump with variable speed compressor. A separate heat pump (DX type air-cooled) will be used to condition the veterinary treatment and surgery

rooms. Ductless split systems will be used to condition electrical, mechanical, and telecom rooms. A DX Dedicated Outside Air System (DOAS) unit with an energy recovery wheel will condition the indoor kennel space with 100% outside air.

Alternative 2: This alternative is the same as Alternative #1, except it will utilize hot water reheat for the VAV terminal units as opposed to electric reheat. This alternative will use two boilers and two pumps to provide heating to the spaces.

Alternative 3: This alternative utilizes a packaged (ground-mounted) VAV air handling unit system with a direct expansion (DX) heat pump to provide conditioned air to the spaces. This packaged unit will feature a variable speed compressor. VAV terminal units control airflow to each zone and include electric reheat coils for space heating. A separate heat pump (DX type air-cooled) will be used to condition the veterinary treatment and surgery rooms. Ductless split systems will be used to condition electrical, mechanical, and telecom rooms. A DX DOAS unit with an energy recovery wheel will condition the indoor kennel space with 100% outside air.

8.5 **LCCA Conclusions and Recommendations**

As shown in the table below, Alternative #1: VAV AHU w/ Electric Reheat has the lowest total life cycle cost. Alternative #2 VAV AHU w/ Hot Water Reheat is the highest total life cycle cost. The additional cost of the hot water system does not save enough energy to pay back. Therefore, the recommended system is Alternative #1: VAV AHU with electric Reheat.

Alternative	Rankings (1 = Lowest Cost, 3 = Highest Cost)				
	Initial Cost	Maintenance	Energy	Replacement	Overall
1	1	1	1	1	1
2	3	3	3	3	3
3	2	2	1	2	2

See full HVAC System Life Cycle Cost Analysis document for further information.

8.6 **HVAC Systems**

General Ductwork Design

Air intakes for ventilating and air-conditioning will be located at least ten feet above the ground, except where inside a fenced-in enclosure.

Overhead items such as suspended ductwork, piping, and equipment will be braced laterally as required by DoD Antiterrorism for Buildings Standard. Specifically, mountings will be designed to resist forces equal to 1.5 times the component weight in the downward direction and 0.5 times the component weight in any other direction.

Toilets, and tack room will be provided with transfer air from adjacent spaces to makeup exhaust air requirements in addition to dedicated conditioned air systems.

Air distribution will be provided by air handling units, and exhaust fans. Conditioned air will be supplied or returned to the spaces via externally wrapped metal ductwork connected to diffusers or supply grilles. Exhaust air in the admin areas will be exhausted through uninsulated metal ductwork connected to exhaust registers or grilles. Exhaust air in the indoor kennel space will be returned to the DOAS unit via externally wrapped metal ductwork connected to grilles for heat recovery purposes. Transfer air will be transferred through internally lined metal ductwork connected to diffusers or grilles.

All ductwork will be constructed of galvanized sheet metal or stainless steel, as the application requires. Ductwork will be constructed and installed in accordance with SMACNA requirements.

Fire dampers will be provided for all rated walls as required.

Cooling and Heating System

Cooling to the Administrative and Veterinary Treatment / Surgery areas will be provided with cooling and heating through a direct-expansion, air-cooled, split system heat pump with a variable speed compressor. The administrative area will have VAV electric reheat boxes.

Cooling for the Indoor Kennel Area will be provided by a packaged, direct-expansion, air-cooled heat pump.

Heating for the Administrative area will be provided mechanically through the use of an air-cooled heat pump split system combined with electric reheat VAV boxes.

Heating for the Veterinary Treatment and Surgery areas will be provided mechanically through the use of an air-cooled heat pump split system.

Heating for the Indoor Kennel areas will be provided mechanically through the use of a packaged, air-cooled, heat pump with natural gas heat back up.

Ventilation System

Exhaust fans will be in-line centrifugal fans. Discharge air will be through wall louvers and roof gravity hoods. Outside air will be provided by the louvers with motorized dampers during occupied hours for the Administrative and Veterinary Treatment and Surgery areas.

Exhaust for the indoor kennel area will be ducted to the DOAS unit for energy recovery. Quarantine kennel exhaust will be provided by a separate exhaust fan and will not be returned to the DOAS unit for energy recovery. 100% outside air will be delivered to the indoor kennel space through the packaged outdoor unit.

Additional in-line axial exhaust fans will be utilized in the indoor and outdoor kennels to provide emergency smoke evacuation. Smoke exhaust system and associated dampers will be controlled through the fire alarm panel. Smoke exhaust fans are sized based on calculations provided by the QFPE. Limit switches and flow switches will provide positive confirmation of activation back to the fire alarm panel. Make up air will be provided through gravity hood when system is activated.

Energy Recovery

It was determined that energy recovery is not required for the administration area per ASHRAE 90.1 – 2013 Table 6.5.6.1-1. This portion of the facility will be occupied less than 8000 hours a year and will have a maximum of 48% outside air with both units being less than 5500 cfm indicating that no energy recovery is required. The largest source of exhaust will occur in the locker room, tack room and vet treatment/surgery areas.

For the indoor kennel portion of the building it was determined that energy recovery is required per ASHRAE 90.1 – 2013 Table 6.5.6.1-2. This unit is 100% outside air and is providing conditioned air to the space requiring energy recovery to be utilized. An energy recovery wheel is utilized to transfer heat between the outgoing exhaust air and the incoming outside air.

Economizer

ASHRAE 90.1 – 2013 requires economizers for all air handling units of cooling capacity greater than 54,000 Btu/h for climate zone 2A. However, the Administrative area systems exceed the 17% improved efficiency per Table 6.5.1-3, therefore no economizers for the admin areas are required.

UFC 3-410-01-3-6.3 states “For Army and Air Force projects, air economizers must not be used in ASHRAE climate zones 1, 2, 3a, and 4a.” Therefore, economizers on the indoor kennel DOAS unit will not be used.

Offices, Toilets, Mother’s Room, Multi-purpose Rooms, Tack Room, Locker Room, Corridors, and Food Storage

These areas will be air-conditioned. Corresponding VAV air handling unit (VAV AHU) will be located in the corresponding mechanical room. AHU will have a mixing box section, MERV 8 and MERV 13 filters, DX-cooling/heating coil, and supply fan section. Shut-off type VAV boxes with electric reheat coils will provide zone control. Return air will be ducted from the spaces to the air handling unit. Outside air will be provided through intake louvers with a motorized control damper and will be in accordance with UFC 4-010-01.

8.7 Veterinary Treatment and Surgery

These areas will be air-conditioned. Corresponding VAV AHU will be located in the mechanical room. AHU will have a mixing box section, MERV 8 and MERV 13 filters, DX-cooling/heating coil, and supply fan section. Return air will be ducted from the spaces to the air handling unit. Outside air will be provided through intake louvers with a motorized control damper and will be in accordance with UFC 4-010-01.

8.8 Indoor Kennels

This area will be air-conditioned. Corresponding constant volume packaged DOAS unit will be located outside the building near the mechanical room. The DOAS unit will have energy recovery section, MERV 8 and MERV 13 filters, DX cooling coil and a natural gas heating. Unit will be equipped with hot gas reheat for dehumidification cycle.

8.9 Outdoor Kennels

Outdoor kennels will be unconditioned and open to the elements. This space will have a smoke evacuation system. Ceiling fans will be provided in each outdoor kennel.

8.10 Mechanical, Electrical and Telecom Room

DX cooling will be provided via ductless, non-CFC refrigerant, split-system units for the telecom, mechanical and electrical rooms. Remote air-cooled condensing units will be pad mounted on the exterior of the building in close proximity for heat rejection, while indoor evaporator coils will be in the respective communication rooms. Mechanical room ductless split will be a heat pump to provide heating and cooling.

Toilet Rooms, Locker Room, Tack Room, Veterinary Treatment and Surgery

Rooms will be exhausted via in-line exhaust fans discharging to the exterior through the exterior building wall louver with interlocked motor operated damper or through a roof hood with interlocked motor operated damper.

8.11 Control Systems

Building will have new BACnet Direct Digital Control (DDC) System connected throughout a supervisory module. The system will use BACnet MS/TP protocol. A touch screen human-machine interface (HMI) will be provided with all the factory installed DDC controllers for the building controls. Touch screen HMI will be located within the DDC panel.

The DDC controls will be stand-alone type and have the option to be interfaced with an existing base Utility Management and Control System (UMCS) in the future. The DDC system will be “user friendly,” should have good graphics and touch screen operation.

8.12 Training

Training by factory certified technicians will be required for all HVAC systems. Training in a classroom type setting will include proper operating and maintenance procedures, troubleshooting procedures, routine and overhaul maintenance, testing and balancing, and calibration.

8.13 Test and Balance

Building systems will be tested, balanced, and adjusted in accordance with SMACNA and IGCC-2018 requirements for commissioning and for measurement and verification credits to verify that the systems are designed, installed, and calibrated to operate effectively.

8.14 Commissioning

Building systems will be commissioned in accordance with IGCC-2018 requirements to verify that the systems are designed, installed, and calibrated to operate effectively.

8.15 AT/FP

Outside Air Intakes: All outside air intakes will be at least 10 feet above the ground except where located in a fenced-in enclosure.

Emergency Shut Off Switches for HVAC Systems: Emergency HVAC shut off switches will be strategically located in the building to be easily accessible by building occupants. The travel distance to the nearest shut off switch will not exceed 200 feet.

Low Leakage Dampers: Provide all outside air intakes, relief air, and exhaust openings with low leakage dampers that are automatically closed when the emergency HVAC shut off switch is activated. The low leakage dampers will have a maximum leakage rate of 3 cfm/sq. ft with a differential pressure of one-inch water gauge across the damper.

8.16 Energy Budget Analysis

An energy analysis has been performed for the building to demonstrate compliance with the Energy Policy Act 2005 and to evaluate amount of energy cost savings to be applied towards HPSB II: Optimize Energy Performance.

To comply with Energy Policy Act 2005, an energy model has been performed for the building to predict the amount of energy savings compared to an ASHRAE 90.1, Appendix G building (neglecting plug loads in accordance with EAct 2005 calculation method). Estimated energy savings are shown in greater detail in the Energy Analysis report.

A comparison of this Proposed building to an ASHRAE 90.1, Appendix G Baseline building has been performed to estimate the amount of LEED points attainable for energy efficiency (EA Credit 1). See the Energy Analysis document for predicted energy savings and LEED points available under EAc1 – Optimizing Energy Performance.

Part 9

Fire Protection

Part 9: Fire Protection

9.1 Applicable Criteria

International Code Council (ICC)

IBC

International Building Code, 2024 Edition

National Fire Protection Association (NFPA)

NFPA 1

Fire Code, 2024 Edition

NFPA 10

Standard for Portable Fire Extinguishers, 2026 Edition

NFPA 13

Standard for the Installation of Sprinkler Systems, 2025 Edition

NFPA 24

Standard for the Installation of Private Fire Service Mains and Their Appurtenances, 2025 Edition

NFPA 70

National Electrical Code, 2026 Edition

NFPA 72

National Fire Alarm and Signaling Code, 2025 Edition

NFPA 90A

Standard for the Installation of Air-Conditioning and Ventilating Systems, 2024 Edition

NFPA 92

Standard for Smoke Control Systems, 2024 Edition

NFPA 99

Health Care Facilities Code, 2024 Edition

NFPA 101

Life Safety Code, 2024 Edition

NFPA 150

Fire and Life Safety in Animal Housing Facilities, 2025 Edition

NFPA 291

Recommended Practice for Fire Flow Testing and Marking of Hydrants, 2025 Edition

NFPA 1225

Standard for Emergency Services Communications, 2022 Edition

U.S. Department of Defense (DOD)

UFC 1-200-01

DoD Building Code (General Building Requirements), Change 4, 2024 Edition

UFC 3-301-01

Structural Engineering, Change 4, 2025 Edition

UFC 3-600-01

Fire Protection Engineering for Facilities, Change 6, 2021 Edition

UFC 4-010-01

DoD Minimum Antiterrorism Standards for Buildings, Change 3, 2024 Edition

UFC 4-021-01

Design and O&M: Mass Notification Systems, Change 1, January 2010 Edition

UFC 4-510-01

Military Medical Facilities, Change 4, 2025 Edition

ECB 2018-17

New Requirements for Visual Notification for Mass Notification Systems, Revision 4, 2025 Edition

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9.2 **Building Description**

See Architecture Section for the building descriptions.

9.3 **Life Safety**

The UFC 1-200-01 requires the use of several codes and standards, primarily the International Building Code (IBC), NFPA 101 Life Safety Code, NFPA 150 Fire and Life Safety in Animal Housing Facilities and UFC 3-600-01 Fire Protection Engineering for Facilities. In accordance with UFC 1-200-01, the IBC's focus is on allowable floor area, building height limitations, and building separation distance requirements. NFPA 101 is used for building construction related to egress and safety to life.

A separate life safety analysis is provided for the main facility and the support storage/break area facilities.

Main MWD Facility:

9.3.1 *Type of Construction (IBC 601)*

Building Element	Type of Construction	Fire Resistance Rating
Primary Structural Frame	IIB	0 hour
Bearing Exterior Wall	IIB	0 hour
Bearing Interior Wall	IIB	0 hour*
Non-Bearing Exterior Wall	IIB	0 hour
Non-Bearing Interior Wall	IIB	0 hour*
Roof Construction Including Supporting Beams and Joists	IIB	0 hour

*Except as required for occupancy separation, incidental use, and other passive fire protection.

9.3.2 *Classification of Occupancy*

Area	IBC Occupancy	NFPA 101 Occupancy	NFPA 150 Animal Housing Category
Office, Food Storage, Toilets, Mothers Room, Multipurpose Handler, Tack Room, Circulation	Business Group B Section 304.1	Business Section 6.1.11	N/A
Veterinary Treatment, Surgery	Business Group B Section 304.1	Business Section 6.1.11	Category 1-B Section 6.2.1.3
Kennels, Quarantine	Business Group B Section 304.1	Business Section 6.1.11	Category 6-B Section 6.2.6.3

9.3.3 Allowable Building Height/Stories

The allowable building height shall be based on the applicable provisions of IBC Section 504.3 for the occupancies of the building. The maximum number of stories shall be based on IBC Section 504.4 for the occupancies of the building and a completely sprinklered building.

Occupancy / Animal Housing Category	Allowable Height (ft)	Allowable Stories	Code
All	75	4	IBC Table 504.3, 504.4 NFPA 150 7.2.1

9.3.4 Building Allowable Area

Occupancy / Animal Housing Category	Building Factor	Allowable Area (SF) *	Actual Area (SF)	Code
Group B	S1	92,000	11,028	IBC Table 506.2
Category 1-B	S1	40,000	603	NFPA 150 Table 7.2.2
Category 6-B	S1	64,000	5,142	NFPA 150 Table 7.2.2

*Areas with an occupancy classification and animal housing category must comply with the most stringent criteria.

9.3.5 Building Separation (IBC Table 705.5)

Occupancy	Elevation	Fire Separation Distance (ft)*	Fire Resistive Rating of Exterior Wall
Group B	North/South/East/West	≥10	No Rating

*Fire separation distance is defined as the distance from the building face to the closest interior lot line, to the centerline of a street, alley, or public way, or to an imaginary line between two buildings.

9.3.6 Passive Fire Protection

Component	Required Rating	Code
Corridor	No Rating	NFPA 101 38.3.6
Separation of Animal Housing from Facility	1 Hour Barrier	UFC 3-600-01 4.7-3
Separation of Category 6-B and Category 1-B	1 Hour Barrier	NFPA 150 6.3.4.1

9.3.7 Passive Fire Protection Penetration Protection

Component	Doors	Fire Damper Requirements	Other Penetrations	Code

Fire Barrier (1 hr)	¾ hour	1 ½ hour on air transfer openings	1 hour	NFPA 150 9.8.4, 9.8.5 NFPA 101 8.3.4.8

9.3.8 Minimum Interior Finish Ratings

Occupancy / Animal Housing Category	Exits*	Exit Access Corridors* **	Other Spaces	Code
Category 1-B, Category 6-B	Class B	Class B	Class C	NFPA 150 10.1
Business	Class C	Class C	Class C	NFPA 101 Table A.10.2.2

*Areas with an occupancy classification and animal housing category must comply with the most stringent criteria.

**All areas used for egress from an animal housing category must meet the minimum exit access rating for the category.

9.3.9 Egress Analysis

For the purposes of occupant loading, the use of a space can be different than the occupancy classification. For example, Assembly areas less than 750 square feet have an occupancy classification of the overall building's classification, but the occupancy load would still be Assembly.

9.3.9.1 Occupant Load Calculations (NFPA 101 Table 7.3.1.2, UFC 3-600-01 Table 10-1)

Floor	Area*	Function of Space	Area (sf)	Occupant Load Factor (sf / Person)	Occupants
Level 1	Offices, Food Storage, Toilets, Mothers Room, Multipurpose Handler, Veterinary Treatment, Surgery, Quarantine, Tack Room, Indoor Kennel, Outdoor Kennel, Circulation	Business	9,424	150 (Gross)	63
	Mechanical, Electrical, Telecom	Mechanical, Electrical, and other Building Equipment Spaces	623	500 (Gross)	2
	Locker Room	Locker Room	981	50 (Gross)	20
		Total	11,028		85

*Category 1-B and 6-B animal housing categories are treated as business areas for the purpose of occupant load in accordance with NFPA 150 11.1.7 and 16.1.7.

9.3.9.2 Occupant Load Summary and Minimum Exits from the Building

Floor	Occupants	Required Exits (NFPA 101)	Required Exit Separation (NFPA 101)
Level 1	85	2 (7.4.1.1)	1/3 Diagonal (7.5.1.3.3)

9.3.9.3 Minimum Exits or Exit Accesses from a Space or Area

Occupancy	Conditions Permitting One Exit	Condition Requiring Two Exits	Code
Business	Less than 100' travel distance, less than 100 occupants, exit discharges directly to the outside	100' or greater common path, 100 occupants or more, or exit does not discharge directly to the outside	NFPA 101 38.2.4.3

9.3.9.4 Minimum Egress Widths

Component	Requirement	Width (in)	Code
Doors in Egress Access	Per component	32 and one-and-one-half times the largest animal using the door and any associated egress equipment	NFPA 150 8.2.1.1
Level Components	Per occupant	0.2	NFPA 101 Table 7.3.3.1
Corridor Serving Less Than 50 Occupants	Minimum	36	NFPA 101 7.3.4

9.3.9.5 Common Path, Dead-End, and Travel Distance Limits

Occupancy / Animal Housing Category	Common Path Limit (ft) (NFPA 101 Table A7.6)	Dead End Limit (ft) (NFPA 101 Table A7.6)	Travel Distance Limit (ft)*
Category 1-B, Category 6-B	100	50	100 (NFPA 150 8.7.1)
Business	100	50	300 (NFPA 101 Table A7.6)

*Areas with an occupancy classification and animal housing category must comply with the most stringent criteria.

9.3.10 Smoke Management Systems (UFC 3-600-01 7-5, 9-20)

Smoke Control System	Smoke and Heat Vents	Passive Smoke Management
Required*	Not required	Not required

*Required by DFPE in accordance with UFC 3-600-01 4-7.5.

9.3.11 Emergency Lighting and Exiting

Occupancy	Emergency Lighting	Exit Signage
Business	Provided / Not Required (NFPA 101 38.2.9.1)	Provided / Required (NFPA 101 38.2.10)

Break Area / Storage Facility:

For life safety purposes, the Break Kennels and the Storage Building will be considered “buildings on the same lot” in accordance with IBC Section 503.1.2.

9.3.12 Type of Construction (IBC 601)

Building Element	Type of Construction	Fire Resistance Rating
Primary Structural Frame	IIB	0 hour
Bearing Exterior Wall	IIB	0 hour
Bearing Interior Wall	IIB	0 hour
Non-Bearing Exterior Wall	IIB	0 hour
Non-Bearing Interior Wall	IIB	0 hour
Roof Construction Including Supporting Beams and Joists	IIB	0 hour

9.3.13 Classification of Occupancy

Area	IBC Occupancy	NFPA 101 Occupancy	NFPA 150 Animal Housing Category
Break Area	Business Group B Section 304.1	Business Section 6.1.11	Category 6-B Section 6.2.6.3
Storage	Storage, Group S-1 Section 311.1	Storage Section 6.1.13	N/A

9.3.14 Occupancy Separation

Floor / Occupancy	Separation	Floor / Occupancy	Separation Rating	IBC
Level 1 / B	Nonseparated	Level 1 / S-1	Not required	508.3.3

9.3.15 Allowable Building Height/Stories

The allowable building height shall be based on the applicable provisions of IBC Section 504.3 for the occupancies of the building. The maximum number of stories shall be based on IBC Section 504.4 for the occupancies of the building and a completely sprinklered building.

Occupancy / Animal Housing Category	Allowable Height (ft)	Allowable Stories	Code
All	75	4	IBC Table 504.3, 504.4 NFPA 150 7.2.1

9.3.16 Building Allowable Area (NFPA 150 Table 7.2.2, IBC Table 506.2)

Occupancy / Animal Housing Category	Building Factor	Allowable Area (SF) *	Actual Area (SF)	Code
Group B	S1	92,000	2,200	IBC Table 506.2
Group S-1	S1	70,000	482	IBC Table 506.2
Category 6-B	S1	64,000	2,200	NFPA 150 Table 7.2.2

*Areas with an occupancy classification and animal housing category must comply with the most stringent criteria.

9.3.17 Building Separation (IBC Table 705.5)

Occupancy	Elevation	Fire Separation Distance (ft)*	Fire Resistive Rating of Exterior Wall
Group B, S-1	North/South/East/West	≥10	No Rating

*Fire separation distance is defined as the distance from the building face to the closest interior lot line, to the centerline of a street, alley, or public way, or to an imaginary line between two buildings.

9.3.18 Minimum Interior Finish Ratings

Occupancy / Animal Housing Category	Exits	Exit Access Corridors	Other Spaces	Code
Category 6-B	Class B	Class B	Class C	NFPA 150 Table 10.1
Storage	Class C	Class C	Class C	NFPA 101 Table A.10.2.2

9.3.19 Egress Analysis

For the purposes of occupant loading, the use of a space can be different than the occupancy classification. For example, Assembly areas less than 750 square feet have an occupancy classification of the overall building's classification, but the occupancy load would still be Assembly.

9.3.19.1 Occupant Load Calculations (NFPA 101 Table 7.3.1.2, UFC 3-600-01 Table 10-1)

Floor	Area*	Function of Space	Area (sf)	Occupant Load Factor (sf / Person)	Occupants

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Level 1	Break Area	Business	2,200	150 (Gross)	15
	Storage	Mechanical, Electrical, and other Building Equipment Spaces	482	500 (Gross)	1
		Total	2,682		16

*Category 6-B animal housing categories are treated as business areas for the purpose of occupant load in accordance with NFPA 150 16.1.7.

9.3.19.2 Occupant Load Summary and Minimum Exits from the Building

Floor	Occupants	Required Exits (NFPA 101)	Required Exit Separation (NFPA 101)
Level 1	16	1 (7.4.1.1)	N / A

9.3.19.3 Minimum Exits or Exit Accesses from a Space or Area

Occupancy	Conditions Permitting One Exit	Condition Requiring Two Exits	NFPA 101 Section
Business	Less than 100' travel distance, less than 100 occupants, exit discharges directly to the outside	100' or greater common path, 100 occupants or more, or exit does not discharge directly to the outside	38.2.4.3
Storage	Less than 100' travel distance	100' or greater travel distance	42.2.4.1

9.3.19.4 Minimum Egress Widths

Component	Requirement	Width (in)	Code
Doors in Egress Access	Per component	32 and one-and-one-half times the largest animal using the door and any associated egress equipment	NFPA 150 8.2.1.1
Level Components	Per occupant	0.2	NFPA 101 Table 7.3.3.1

9.3.19.5 Common Path, Dead-End, and Travel Distance Limits

Occupancy / Animal Housing Category	Common Path Limit (ft) (NFPA 101 Table A7.6)	Dead End Limit (ft) (NFPA 101 Table A7.6)	Travel Distance Limit (ft)
Category 6-B	100	50	100 (NFPA 150 8.7.1)
Storage	100	100	400 (NFPA 101 Table A7.6)

9.3.20 Smoke Management Systems (UFC 3-600-01 7-5, 9-20)

Smoke Control System	Smoke and Heat Vents	Passive Smoke Management
Not required	Not required	Not required

9.3.21 Emergency Lighting and Exiting

Occupancy	Emergency Lighting	Exit Signage
Business	Not required (NFPA 101 38.2.9.1)	Not required (NFPA 101 38.2.10)
Storage	Not required (NFPA 101 42.2.9)	Not required (NFPA 101 42.2.10)

9.4 **Fire Suppression and Water Supply**

9.4.1 Fire Suppression Requirements (UFC 3-600-01 4-7.1, 9-10, 9-17)

Sprinklers	Standpipe	Fire Extinguishers
Provided / Required (UFC 3-600-01 4-7.1)	Not provided / Not required (UFC 3-600-01 9-10)	Provided / Required (UFC 3-600-01 9-17)

9.4.2 Water Supply

A water flow test was performed on 23 September 2025. The results showed a static pressure of 60 psi, a residual pressure of 50 psi, and a flow of 1,662 gpm. Preliminary hydraulic calculations indicate the fire sprinkler system will require 616 gpm at 46 psi including a 250-gpm hose flow. An additional 12.6 psi is available based on the water supply characteristics. A fire pump will not be required to meet the demand of the facility sprinkler system.

Provide an approved double check backflow preventer with supervised indicating shut off valves. Hydraulic calculations shall provide a minimum pressure loss across the backflow preventer of 8 psi or the manufacturer's pressure loss criteria, whichever is greater.

A post indicator valve (PIV) will be provided.

9.4.3 Fire Hydrant Distribution and Fire Department Access (UFC 3-600-01 9-1.1, 9-1.4, 9-3.5)

All parts of the building will be located within 350 feet of a hydrant. At least one fire hydrant will be located within 150 feet of the fire department connection. A fire hydrant will be located inside the perimeter fence as required for code compliance spacing and fire department access requirements.

Maximum Distance to Building Perimeter (ft)	Distance to FDC (ft)	Distance to Corner of Building (ft)	Fire Truck Access (ft)
350	150	NA	33

9.4.4 Fire Suppression Systems

Occupancy Hazard Classification (UFC 3-600-01 Table 9-3, Table 9-4 and Appendix B)

Hazard Classification	Density (gpm/sf)	Remote Area (sf)	Maximum Area per Head (sf)	K Factor	Hose Demand (gpm)

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Light Hazard (Wet)	0.10	1500	225	5.6	250
Ordinary Hazard (Wet)	0.20	2500	130	8.0	250
Light Hazard (Dry)	0.10	1950	225	5.6	250
Ordinary Hazard (Dry)	0.20	3500	130	8.0	250

*Increase the remote area by 30% where the slope of the ceiling exceeds 2 in 12.

The buildings will be completely protected by a hydraulically designed automatic wet pipe and dry pipe sprinkler systems in accordance with UFC 3-600-01. Dry-pipe sprinkler systems will be used in any areas subject to freezing. The dry pipe system will extend to the Break Area and Storage Building using an underground trench.

Sprinkler piping 2-in and less will be minimum schedule 40 black steel. Sprinkler piping larger than 2- in will be minimum schedule 10. Welded or flanged connections will be provided upstream of the system valves and threaded or grooved couplings will be provided downstream of the system valves. Recessed pendent sprinklers will be provided in areas with lay-in ceilings, and upright sprinklers will be provided in areas without ceilings. Sprinkler mains will be routed in the ceiling space with branch piping routed to serve the individual room sprinklers. Hazard classifications will be as indicated on the drawings.

Special extinguishing systems such as clean agent systems or wet chemical hood suppression are not used in the facility.

A yard fire department connection (FDC) will be provided per UFC 3-600-01 and coordinated with the location of fire hydrants and fire department access lanes.

Hazardous materials are not used or stored in the facility in general, other than what is needed for janitorial supplies.

9.4.5 Hydraulic Analysis

Preliminary hydraulic demands are estimated to be 460 gpm for the wet-pipe system at 38.7 psi. A 250 gpm hose stream demand is included in hydraulic calculations as well as a 25-gpm domestic demand, making the total fire water demand approximately 735 gpm at 38.7 psi including industrial demands.

Preliminary hydraulic demands are estimated to be 341 gpm for the dry-pipe system at 46 psi. A 250 gpm hose stream demand is included in hydraulic calculations as well as a 25-gpm domestic demand, making the total fire water demand approximately 616 gpm at 45.8 psi including industrial demands.

The existing water supply is capable of producing the necessary pressure required for the sprinkler suppression systems. As such, a fire pump will not be provided. See section 9.4.2 Water Supply for more information.

9.4.6 Seismic Requirements

A Fire Sprinkler system is to be provided with supports and bracing as required by UFC 3-600-01 and NFPA 13.

9.5 Fire Alarm and Mass Notification System

9.5.1 Fire Alarm Requirements (UFC 3-600-01 9-18.1, UFC 4-021-01)

Manual Initiation	Automatic Initiation	Occupant Notification
Manual fire alarm pull stations at all exits	Sprinkler flow switches	Speakers
	Spot smoke detection	Clear strobes
	Heat detectors where environment is not suitable for smoke detectors	Text signs
	Duct smoke detectors	
	Carbon monoxide detection	

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A combined addressable fire alarm and mass notification system (FA/MNS) will be provided throughout the buildings. The Break Area and Storage Building will be served by the Main Building fire alarm/mass notification control unit. Fire alarm control unit, mass notification autonomous control unit, and sub-panels are to be located in the electrical room. A remote annunciator panel will be mounted at the main building entry point and locked for use by the fire department only. The system utilizes Class A SLC circuits and Class B IDC and NAC circuits. The fully addressable fire alarm/mass notification system will be provided with battery backup power supply with rechargeable batteries in accordance with UFC 3-600-01, UFC 4-021-01, ECB 2018-17 and NFPA 72 requirements.

All fire alarm circuits are installed in conduit. Fire alarm conduit and junction boxes are painted red in unfinished areas and are permitted to be painted to match the room finishing in finished areas. All junction boxes are labeled. Wire nuts and crimp connectors are not permitted. Conductors and conduits extending from the Main Building to the Break Area and Storage Building will be routed through an underground trench. All fire alarm circuits entering or leaving the facility and all power supply circuits to the FACU/ACU and subpanels are protected by a surge protection device (SPD).

All fire alarm and mass notification devices located in the outdoor portion of the kennel area shall be weatherproof.

For mass notification, an autonomous control unit (ACU) is provided to monitor and control the notification appliance network. The ACU allows personnel in the facility to initiate delivery of a pre-recorded voice message, provide live voice messages and instructions, and initiate visual strobes. The ACU is integrated with the building FACU to form one combined system which performs fire alarm and mass notification as required by UFC 4-021-01. Local Operating Consoles (LOC) will be provided every 200 feet of egress travel inside the building and be accessible to building occupants. A combined fire alarm annunciator and LOC is not allowed, and LOCs are to include a latch, but not be locked.

Notification will include speakers with different voice messages to alert occupants as to the nature of the emergency and provided functional instructions. Text signs will be provided over substantial means of egress. Fire alarm and mass notification announcements shall be indicated with clear strobes. Exterior speakers will be provided in accordance with UFC 4-021-01. Audible notification provides a minimum 15 dBA above ambient in all locations in the facility, measured with all openings closed (e.g. doors). Intelligibility requirements will be met in accordance with UFC 4-021-01. Audible notification is to achieve a CIS score of 0.70 in each room measured at five feet above finished floor as required by UFC 4-021-01. Fire alarm notification will not be provided in the surgery room.

Manual pull stations will be provided at each exit. Manual pull stations at the outdoor portion of the kennel shall be waterproof. Smoke detection is limited to duct smoke detection at large HVAC equipment, surgery areas, veterinary treatment areas, kennel areas, and at locations at fire alarm and mass notification control panels. Carbon monoxide detection will be provided above the fuel-fired water heaters. The system will control passive fire protection features such as fire dampers where applicable and will activate the smoke control system where provided.

The fire alarm system will monitor the fire suppression systems and transmit signals to the fire department through the Base Monaco radio transceiver system. A Monaco BT-XM transceiver is to be used to transmit fire alarm signals via an antenna on the exterior of the building configured to the existing Base Monaco system frequency. Signals to be transmitted include alarm signals by alarm initiating device; common supervisory signals; and common trouble signals.

Part 10

Electrical

Part 10: Electrical

10.1 Applicable Criteria

ADA	Americans with Disabilities Act
ANSI C2	National Electrical Safety Code (NESC)
ASHRAE 90.1	Energy Standard for Buildings Except Low-Rise Residential Buildings
IEEE 142	Recommended Practice for Grounding of Industrial and Commercial Power Systems
IESNA	Illuminating Engineering Society of North America Handbook, Current Edition
ICD/ICS 705	IC Tech Spec for ICD/ICS 705
NFPA 70	National Electrical Code (NEC) 2017
NFPA 70E	Standard for Electrical Safety in the Workplace - 2018
NFPA 72	National Fire Alarm Code
NFPA 101	Safety to Life from Fire in Buildings and Structures
NFPA 780	Lightning Protection Code
UFC 3-501-01	Electrical Engineering, with Change 1 (01 Nov 2019)

**Note that 3-501-01 is the Top Level Document for Electrical Engineering

All documents that fall under 3-501-01 are also included in this design effort.

Including but limited to 3-520-01 and 3-530-01**

UFC 3-520-01	Interior Electrical Systems, with Change 2 (12 Apr 2021)
UFC 3-520-05	Stationary Battery Areas, with Change 2 (09 Jan 2020)
UFC 3-530-01	Interior and Exterior Lighting Systems and Controls, with Change 4 (01 Nov 2019)
UFC 3-540-01	Engine-Driven Generator systems for Prime and Standby Power Applications, with Change 2 (01 Aug 2014)
UFC 3-550-01	Exterior Electrical Power Distribution, with Change 3 (01 Nov 2019)
UFC 3-560-01	O&M Electrical Safety, with Change 2 (31 Oct 2019)
UFC 3-575-01	Lightning and Static Electricity Protection Systems (1 Jul 2012)
UFC 3-580-01	Telecommunications Building Cabling Systems Planning and Design, with Change 1 (1 Jun 2016)
UFC 4-010-01	DoD Minimum Antiterrorism Standards for Buildings, with Change 1 (12 December 2018)
UL 96A	Installation Requirements for Lightning Protection Systems

10.2 Design Requirements

This project consists of complete installation of all electrical systems for the new Military Working Dog (MWD) Kennel at Hunter Army Airfield as described herein.

10.3 Demolition

Existing building will be demolished. Existing service feed to existing building will be removed back to transformer.

10.4 System Descriptions

10.4.1 *Primary Power Distribution System*

The primary electrical distribution system is owned and operated by Canoochee Electric Membership Corporation (CEMC). The proposed primary tie-in location will be at the nearest manhole/handhole or pole. The underground primary ductbank, conductors, pad mounted transformer, transformer pad and primary terminations at the transformer will be provided and installed by CEMC. The new transformer will be sized to meet the calculated electrical loads of the new facility.

10.4.2 *Secondary Power Distribution System*

The secondary duct bank, secondary conductors will be provided and installed by the Contractor. The secondary terminations will be completed by CEMC. Service entrance conductors will extend from the pad-mounted transformer through new electrical duct bank to the 208Y/120V Main Distribution Panel (MDP) located in the electrical room. The service entrance conductors will be copper with type XHHW insulation. The main distribution panel will be a 208Y/120V, 3-phase, 4-wire and will be provided with digital metering capable of transmitting energy usage.

Feeders will extend from the MDP to large load mechanical equipment, lighting panel, and smaller load panels. 120-volt branch circuits will have dedicated neutrals (no shared neutrals.) All panel neutrals will be 100% rated.

A special standby panel 208Y/120V will be provided to serve the Veterinary Treatment room. The special standby panel will feed Un-interruptible Power Supply (UPS) system and critical panel 208Y/120V for surgery operations equipment. Refer to paragraphs 10.4.4 Backup Power Systems and 10.4.5 Un-interruptible Power Supply (UPS) system for more information.

Panelboards and associated feeders will be sized for 20 percent spare capacity. All panelboards will contain 20 percent spare circuit breakers and surge protection device (SPD) modules. Voltage drop will be limited to 2 percent from main distribution panelboard to panelboard and 3 percent from panelboard to load for a maximum total of 5 percent.

10.4.3 *Site Grounding*

Grounding will consist of a bare copper ground counterpoise with ¾-inch x 10-foot copper-clad steel ground rods around the building. This counterpoise system will be connected to building columns, derived source transformer secondary neutrals, service entrance equipment, main grounding bar, telecommunication main grounding bar, and the lightning protection system. All connections will be exothermic welded connections. The building ground will be designed for 5 ohms or less.

10.4.4 *Backup Power Systems*

A standby generator system will be provided and will provide standby power for Veterinary Treatment / Vet Surgical Procedures rooms, the (4) exhaust fans within the kennel area, and the fire panel.

Uninterruptible Power Supplies (UPS) will be provided and will provide power for the Veterinary Treatment/Vet surgical procedure room.

Generator will be natural gas fueled, 208Y/120V, 3-phase, 4-wire and will be installed in a sound attenuated, weatherproof enclosure. Generator shall be TIER 4 permitted for air quality to comply with Federal, state, and local regulations.

An automatic transfer switch (ATS) will be provided for switch between normal power and generator for standby panel, UPS, and critical panel.

10.4.5 Un-interruptible Power Supply (UPS) System

An Uninterruptible Power Supply (UPS) will be provided to power critical surgical procedure equipment during generator startup period.

The UPS shall provide a minimum of 10 minutes back-up power.

10.4.6 Interior Grounding

Grounding will be provided in accordance with the NEC. All feeder and branch circuits will have a “green” insulated equipment ground conductor in addition to the conduit being used as a grounding path.

A main ground bar will be provided in the main electrical room. A primary bonding busbar will be provided in the communication room. A ground conductor will be routed from the main grounding bar to the primary bonding busbar as well as a ground conductor from the main ground bar to the building counterpoise system. This ground counterpoise will be connected to building columns, service entrance equipment, and the lightning protection system.

10.4.7 Lightning Protection Systems

A traditional franklin rod type Lightning Protection System (LPS) in accordance with NEC, NFPA 780 and UFC 3-575-01 will be provided for the facility. An array of roof mounted air terminals, roof conductors and down conductors will be included with the system. The lightning protection system will be interconnected to the building counterpoise system. Test wells will be provided for the grounding system. The lightning protection system will be installed under the supervision of an LPS certified master installer. The LPS will be required to obtain a UL Master label per UL96A.

10.4.8 Interior Lighting

Lighting levels will be designed to meet illuminance values recommended in the UFC 3-530-01 and IES Lighting Handbook. The basic fixtures, not necessarily all fixtures, that will be provided are:

1. 1' x 4' industrial fixtures in unfinished areas
2. 2' x 2' fixtures in transitional spaces, vestibules
3. 2' x 4' fixtures for finished offices, administrative areas, classrooms, conference rooms
4. Linear indirect type fixtures in laboratories and open office areas.
5. low bay light fixtures
6. 6 or 8 inch downlights

Lighting in general throughout the facility will consist primarily of recessed and suspended or pendant mounted LED fixtures. LED color temperature will be 4000 degrees K and the color rendering index (CRI) will be greater than 80. All interior lighting for the facility will be 120V. LED lighting will be provided with 10 year manufacturer's warranty per UFC 3-530-01.

Lighting power densities will be included in the “Calculations” of each submittal demonstrating compliance with ASHRAE 90.1-2013

10.4.9 Lighting Controls

Lighting controls will be provided per ASHRAE 189.1-2014 and 90.1-2013. No complex systems controlled by mobile devices are allowed. Dual level lighting will be installed in presentation rooms and other areas accepted as general practice in the industry.

Occupancy sensors will be provided for automatic controls, reduce energy costs and to address LEED criteria. The occupancy sensors will be dual-technology (ultrasonic and infrared) and will be ceiling or wall mounted in open office

areas, administrative areas, lobby entrance, corridors, vestibules, and other rooms that are not kennel or veterinary type spaces. Automatic lighting controls will not be provided in kennel or utility spaces.

10.4.10 Exterior Lighting

Exterior lighting shall be LED type and designed per, UFC 3-530-01 requirements and IESNA standards. Exterior lighting fixtures for the roadways and parking lots will be pole mounted. All poles and pole mounted fixtures will be provided by CEMC. Exterior lighting fixtures for the building will be wall mounted. All exterior lighting will be automatically controlled by photocells or by a programmable lighting control panel with astronomical timeclock.

Computer generated photometric calculations will be analyzed to optimize the lighting distribution.

10.4.11 Emergency Egress and Exit Lighting

Emergency lighting will be in accordance with the NEC, NFPA 101, International Building Code, and UFC. The facility will be equipped with a stand-by generator and a separate automatic transfer switch for life-safety loads. Lighting fixtures designated as emergency egress lighting will have an integral battery connected to them. Red LED-type illuminated exit signs will have a 90-minute integral battery as well.

10.4.12 Cathodic Protection

Cathodic protection requirements will not be required based on the soil type listed in the Geotech Report and material type of the water and natural gas pipes.

10.5 Materials

Threaded galvanized rigid steel conduit or intermediate metal conduit will be used in all outdoor locations and when exposed to physical damage.

EMT with compression couplings will be installed indoors concealed in walls and in areas not exposed to physical damage.

MC cable will be prohibited. Manufacturer provided wired whips will be allowed for flexible connections to lighting and systems furniture only.

PVC SCH40 or EB-20 conduit will be used in concrete-encased underground duct banks.

All interior electrical cables will be copper. All conductors #8 and greater will be stranded copper. The minimum size will be #12 AWG for power and #14 for control circuits. All wiring will have 600V THHN/THWN insulation.

All panelboards will be of the circuit breaker type with copper busses. Each panelboard supplying power to sensitive equipment will have adjacent transient voltage surge protection.

All power wiring will be routed in conduit with a minimum size of 3/4-inch. Threaded galvanized rigid steel conduit will be utilized outdoors and in equipment rooms. Indoor conduit in exposed areas above 10 feet will be EMT with compression fittings.

All electrical equipment will be UL listed where UL listings are available.

All equipment located outside will be NEMA 4X stainless steel.

10.6 Life Cycle Cost Analysis (LCCA) for Photovoltaic Systems and Lighting

We propose that an LCCA for different types of lighting systems is not required since the base standard is LED. This design will utilize LED lighting per the base standard. LED lighting is the most efficient type of lighting system available on the market today. We have conducted an LCCA for Photovoltaic Solar System and it was determined that a solar system should not be considered in the design of the facility due to the Base Case (Utility Power) having the lowest life-cycle cost.

Part 11

Electronics and Communications

Part 11: Electronics and Communications

11.1 Applicable Criteria

ANSI C2	National Electrical Safety Code (NESC)
ANSI/TIA	Commercial Building Telecommunication Cabling Standard
ANSI/TIA	Commercial Building Standard for Telecommunications Pathways and Spaces
ANSI/TIA	Customer-Owned Outside Plant Telecommunications Cabling Standard
CNSSAM TEMPEST/1-13	RED/BLACK Installation Guidance (17 January 2014)
CNSSI 7003	NTISSI 7003 Protective Distribution System
I3A	Technical Criteria for the Installation Information Infrastructure Architecture (Feb 2010)
ICD/ICS 705	IC Tech Spec for ICD/ICS 705
NFPA 70	National Electrical Code (NEC) 2017
NFPA 72	National Fire Alarm Code
NFPA 1225	Standard for Emergency Services Communications.
SIPRNET Technical Implementation Criteria	
TIA	Telecommunications Industries Association
UFC 3-501-01	Electrical Engineering, with Change 1 (01 Nov 2019)
UFC 3-550-01	Exterior Electrical Power Distribution, with Change 3 (01 Nov 2019)
UFC 3-520-01	Interior Electrical Systems, with Change 2 (12 Apr 2021)
UFC 3-570-01	Cathodic Protection (14 Jan 2019)
UFC 3-580-01	Design: Telecommunications Building Cabling Systems Planning and Design, with Change 1 (1 Jun 2016)
UFC 4-010-05	Sensitive Compartmented Information Facilities Planning, Design, and Construction, with Change 1 (01 Oct 2013)
UFC 4-010-06	Cybersecurity of Facility-Related Control Systems, with Change 1 (18 Jan 2017)
UFC 4-021-02	Electronic Security Systems, with Change 1 (11 Sept 2019)
USASOC Information Technology (IT) Technical Design Guide	
Memorandum for Record: Controlled Access (CAA) Working Definition for Army	

11.2 Electronic Access Control System (EACS)

The Electronic Access Control System (EACS) will use hardware compatible with existing Technical Security infrastructure at Hunter Army Airfield.

The EACS will be activated using Common Access Card (CAC) and keypads. The EACS design will provide head-end equipment, sensors, locking devices, monitoring workstation, and card readers that are proxy/pin. EACS will be provided at:

1. Building Entrance Doorways
2. Building Telecommunication Server Room
3. Access into Controlled Access Area (CAA)
4. Entrance from Kennel into Office Space

Only infrastructure for the EACS system will be provided through this project.

11.3 Intrusion Detection (IDS)

The IDS will provide IDS control boards with-in the EACS system, PIR motion sensors, and high security switches (HSS) and other devices as required to make for a complete IDS for each area requiring monitoring. The spaces that will include individual IDS systems are:

1. Overall facility
2. Telecomm Rooms

All doors requiring monitoring will have high security switches that are completely sealed, co-planar magnetic type with pry-tamper circuit and narrow read angle that have a high defeat resistance.

In addition to HSS located at the doors, each door will be covered by a passive infrared (PIR) motion detector on the inside of the monitored space. PIR units will also be in other areas deemed as requiring monitoring, such as corridor areas where Protective Distribution System (PDS) is routed. PIR coverage zones are indicated on plans. Premise Control Unit (PCU) will also be located inside the entry door to allow authorized personnel to enable or disable the IDS system for that area.

All IDS will be compatible with the EACS system.

Only infrastructure for the IDS system will be provided through this project.

11.4 Internet-Protocol Closed Circuit Television Systems (IPCCTV)

Fixed IPCCTV cameras will cover the entire building exterior. Interior fixed IPCCTV cameras will monitor interior and exterior kennel areas, building entrances, hallways, and the entrances to IDS protected spaces. Cameras will be monitored at the Staff Duty Office in the Battalion Headquarters.

The IPCCTV design will provide head-end equipment, cabling, PoE network switches, and control equipment in the telecommunications room. Multi-sensor fixed IP cameras will be utilized in areas that require multiple views such as intersecting hallways and exterior corners of the facility. IPCCTV will be provided at:

1. Building Entrances / Exits
2. Interior Hallways
3. ARMAG building

Only infrastructure for the IPCCTV will be provided through this project.

11.5 Telephone and Data Communication Systems

Exterior communications will connect to the building network infrastructure through new and existing underground infrastructure per UFC 3-580-01. The components provided for the site communications will include new underground concrete encased duct bank, copper cable, fiber optic cable, terminations, splice enclosures, cable vaults, and copper and fiber optic entrance facilities. New underground communication duct bank consisting of concrete-encased conduits

will be provided from the new building to existing manhole. New cabling and their terminations into the new facility will be by the contractor. Underground boring systems shall be used for all underground utilities that cross active road crossings to tie into existing utilities.

The building will be provided with two separate networks: NIPRNET and SIPRNET. Interior telecommunication system will be provided in accordance with UFC 3-580-01, ANSI/TIA, Secret Internet Protocol Router Network Technical Implementation Criteria, and RED/BLACK Installation Guidance.

The main equipment will consist of telecommunications racks, floor and wall mounted cabinets, plywood backboards, patch panels, conduit, cable tray, and copper and fiber horizontal cabling. Copper backbone cable will be voice grade. Fiber optic backbone cable will be single-mode type. Horizontal cabling will be category 6, unshielded twisted pair, and plenum rated. Modular jacks will be RJ-45. A facility specific color coding and labeling scheme will be developed for the outlets and cables. Secured data network cables and jacks will be red in color and will be installed in a Protected Distribution System (PDS) where required.

Communication outlets will be provided as required by UFC 3-580-01. For each private office, two communications outlets with outlets mounted on different walls in order to accommodate future furniture relocations. Typical standard communication outlets shall be provided with three category 6 cables and RJ-45 jacks to support the faceplate configuration of 1-voice, 2-data.

Communication outlets will be provided for building Direct Digital Control (DDC) system, electric meter, and water meters.

NIPR equipment shall utilize open 19" racks. SIPR equipment shall utilize lockable, enclosed, floor mounted communications cabinets. There will be a minimum two communications racks/cabinet in each telecommunications room. Two (2) NEMA 5-20R receptacles shall be mounted within the SPIR cabinet near the floor. The receptacles should be placed on the outer wall of the cabinet. Double gang floor boxes with duplex NEMA 5-20R receptacles will be provided behind the vertical cable management of the racks.

Telecommunications grounding will be in accordance with the UFC 3-580-01, all TIA standards and regulations. Grounding for red/black systems shall comply with CNSSAM TEMPEST/1-13 RED/BLACK Installation Guidance. Telecommunications grounding systems will generally consist of the following major components: primary bonding busbar (PBB) and a telecommunications bonding backbone (TBB). All TRs shall be connected to the building earth electrode subsystem (EES).

11.6 Public Address Systems

A Public Address system will be required for the facility. Only the infrastructure of the public address system will be provided through this project.

11.7 Cable Television (CATV) System

CATV is not required for the facility.

11.6 Public Safety Systems

A public safety Distributed Antenna System (DAS) will be implemented to ensure reliable emergency communication coverage within the building. The system will be passive and will consist of a donor antenna to receive signals, a Bi-Directional Amplifier (BDA) to boost those signals, and multiple in-building antennas to distribute coverage. This configuration is designed to support first responder radio communications in compliance with NFPA 1225 standards.

Part 12

Sustainable Design

Part 12: Sustainable Design

12.1 Applicable Criteria

Army SDD Policy	Army Sustainable Design and Development (SDD) Policy
HPSB Guiding Principles	(2016) Guiding Principles for Sustainable Federal Buildings and Determining Compliance with the Guiding Principles for Sustainable Federal Buildings
LEED BD+C: NC	U.S. Green Building Council (USGBC) – LEED v4 for Building Design and Construction: New Construction and Major Renovations
UFC 1-200-02	High Performance and Sustainable Building Requirements

12.2 High Performance and Sustainable Building (HPSB) Requirements

UFC 1-200-02 High Performance and Sustainable Building Requirements is organized around the “Guiding Principles for Sustainable Federal Buildings” to guide transformation in performance of the DOD facility inventory. Design approaches and technologies focus on compliance with the Guiding Principles including sustainable site development, water savings, energy efficiency, materials and resources selection and indoor environmental quality specific to the site, mission, and programmatic needs of the MWD Kennel.

Integrated Design: The integrated design process evaluates strategies to meet the requirements of federal mandates that reinforce the importance of sustainable development through the planning, design, construction, and operation of facilities. Such policies were enacted to reduce environmental impacts, lower energy, and operating costs, optimize performance and conserve water, while increasing occupant satisfaction and productivity through improved health and well-being.

Commissioning: A robust commissioning program is integrated with design and construction to optimize building performance, reduce energy use, improve indoor air quality and occupant productivity, extend equipment life and reduce maintenance costs. The Commissioning Authority (CxA) participates in the project from the beginning of design through completion of construction.

Optimize Energy Performance: The building envelope, mechanical systems, lighting fixtures and controls are designed to maximize energy savings and exceed the requirements of ASHRAE 90.1-2013, with meters to monitor utility consumption and verify operational performance over time. Multiple systems and the baseline capital costs, annual energy costs, annual maintenance costs and replacement costs are compared and selected based on energy and life cycle cost analysis. Whole building energy simulation is used to validate energy savings of the selected system, with a goal of achieving a 30% energy use reduction as compared to the ASHRAE 90.1-2013 baseline. To further reduce dependence on grid-based energy and in compliance with EISA 2007, solar hot water and photovoltaic solar power systems are evaluated based on life-cycle cost analysis. Roofing and hardscape materials are anticipated to comply with SRI requirements for solar reflectance. Exterior lighting reduces light pollution through an efficient, but secure, lighting design.

Protect and Conserve Water: Stormwater design focuses on low impact design strategies to reduce runoff volumes and improve water quality. Permanent irrigation systems are eliminated by selecting native and drought-tolerant landscaping. Water use within the buildings is anticipated to be reduced over 40% through selection of low flow plumbing fixtures.

Indoor Environmental Quality: Good indoor air quality reduces health risks and promotes occupant productivity. Strategies include a no smoking policy, outside air ventilation rates above ASHRAE 62.1 minimums with automatic controls and reduction of indoor pollutants. IAQ management during construction and before occupancy reduces air quality problems resulting from the construction process. Pollutant source control, increased filtration at outside air supply, and the use of low-emitting interior finishes contribute to a healthier indoor environment. Thermal comfort is

maintained through efficient system design, while occupant well-being is aided by controllability of systems and providing a connection to the exterior environment to the greatest extent possible.

Environmental Impact of Materials: Recycling, both during construction and throughout facility operation, is prioritized to reduce the amount of waste directed to landfills. Receptacles for co-mingled recyclables are located throughout the facility, with collection at a central location. Building materials with high recycled content and longevity reduce impact to the waste stream, and locally available materials benefit the local economy and reduce transportation impacts. Rapidly renewable and bio-based materials, as well as certified wood products, are specified to further reduce negative impact to natural resources.

Climate Change Risk: Building design solutions evaluate and respond to mission criticality in order to maintain resiliency to the impact of climate change.

12.3 Third Party Certification

The project will use LEED v4 Silver to validate compliance with the Guiding Principles and will be registered on LEED Online and submitted for third party certification.

The Federal High Performance Sustainable Building Checklist provides a summary of Guiding Principles compliance. The LEED-NC v4 Checklist provides a summary of LEED Silver compliance.

Both documents are submitted at each design milestone, with final submittal by the General Contractor after construction is complete. The HPSB and LEED checklists will be included in Contract Documents as attachments to Section 01 33 29 Sustainability Reporting.

Documentation will be provided in accordance with the “USACE LEED-NC v4 Submittals for Registered Projects” spreadsheet. Burns & McDonnell will complete design-phase documentation and the General Contractor will complete construction-phase documentation. The “USACE LEED-NC v4 Submittals for Registered Projects” spreadsheet will also be included in Contract Documents as an attachment to Section 01 33 29 Sustainability Reporting to provide clear documentation requirements to the General Contractor.

Part 13

Cybersecurity Design

Part 13: Cybersecurity

13.1 Applicable Criteria

Committee on National Security Systems (CNSSI)

CNSSI 1253

Security Categorization and Control Selection for National Security Systems

Department of Defense Instruction (DODI)

DODI 8500.01

Cybersecurity

DODI 8510.01

Risk Management Framework (RMF) for DoD Information Technology (IT)

Engineering and Construction Bulletin (ECB)

ECB 2018-11

Control System Cybersecurity Coordination Requirement

National Institute of Standards and Technology (NIST)

NIST SP 800-30 Rev 1

Guide for Conducting Risk Assessments

NIST SP 800-37

Guide for Applying the Risk Management Framework to Federal Information Systems: A Security Life Cycle Approach

NIST SP 800-53

Security and Privacy Controls for Federal Information Systems and Organizations

NIST SP 800-53A

Guide for Assessing the Security Controls in Federal Information Systems and Organizations

NIST SP 800-82

Guide to Industrial Control Systems (ICS) Security

Department of Defense (DOD)

UFC 04 010 06

Cybersecurity of Facility Related Control Systems, with Change 1

13.2 Overview

The design of cyber secure facility-related control systems sets the foundation for long-term successful cybersecurity of the facility. To achieve success during the MILCON stage and beyond into operations, it requires a multi-disciplined effort executed by members of the DPW, IMCOM, USACE, the designer, the contractor, system-specific installers and integrators, and the new MWD Kennel staff.

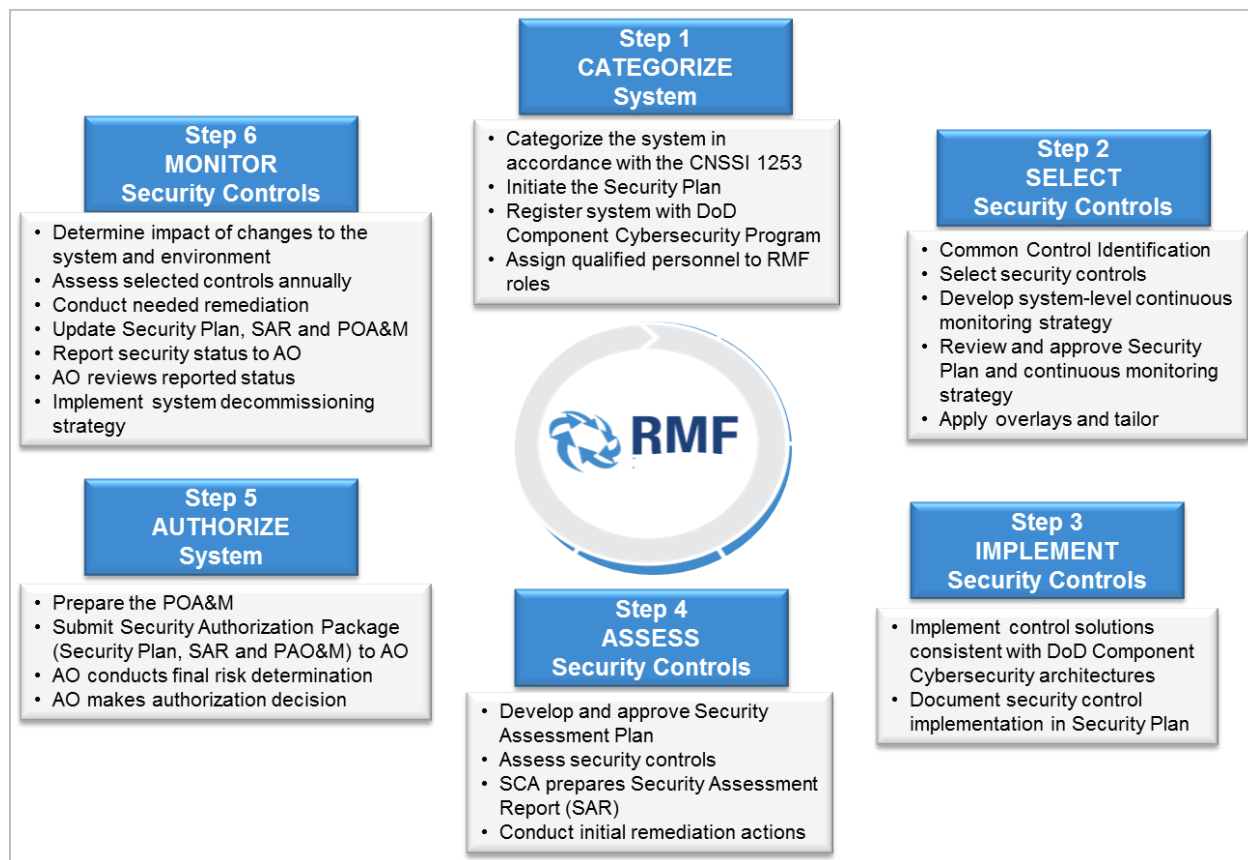
Cybersecurity design and implementation is defined in UFC 4-010-06 and the other supporting references listed above for all facility-related control systems with networked digital controllers (e.g., building control systems, utility control systems, lighting control, electronic security systems, UPS Monitoring System, and fire and life safety systems). Deliverables during the design process include an explanation in the Design Analysis, the creation of guide specifications tailored to each system that will be included in the RFP, and other supporting documentation. The goals of the UFC requirements are to supply enough information so bidding contractors can generate realistic cost proposals, to support HAAF in achieving control system accreditation, and to provide the appropriate level of cybersecurity for Facility Related Control Systems.

Design of these control systems and the documentation supplied to the contractor are consistent with the baselines already established or with Risk Management Framework (RMF) guidelines. Coordination with Fort Stewart, USACE, and IMCOM/AMC staff will occur throughout to enable the contractor to continue the process through construction.

Control systems subject to these cybersecurity requirements in the MWD Kennel include HVAC DDC Controls and Fire Alarm/Mass Notification. Government Furnished Government Installed (GFGI) systems, both Information Technology (IT) and Operational Technology (OT), are usually not part of the design scope and are excluded. Electronic Security System (ESS) design is limited to infrastructure only. All switches and head-end devices are GFGI.

13.3 **RMF Process Overview**

DoD utilizes the Risk Management Framework (RMF) Process to achieve an acceptable level of risk related to cybersecurity and provide a baseline for accrediting systems to operate in DoD's IT and OT environments. The RMF process is broken into six steps as shown below.



UFC 4-010-06 applies to all planning, design and construction, renovation, and repair of new and existing facilities and installations that result in DoD real property assets, regardless of funding source. This UFC provides criteria for the inclusion of cybersecurity in the design of control systems in order to address appropriate RMF security controls. The rationale for applying RMF to control systems is discussed in FIPS PUB 200 and DODI 8500.01. The specifics of the RMF process and related controls are set forth in DODI 8510.01, NIST SP 800-37, NIST SP 800-53, and NIST SP 800-82.

13.4 **RMF Design Scope and Specification Development**

As discussed above, the RMF process is broken into six steps with Step 5 achieving the Authority to Operate (ATO). This process requires coordination and participation between the designer, constructor, and government personnel throughout. For the MWD Kennel project, the designer and the government are responsible for Steps 1 and 2. The constructor and the government are responsible for tailoring Step 2 to match as-built conditions and Steps 3-5, and the government is responsible for Step 6.

Step 2 involves applying the system categorization for C-I-A to the security controls specified by CNSSI 1253. The design phase provides a draft set of controls that will need to be addressed during construction and Step 3. Once controls have been selected and agreed upon by the AO for all systems, it is the contractor's responsibility to ensure that all applicable controls are met during the build process. Some controls have requirements for documentation or deliverables and must be provided to the government to support the accreditation process.

The designer will also supply, as applicable and practicable, high-level network diagrams, and control-specific versions of UFGS 25 05 11. Once these have been reviewed and approved by the government, these documents become artifacts for the contractor to utilize during construction, commissioning, and accreditation support.

The awarded contractor is responsible for detailed design drawings (topology and dataflow diagrams), and detailed Hardware / Software listings. These artifacts are also detailed in the SUBMITTALS section of the UFGS 25 05 11 specifications provided as part of design.

13.5 Impact of Facility and Mission Ratings on C-I-A Categorization

The criticality rating of the facility and the mission may impact the number of cybersecurity controls that are required to be addressed during design and construction. Mission support activities require the lowest level of rigor (C-I-A levels of L-L-L), while mission essential and mission-critical ratings generally require higher C-I-A levels, and thus a higher level of effort among all parties to deliver cyber-secure control systems. Final determination is the responsibility of the AO in concert with Fort Stewart-HAAF staff, IMCOM and AMC.

Based on past project experience and guidance from DoD / USACE, the C-I-A categorization of HVAC DDC is Low-Low-Low (L-L-L). Since FARS addresses life safety, the categorization at Army installations is usually Low-Medium-Medium (L-M-M). These ratings are captured in the below table.

System Name	C-I-A Impact Levels
HVAC DDC	L-L-L
FARS / Fire Suppression	L-M-M

13.6 Existing Accreditations

It is our current understanding that neither of the listed systems has explicitly gone through the RMF process.

13.7 HVAC DDC Controls

The building will have new BACnet Direct Digital Control (DDC) System connected throughout a supervisory module. The system will use BACnet MS/TP protocol. A touchscreen human-machine interface (HMI) will be provided with all the factory-installed DDC controllers for the building controls. Touchscreen HMI will be located within the DDC panel.

The DDC controls will be stand-alone type and have the option to be interfaced with an existing base Utility Management and Control System (UMCS). However, as part of this design effort, there is no intention of integrating with the base-wide UMCS, and therefore no connections to that system will be shown or detailed. Additionally, no 25 10 10 specification will be provided.

There are no computers in the design. However, the DDC Control Panel will have an ethernet port capable of connecting to a computer or laptop, as well as an ethernet connection for a future connection to a base-wide utility monitoring system. Cybersecurity for contractor configuration of the system is detailed in the accompanying 25 05 11 specification.

A high-level diagram of the HVAC DDC control system is provided below:

Typical Network Diagram to Support Building Level RMF Artifact Submission
MWD KENNEL HUNTER ARMY AIRFIELD
HVAC CONTROLS ARCHITECTURE



13.8 Fire Alarm and Mass Notification System

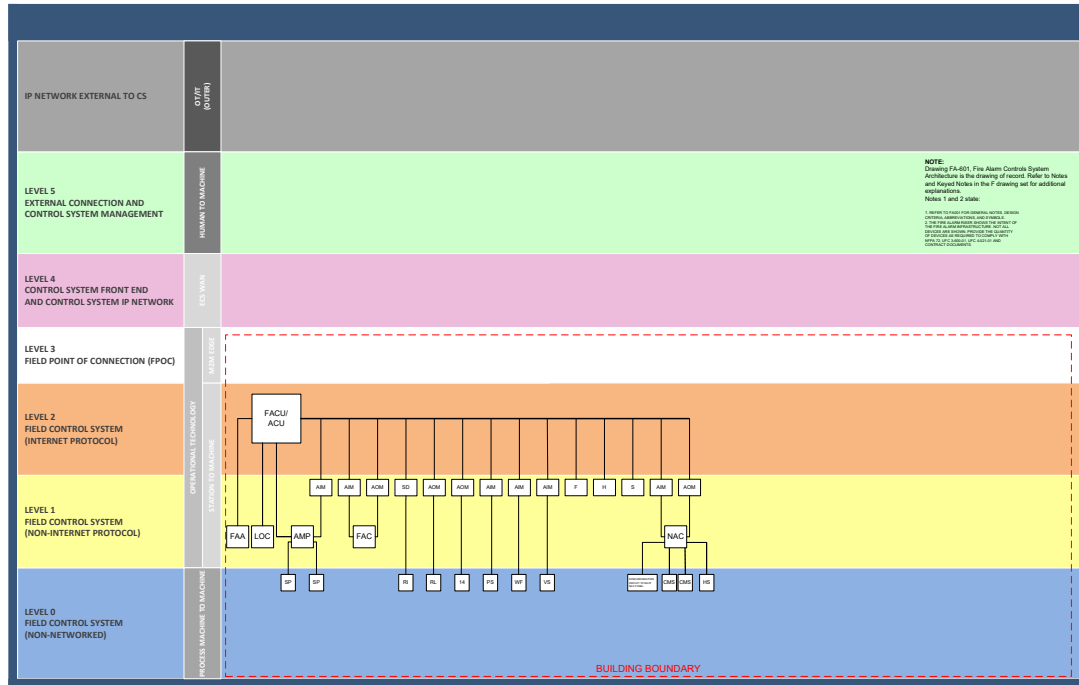
A combined addressable fire alarm and mass notification system (FAMNS) will be provided throughout the tower building. The fire alarm control unit (FACU) and mass notification autonomous control unit (ACU) will be located in a year around environmentally conditioned space that complies with the environmental conditions required in the control unit approval or listing. Fire alarm control units and sub-panels are to be located in the electrical room.

The fire alarm/mass notification system will be fully addressable and electrically supervised with battery backup in accordance with NFPA 72.

The fire alarm system will monitor the fire suppression systems and transmit signals to the fire department through the Base Monaco radio transceiver system. A Monaco BT-XM transceiver is to be used to transmit fire alarm signals via an antenna on the exterior of the building configured to the existing Base Monaco system frequency.

A high-level diagram of the Fire Alarm and Mass Notification System is provided below.

Typical Network Diagram to Support Building Level RMF Artifact Submission
FA-601 HUNTER ARMY AIRFIELD, GEORGIA
MWD KENNEL HUNTER ARMY AIRFIELD
FIRE ALARM AND MASS NOTIFICATION SYSTEM ONE-LINE DIAGRAM





CREATE AMAZING.

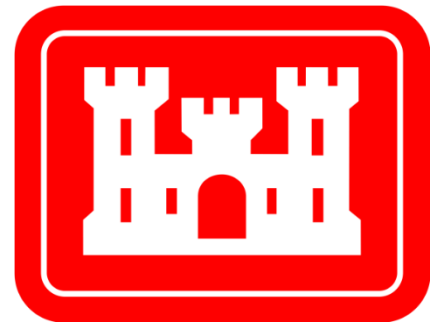
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APPENDIX A - OWNER'S PROJECT REQUIREMENTS DOCUMENT

NOT A CONTRACT DOCUMENT – FOR COMMISSIONING PURPOSES ONLY

Owner's Project Requirements for the
Military Working Dog Kennel

Hunter Army Airfield, Savannah, Georgia



US Army Corps of Engineers Savannah District

Project No. 189618

Ready to Advertise Design Submittal

January 2026

OWNER'S PROJECT REQUIREMENTS

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I Project

A. Project Description

Currently, 1/75th Ranger Battalion MWD Program occupies Building 1030 at HAAF. Building 1030 was adapted as an interim fix to support the new MWD mission operations for the 1/75th Ranger Battalion. This existing facility does not adequately meet the mission requirements and many of the architectural and engineering systems need upgrades or repair. This existing structure was originally constructed in the 1950's as a radio transmitter and communications building. The original facility was never envisioned to support MWD mission operations in accordance with current MWD design standards. The facility has undergone several renovations up to present day including the conversion of the facility to a kennel in the 2007-2008 timeframe.

Building 1030 has significant moisture problems that include water infiltration in the building's slab, a leaking roof, inadequate drainage in the interior and exterior of the facility and clogging and backflow of kennel drains. The building is subject to seasonal flooding due to building elevation. Low water pressure within the facility plumbing system inhibits kennel cleaning. The facility is not constructed to house the programmed number of canines which increases the risk of spread of infectious disease. The quantity of dog runs, and canine break areas is inadequate for the current number of canines within the facility. The current kennel layout does not allow for visual or physical separation between canines which poses substantial safety risks for the dogs and handlers. Renovating existing facilities or a combination of new and renovated facilities has been analyzed and deemed not viable for mission requirements.

Per the DD1391, the MWD Kennel will include kennel administration offices, veterinary exam and surgical suite, TA-50 locker area, latrines with showers, tack room, food preparation and storage areas, indoor and outdoor kennels, and building utility support areas. Fire detection and suppression, energy management control, unclassified and classified communications networks, intrusion detection, surveillance, and access control systems will be provided. Supporting facilities include all related site-work and utilities (electrical, water, gas, sanitary sewer, and information systems distribution), lighting, parking, curb and gutter, sidewalks, storm drainage, landscaping, antiterrorism/force protection measures (AT/FP), obedience course with apparatuses, exercise and break areas, mobility equipment storage, and other site improvements. Special construction includes sustainable construction features complying with Leadership in Energy and Environmental Design LEED "Silver". The AT/FP measures include perimeter barriers, access control, mass notification system, laminated glass, and minimum stand-off distances. Access for people with disabilities will be provided in the kennel administration area. Comprehensive building and furnishings related interior design and audio-visual services are required. The project will include the demolition of building 1030 (9,851 SF). The new building air conditioning is estimated to be 70 kW (20 tons). The facilities will be designed to a minimum life span of 40 years in accordance with DoD's Unified Facilities Criteria (UFC 1-200-02), including energy efficiencies, building envelope and integrated building systems performance.

Per an updated DD1391, dated 11 February 2022, the project calls for a 11,183 SF MWD Kennel with a 500 SF of Unheated Storage Building and a 560 SF Outdoor Break Area. The revised, estimated start of construction is FY2026. Design has proceeded under a directive from USACE Savannah District assuming a new PA of \$15.75M, which would require 1391 to be revised from its current 11 February 2022 date.

II Goals

A. Overall Project Goals

There are several requirements which are critical to the success of the project. These include:

1. Project is completed on time and within budget. "Punch List" items should be expedited for fast completion. No punch list items remain upon occupancy of the facility.
2. System accessibility and maintainability - the design and construction of the building must be energy efficient to operate and maintain. The new building systems must be easily maintainable by staff maintenance personnel, with sufficient access to systems for routine maintenance. Warranty calls should be minimal during the first year of occupancy.
3. Heating and cooling - the heating, ventilating, and air conditioning systems shall provide the appropriate thermal comfort for its occupants while maintaining an environmentally sound and energy efficient status. The systems must provide consistent and individually controllable temperature, humidity, and airflow.
4. Energy efficiency goals – achieve energy use reduction as compared to the ASHRAE 90.1-2013 baseline.
5. Environmental and safety goals – meet all environmental and safety regulations.
6. Quality - use high-quality building materials. Maintain a high-level of construction quality throughout the project by utilizing construction supervision. Select equipment with lowest life cycle costs.
7. Cost of operating facility should be at a minimum. The cost to operate the systems, including utilities, manpower and materials.
8. Warranty of the facility does not start until the substantial completion date.

B. Occupant Comfort

Occupant Comfort is critical to a productive and efficient work environment. Occupant comfort is a key requirement of this project. Comfort is defined as:

1. Temperature – consistent temperature within the space and from space to space.
2. Humidity – control the humidity levels in the space and do not allow the humidity level to achieve levels that causes occupant complaints.
3. Common space – there are open areas with flexibility in use to accommodate various functions and activities
4. Lighting – use of individual task lighting that is adjustable and directional.
5. Controllability of total environment – occupants can control local comfort of temperature, airflow, noise, and seat position.
6. No drafts – consistent airflow throughout the space with no "drafts" or "dead spots".
7. Good flooring – the flooring is aesthetically pleasing, highly durable, and comfortable to walk upon.
8. No glare – there is no glare from outdoor natural lighting. Add manual shades, as necessary.

C. Indoor Air Quality

Better indoor air quality reduces health risks and promotes occupant productivity. Strategies include a no smoking policy, outside air ventilation rates above ASHRAE 62.1 minimums with automatic controls, and reduction of indoor pollutants. IAQ management during construction and before occupancy reduces air quality problems resulting from the construction process. Pollutant source control, increased filtration at outside air supply, and the use of low-emitting interior finishes contribute to a healthier indoor environment.

The following are known activities or conditions that generate or contribute pollutants in/near the facility that impact the HVAC system. HVAC system design must address the following concerns to assure the system provides good health, hygiene, and indoor environmental quality.

1. Poor circulation – build-up of pollutants due to a lack of air circulation.
2. Dumpster – the trash within the dumpster. Provide a garbage staging area in a location to not allow odors into facility. Place outside if necessary.
3. Outdoor air contaminants – build-up of dust, dirt, and other outdoor contaminants within the ventilation system (outdoor air intake).
4. Pests – no pests from outdoors.

5. Smoking – no byproducts of smoking.
6. Noise – noise from adjacent spaces and outdoors.
7. Cleaning – chemicals and materials utilized during the cleaning process
8. Lavatories – restroom byproducts.
9. Mold – growth from water and humidity build-up on materials.
10. Dirty filters – allowing dust and dirt to bypass filtration.

D. Sustainability:

UFC 1-200-02 High Performance and Sustainable Building Requirements is organized around the “Guiding Principles for Sustainable Federal Buildings” to guide transformation in performance of the DOD facility inventory. Design approaches and technologies focus on compliance with the Guiding Principles including sustainable site development, water savings, energy efficiency, materials and resources selection and indoor environmental quality specific to the site, mission, and programmatic needs of the MWD Kennel.

1. Integrated Design
2. Commissioning
3. Optimize Energy Performance
4. Protect and Conserve Water
5. Indoor Environmental Quality
6. Environmental Impact of Materials
7. Climate Change Risk

The project will use LEED v4 Silver to validate compliance with the Guiding Principles and will be registered on LEED Online and submitted for third party certification.

The Federal High Performance Sustainable Building Checklist provides a summary of Guiding Principles compliance. The LEED-NC v4 Checklist provides a summary of LEED Silver compliance. Both documents are submitted at each design milestone, with final submittal by the General Contractor after construction is complete. The HPSB and LEED checklists will be included in Contract Documents as attachments to Section 01 33 29 Sustainability Reporting.

Documentation will be provided in accordance with the “USACE LEED-NC v4 Submittals for Registered Projects” spreadsheet. Burns & McDonnell will complete design-phase documentation and the General Contractor will complete construction-phase documentation. The “USACE LEED-NC v4 Submittals for Registered Projects” spreadsheet will also be included in Contract Documents as an attachment to Section 01 33 29 Sustainability Reporting to provide clear documentation requirements to the General Contractor.

III Functional Uses

A. Building Functional Uses

The overall design, includes the main MWD Facility, accompanied by two support buildings – MWD Break Area and Storage, and a prefabricated Ammo/Explosives Storage structure. The main MWD Facility is approximately 11,123 square feet and is comprised of two primary functions, the administrative areas and the indoor/outdoor kennels. A portion of the administrative areas are located within an access-controlled perimeter, to include the Kennel Master, Trainer, Locker Room, Multi-purpose Handlers, and Telecom spaces. Electronic key card access is located at perimeter doors of the controlled area, and the surrounding walls are built to a sound attenuation rating (STC) of 50. Electronic key card access is located at all exterior doors of the MWD Facility, however those without access to the controlled area of the building enter at the North Hall, and those with authorized access may enter at the main entrance on the plan East side of the facility.

The two support spaces accompanying the MWD Facility includes the MWD Break Area and Storage. The Break Area includes 16 individual kennels that rest on a covered, 2,200 square foot concrete

pad. Each kennel is separated by 8 feet high 8 inch sealed CMU block walls, with a wire mesh partition and gate door on the entry side into each kennel, and a wire mesh cap across the top. The kennels are covered by a standing seam metal roof canopy. The additional Storage facility is a 529 square foot pre-engineered metal building, with a double door entrance on the plan East side.

IV Project Requirements:

A. Design Requirements:

The intent of this project is to construct a new Military Working Dog (MWD) Kennel at Hunter Army Airfield, Georgia. The size of the facility is approximately 11,123 square feet in size and is programmed in accordance with DD1391 dated 08 February, 2022 for the SOF Military Working Dog (MWD) Kennel.

B. Building Systems Requirements:

1. Performance & Benchmarking Requirements:

- a. Better than ASHRAE Standard 90.1 – building systems perform better than the baseline requirements in ASHRAE Standard 90.1-2013.
- b. Avoid system degradation – avoid degradation of systems that leads to reduced energy efficiency.
- c. # hot/cold calls per year – track the number of annual comfort complaints to verify that non - energy criteria are not compromised by focusing solely on energy efficiency.
- d. Use of low energy equipment – plug loads reduced each year through acquisition of more energy efficient office equipment.
- e. Actual compared to budget – compare the actual to the budget to verify assumptions and identify opportunities to improve.
- f. Owner expects a high level of material and construction quality.
- g. Durability – high durability with resistance to damage by ambient conditions, users or operation and maintenance personnel.
- h. Time expectancy between failures – no equipment failures are expected during the first five years of operation.

2. HVAC System Requirements:

a. General Ductwork Design:

Air intakes for ventilating and air-conditioning will be located at least ten feet above the ground, except where inside a fenced-in enclosure.

Overhead items such as suspended ductwork, piping, and equipment will be braced laterally as required by DoD Antiterrorism for Buildings Standard. Specifically, mountings will be designed to resist forces equal to 1.5 times the component weight in the downward direction and 0.5 times the component weight in any other direction.

Toilets, and tack room will be provided with transfer air from adjacent spaces to makeup exhaust air requirements in addition to dedicated conditioned air systems.

Air distribution will be provided by air handling units, and exhaust fans. Conditioned air will be supplied or returned to the spaces via externally wrapped metal ductwork connected to diffusers or supply grilles. Exhaust air in the admin areas will be exhausted through uninsulated metal ductwork connected to exhaust registers or grilles. Exhaust air in the indoor kennel space will be returned to the DOAS unit via externally wrapped metal ductwork connected to grilles for heat recovery purposes. Transfer air will be transferred through internally lined metal ductwork connected to diffusers or grilles.

All ductwork will be constructed of galvanized sheet metal or stainless steel, as the application requires. Ductwork will be constructed and installed in accordance with SMACNA requirements. Fire dampers will be provided for all rated walls as required.

b. Cooling and Heating System:

Cooling to the Administrative and Veterinary Treatment / Surgery areas will be provided with cooling and heating through a direct-expansion, air-cooled, split system heat pump with a variable speed compressor. The administrative area will have VAV electric reheat boxes.

Cooling for the Indoor Kennel Area will be provided by a packaged, direct-expansion, air-cooled heat pump.

Heating for the Administrative area will be provided mechanically through the use of an air-cooled heat pump split system combined with electric reheat VAV boxes.

Heating for the Veterinary Treatment and Surgery areas will be provided mechanically through the use of an air-cooled heat pump split system.

Heating for the Indoor Kennel areas will be provided mechanically through the use of a packaged, air-cooled, heat pump with natural gas heat back up.

c. Ventilation System:

Exhaust fans will be in-line centrifugal fans. Discharge air will be through wall louvers and roof gravity hoods. Outside air will be provided by the louvers with motorized dampers during occupied hours for the Administrative and Veterinary Treatment and Surgery areas.

Exhaust for the indoor kennel area will be ducted to the DOAS unit for energy recovery. Quarantine kennel exhaust will be provided by a separate exhaust fan and will not be returned to the DOAS unit for energy recovery. 100% outside air will be delivered to the indoor kennel space through the packaged outdoor unit.

Additional in-line axial exhaust fans will be utilized in the indoor and outdoor kennels to provide emergency smoke evacuation. Smoke exhaust system and associated dampers will be controlled through the fire alarm panel. Smoke exhaust fans are sized based on calculations provided by the QFPE. Limit switches and flow switches will provide positive confirmation of activation back to the fire alarm panel. Make up air will be provided through gravity hood when system is activated.

d. Energy Recovery:

It was determined that energy recovery is not required for the administration area per ASHRAE 90.1 – 2013 Table 6.5.6.1-1. This portion of the facility will be occupied less than 8000 hours a year and will have a maximum of 48% outside air with both units being less than 5500 cfm indicating that no energy recovery is required. The largest source of exhaust will occur in the locker room, tack room and vet treatment/surgery areas.

For the indoor kennel portion of the building it was determined that energy recovery is required per ASHRAE 90.1 – 2013 Table 6.5.6.1-2. This unit is 100% outside air and is providing conditioned air to the space requiring energy recovery to be utilized. An energy recovery wheel is utilized to transfer heat between the outgoing exhaust air and the incoming outside air.

e. Economizer:

ASHRAE 90.1 – 2013 requires economizers for all air handling units of cooling capacity greater than 54,000 Btu/h for climate zone 2A. However, the Administrative area systems exceed the 17% improved efficiency per Table 6.5.1-3, therefore no economizers for the admin areas are required.

UFC 3-410-01-3-6.3 states "For Army and Air Force projects, air economizers must not be used in ASHRAE climate zones 1, 2, 3a, and 4a." Therefore, economizers on the indoor kennel DOAS unit will not be used.

f. Offices, Toilets, Mother's Room, Multi-purpose Rooms, Tack Room, Locker Room, Corridors, and Food Storage

These areas will be air-conditioned. Corresponding VAV air handling unit (VAV AHU) will be located in the corresponding mechanical room. AHU will have a mixing box section, MERV 8 and MERV 13 filters, DX-cooling/heating coil, and supply fan section. Shut-off type VAV boxes with electric reheat coils will provide zone control. Return air will be ducted from the spaces to the air handling unit. Outside air will be provided through intake louvers with a motorized control damper and will be in accordance with UFC 4-010-01.

g. Veterinary Treatment and Surgery:

These areas will be air-conditioned. Corresponding VAV AHU will be located in the mechanical room. AHU will have a mixing box section, MERV 8 and MERV 13 filters, DX-cooling/heating coil, and supply fan section. Return air will be ducted from the spaces to the air handling unit. Outside air will be provided through intake louvers with a motorized control damper and will be in accordance with UFC 4-010-01.

h. Indoor Kennels:

This area will be air-conditioned. Corresponding constant volume packaged DOAS unit will be located outside the building near the mechanical room. The DOAS unit will have energy recovery section, MERV 8 and MERV 13 filters, DX cooling coil and a natural gas heating. Unit will be equipped with hot gas reheat for dehumidification cycle.

i. Outdoor Kennels:

Outdoor kennels will be unconditioned and open to the elements. This space will have a smoke evacuation system. Ceiling fans will be provided in each outdoor kennel.

j. Mechanical, Electrical and Telecom Rooms:

DX cooling will be provided via ductless, non-CFC refrigerant, split-system units for the telecom, mechanical and electrical rooms. Remote air-cooled condensing units will be pad mounted on the exterior of the building in close proximity for heat rejection, while indoor evaporator coils will be in the respective communication rooms. Mechanical room ductless split will be a heat pump to provide heating and cooling.

k. Toilet Rooms, Locker Room, Tack Room, Veterinary Treatment and Surgery:

Rooms will be exhausted via in-line exhaust fans discharging to the exterior through the exterior building wall louver with interlocked motor operated damper or through a roof hood with interlocked motor operated damper.

l. Control Systems:

Building will have new BACnet Direct Digital Control (DDC) System connected throughout a supervisory module. The system will use BACnet MS/TP protocol. A touch

screen human-machine interface (HMI) will be provided with all the factory installed DDC controllers for the building controls. Touch screen HMI will be located within the DDC panel.

The DDC controls will be stand-alone type and have the option to be interfaced with an existing base Utility Management and Control System (UMCS) in the future. The DDC system will be "user friendly", should have good graphics and touch screen operation.

m. Training:

Training by factory certified technicians will be required for all HVAC systems. Training in a classroom type setting will include proper operating and maintenance procedures, troubleshooting procedures, routine and overhaul maintenance, testing and balancing, and calibration.

n. Test and Balance:

Building systems will be tested, balanced, and adjusted in accordance with SMACNA and IGCC-2018 requirements for commissioning and for measurement and verification credits to verify that the systems are designed, installed, and calibrated to operate effectively.

o. Outdoor Design Conditions:

Summer Conditions	95.6°F dry bulb (0.4% dry condition)
	77.3°F wet bulb (0.4% dry condition)
	83.6°F dry bulb (0.4% humid condition)
	80.3°F wet bulb (0.4% humid condition)

Winter Conditions	27.9°F dry bulb

Location:	N. Latitude	32.017°
	W. Longitude	81.133°

Elevation	41 feet

ASHRAE Climate Zone	2A

p. Indoor Design Conditions:

Offices, Mother's Room, Multi- purpose Room, Restrooms, TA-50 Locker Room, Tack Room, Food Storage, Veterinary Treatment, Surgery, and Corridors	78°F dry bulb – cooling condition
	40-60% Relative Humidity
	68°F dry bulb – heating condition

Telecom Room	40-60% Relative Humidity
	68°F dry bulb – heating condition

Indoor Kennels	78°F dry bulb – cooling condition
	40-60% Relative Humidity
	65°F dry bulb – heating condition

Outdoor Kennels	Unconditioned

Electrical & Mechanical Rooms	55°F dry bulb – heating condition
	80°F dry bulb – cooling condition

q. Ventilation Air Rates:

Toilet Rooms	50 cfm per fixture (water closet, urinal, or shower head)
TA-50 Lockers	0.5 cfm per ft ²
Tack Room	0.9 cfm per ft ²
Indoor Kennels	10 air changes per hour

r. Conditioned Outside Air Rates:

Offices, Mother's room, Admin, Multi-purpose Room, Restrooms, TA-50 Locker Room, Food Storage	0.06 cfm per ft ² and 5 cfm per person
Veterinary Treatment	2 ACH (ASHRAE 170-2017)
Surgery	3 ACH (ASHRAE 170-2017)
Tack Room	0.18 cfm per ft ² and 7.5 cfm per person
Corridors	0.06 cfm per ft ² – per AHRAE 62.1-2016

3. HVAC General Requirements:

- a. Take appropriate measures to verify sensors are calibrated.
- b. Provide high efficiency motors and variable frequency drives where appropriate.
- c. Verify filter pressure setpoints are documented.
- d. Mechanical system shall be selected based on life cycle cost analysis.
- e. Mechanical system shall be designed in accordance with ASHRAE.
- f. Provide local overrides for lights and HVAC operation.
- g. Provide adequate space for access to above ceiling equipment. Label ceiling tiles with equipment locations.
- h. Equipment provided should include technical support and training from startup technician.
- i. Provide condensate pans with float switch cutout.

4. Plumbing System Requirements:

a. Sanitary Sewer:

Sanitary sewer piping will be designed to provide waste removal from the building water closets, urinals, lavatories, sinks, water coolers, trench drains and floor drains. System will gravity drain to the site sanitary sewer system. Floor drains will have a trap primer connection.

b. Domestic Water:

A 3" domestic water connection will be provided to the facility from the utility provider. Domestic water velocity will not exceed 4 feet per second. Water entrance will be provided with a water meter (independent of utility meter) and reduced pressure zone backflow preventer, located inside the mechanical room. The water meter will have a display for direct visual reading of the meter and will be able to communicate to the building DDC. A pressure calculation was performed, and the building has adequate pressure, therefore a booster pump will not be provided. A 1-1/2" domestic water line will continue from the mechanical room to the outdoor break kennels. Four (4) yard hydrants will be provided at the outdoor break kennels.

The domestic water heating system was evaluated based on a life cycle cost analysis (LCCA) for the facility. Solar hot water heating was evaluated against standard natural

gas water heaters and found not life cycle cost effective. See domestic "DHW Solar System Life Cycle Cost Analysis" report for further information.

Domestic hot water will be provided by two 100-gallon storage type natural gas condensing water heaters, each sized for ~50% of the load. Water will be stored at 140°F. A thermostatic mixing valve will reduce the building hot water supply to 131°F. Point-of-use thermostatic mixing valves will be provided at each plumbing fixture to further reduce the water temperature to 110°F. The clothes washer will be provided with 131°F water. A domestic hot water recirculation loop with pump will be provided to keep hot water at remote fixtures throughout the building.

A non-potable protected domestic water system will be provided from the building domestic water system for trench drain washdown connections.

Domestic water piping exposed to ambient conditions in the kennel area will be heat traced for freeze protection.

A water softener will not be provided.

c. Roof Drainage:

Roof drainage will be provided by exterior gutters and downspouts with splash blocks; no internal roof drains are required.

d. Natural Gas:

Natural gas will be provided in the building to serve the water heaters and the mechanical gas fired heating systems. Site natural gas piping will be covered in Civil documents.

e. Piping Systems:

Sanitary waste and vent piping aboveground will be hub-less service weight cast iron; underground piping will be service weight bell and spigot cast iron.

Domestic hot and cold-water piping will be copper tube or steel pipe and will be per UFGS standards (including insulation). Piping will be exposed in the mechanical room and kennel areas and concealed in all other areas.

Condensate piping will be DWV copper pipe.

Above ground natural gas piping will be schedule 40 steel with welded fittings.

f. Building Plumbing Fixtures:

Cast-iron floor drains will be provided for all necessary mechanical room HVAC equipment and in each indoor kennel. Floor drains will also be provided in various locations throughout the facility as needed. Automatic trap primers will be provided on all floor drains within the admin portion of the building. A trench drain with washdown connection will be provided in the outside corridor on each side of the kennel. Area drains in the kennel areas will have a sediment basket to catch debris. Deep seal traps and trap guards will be placed in the kennel area floor drains.

A mop basin will be provided in room 114 - Tack Room for janitorial service. An animal bath will be provided, with drainage directed to a nearby floor drain incorporating a sediment basket for the collection of hair and other debris. In room 111 – Veterinary Treatment, a floor sink will be provided below the exam table. A stainless steel surgeon's scrub sink will also be provided with touch-less activation.

Freeze-proof wall hydrants will be provided on the exterior of the facility at intervals of 100 feet or less and will be located to minimize lawn hoses from being laid across walkways.

Restrooms will be provided with wall-mounted, manual flush valve water closets; wall-mounted, manual flush valve urinals, and wall-mount, vitreous china lavatories with

manual fixtures and floor drains with trap primer connections. Fixtures will include low-flow water closets (1.28 gpf), urinals (0.125 gpf) and lavatories (0.35 gpm). Showers will be complete with trench drains, mixing valves and low-flow (1.5 gpm) shower heads.

A stainless steel, double-bowl, filtered electric water cooler with bottle filling station will be provided in the main corridor.

Stainless steel, undermount, double and single compartment sinks will be provided where shown with low-flow (1.5 gpm) faucets.

All restroom fixtures, break area sinks, showers and electric water cooler will be ADA compliant.

The kennel area will be provided with surface mounted cold water hose-bibbs and hot/cold wall faucets with ¾" garden hose connection.

Water hammer arresters will be provided in the distribution system.

5. Lighting System Requirements:

a. Interior Lighting:

Lighting levels will be designed to meet illuminance values recommended in the UFC 3-530-01 and IES Lighting Handbook. The basic fixtures, not necessarily all fixtures, that will be provided are:

1. 1' x 4' industrial fixtures in unfinished areas
2. 2' x 2' fixtures in transitional spaces, vestibules
3. 2' x 4' fixtures for finished offices, administrative areas, classrooms, conference rooms
4. Linear indirect type fixtures in laboratories and open office areas.
5. Low Bay Light Fixtures
6. 6 or 8 inch downlights

Lighting in general throughout the facility will consist primarily of recessed and suspended or pendant mounted LED fixtures. LED color temperature will be 4000 degrees K and the color rendering index (CRI) will be greater than 80. All interior lighting for the facility will be 120V. LED lighting will be provided with 10 year manufacturer's warranty per UFC 3-530-01.

Lighting power densities will be included in the "Calculations" of each submittal demonstrating compliance with ASHRAE 90.1-2013

b. Exterior Lighting:

Exterior lighting shall be LED type and designed per, UFC 3-530-01 requirements and IESNA standards. Exterior lighting fixtures for the roadways and parking lots will be pole mounted. All poles and pole mounted fixtures will be provided by CEMC. Exterior lighting fixtures for the building will be wall mounted. All exterior lighting will be automatically controlled by photocells or by a programmable lighting control panel with astronomical timeclock.

Computer generated photometric calculations will be analyzed to optimize the lighting distribution.

c. Emergency Egress and Exit Lighting:

Emergency lighting will be in accordance with the NEC, NFPA 101, International Building Code, and UFC. The facility will be equipped with a stand-by generator and a separate automatic transfer switch for life-safety loads. Lighting fixtures designated as emergency

egress lighting will have an integral battery connected to them. Red LED-type illuminated exit signs will have a 90-minute integral battery as well.

d. Lighting Controls:

Lighting controls will be provided per ASHRAE 189.1-2014 and 90.1-2013. No complex systems controlled by mobile devices are allowed. Dual level lighting will be installed in presentation rooms and other areas accepted as general practice in the industry.

Occupancy sensors will be provided for automatic controls, reduce energy costs and to address LEED criteria. The occupancy sensors will be dual-technology (ultrasonic and infrared) and will be ceiling or wall mounted in open office areas, administrative areas, lobby entrance, corridors, vestibules, and other rooms that are not kennel or veterinary type spaces. Automatic lighting controls will not be provided in kennel or utility spaces.

6. Electrical System Requirements:

a. Demolition:

Existing building will be demolished. Existing service feed to existing building will be removed back to transformer.

b. Primary Power Distribution System:

The primary electrical distribution system is owned and operated by Canoochee Electric Membership Corporation (CEMC). The proposed primary tie-in location will be at the nearest manhole/handhole or pole. The underground primary ductbank, conductors, pad mounted transformer, transformer pad and primary terminations at the transformer will be provided and installed by CEMC. The new transformer will be sized to meet the calculated electrical loads of the new facility.

c. Secondary Power Distribution System:

The secondary duct bank, secondary conductors will be provided and installed by the Contractor. The secondary terminations will be completed by CEMC. Service entrance conductors will extend from the pad-mounted transformer through new electrical duct bank to the 208Y/120V Main Distribution Panel (MDP) located in the electrical room. The service entrance conductors will be copper with type XHHW insulation. The main distribution panel will be a 208Y/120V, 3-phase, 4-wire and will be provided with digital metering capable of transmitting energy usage.

Feeders will extend from the MDP to large load mechanical equipment, lighting panel, and smaller load panels. 120-volt branch circuits will have dedicated neutrals (no shared neutrals.) All panel neutrals will be 100% rated.

A special standby panel 208Y/120V will be provided to serve the Veterinary Treatment room. The special standby panel will feed Un-interruptible Power Supply (UPS) system and critical panel 208Y/120V for surgery operations equipment. Refer to paragraphs 10.4.4 Backup Power Systems and 10.4.5 Un-interruptible Power Supply (UPS) system for more information.

Panelboards and associated feeders will be sized for 20 percent spare capacity. All panelboards will contain 20 percent spare circuit breakers and surge protection device (SPD) modules. Voltage drop will be limited to 2 percent from main distribution panelboard to panelboard and 3 percent from panelboard to load for a maximum total of 5 percent.

d. Site Grounding:

Grounding will consist of a bare copper ground counterpoise with ¾-inch x 10-foot copper-clad steel ground rods around the building. This counterpoise system will be

connected to building columns, derived source transformer secondary neutrals, service entrance equipment, main grounding bar, telecommunication main grounding bar, and the lightning protection system. All connections will be exothermic welded connections. The building ground will be designed for 5 ohms or less.

e. Backup Power Systems:

A standby generator system will be provided and will provide standby power for Veterinary Treatment / Vet Surgical Procedures rooms, the (4) exhaust fans within the kennel area, and the fire panel.

Uninterruptible Power Supplies (UPS) will be provided and will provide power for the Veterinary Treatment/Vet surgical procedure room.

Generator will be natural gas fueled, 208Y/120V, 3-phase, 4-wire and will be installed in a sound attenuated, weatherproof enclosure. Generator shall be TIER 4 permitted for air quality to comply with Federal, state, and local regulations.

An automatic transfer switch (ATS) will be provided for switch between normal power and generator for standby panel, UPS, and critical panel.

f. Interior Grounding:

Grounding will be provided in accordance with the NEC. All feeder and branch circuits will have a "green" insulated equipment ground conductor in addition to the conduit being used as a grounding path.

A main ground bar will be provided in the main electrical room. A primary bonding busbar will be provided in the communication room. A ground conductor will be routed from the main grounding bar to the primary bonding busbar as well as a ground conductor from the main ground bar to the building counterpoise system. This ground counterpoise will be connected to building columns, service entrance equipment, and the lightning protection system.

g. UPS System:

An Uninterruptible Power Supply (UPS) will be provided to power critical surgical procedure equipment during generator startup period. The UPS shall provide a minimum of 10 minutes back-up power.

h. Lightning Protection Systems:

A traditional franklin rod type Lightning Protection System (LPS) in accordance with NEC, NFPA 780 and UFC 3-575-01 will be provided for the facility. An array of roof mounted air terminals, roof conductors and down conductors will be included with the system. The lightning protection system will be interconnected to the building counterpoise system. Test wells will be provided for the grounding system. The lightning protection system will be installed under the supervision of an LPS certified master installer. The LPS will be required to obtain a UL Master label per UL96A.

7. Architectural Requirements:

a. MWD Facility Exterior Wall Construction:

The exterior wall assembly surrounding the administrative portion of the building consists of an 8' high brick veneer water table to align with the Base Installation Planning Standards, capped with a 4" high precast concrete cap. The upper portion of the exterior wall consists of prefinished metal panels. This façade is installed over a 2" air space, 2" rigid insulation (R-10) over a fluid applied air barrier on 5/8" fiberglass reinforced gypsum

sheathing over 6" metal studs with batt insulation (R-21) and finished with 5/8" type 'X' gypsum wall board on the interior.

The exterior wall assembly at the Indoor/Outdoor Kennel portion of the building consists of a 4' high CMU block wall, with a 4" high precast concrete cap, and a thin brick veneer adhered to the face of the CMU block. The mid-portion of this exterior wall consists of a 2'-8" high opening with a prefabricated wire mesh partition, secured with steel framing per the pre-engineered metal building manufacturer. The upper portion of the wall consists of prefinished metal panels on the exterior over fiberglass reinforced gypsum sheathing on a steel framing per the pre-engineered metal building manufacturer and finished with 5/8" gypsum wall board on the interior and 1/2" metal panel.

The prefinished metal paneling on each portion of the facility extends to the roof above. All finishes on the exterior wall construction align with the Fort Stewart Hunter Army Airfield Installation Planning Standards.

b. MWD Break Area Exterior Wall Construction:

The Break Area consists of 16 separate outdoor kennels. The exterior wall assembly at the Break Area consists of 8' high, 8" sealed CMU block walls that divide each kennel. The partition upon entry into each individual kennel consists of galvanized steel wire mesh partition with grill panel design, and gate door for access.

c. MWD Storage Facility Exterior Wall Construction:

The MWD Storage Facility is a pre-engineered metal building. The exterior wall assembly consists of metal framing with prefinished metal paneling on the exterior.

d. Roof (MWD Facility):

The roof system will consist of Steel Standing Seam Metal Roof, over underlayment over R-30 rigid insulation over air barrier and fiberglass reinforced gypsum sheathing over structural steel decking supported by steel roof trusses. Roof type will be a gable roof. All roof slopes to be 3/12. Roof soffit overhang is 2 feet deep max, with a prefinished metal fascia. The gutter discharges to exposed downspouts that are connected to the underground stormwater system.

The structural steel decking within the facility differs between the admin and indoor/outdoor kennels. The two areas are separated by an isolation joint. The structural steel decking within the admin area is a fluted, galvanized steel deck with G90 coating. Because of sounds stemming from the adjacent range and within the kennel itself, noise reduction is prioritized in this design. The Indoor/Outdoor Kennel area (to include Quarantine) is designed with a perforated acoustical galvanized steel deck with acoustical insulation batts within the fluted deck. A fluted, cellular deck in conjunction with the polyisocyanurate roof insulation has a noise reduction value (NRC) of 0.85.

e. Break Area Roof:

The roof system consists of a gable roof with 3/12 slope, steel standing seam metal roof, over structural steel decking supported by light gauge roof trusses. The canopy is held up with structural columns, with an eave height of 11 feet 6 inches.

f. Storage Facility Roof:

The roof system consists of a steel standing seam metal roof, over structural steel decking supported by light gauge roof trusses. Overhangs are not a typical eave

condition for a pre-engineered metal building. Creating an atypical pre-engineered metal building condition increases the risk of water intrusion due to the added complexity and deviates from the standard warranty, therefore the storage facility is designed without overhangs.

g. Doors:

The exterior personnel doors on the MWD Kennel and MWD Storage Facility will be extra heavy duty, flush insulated hollow metal and set in heavy gage steel hollow-metal door frames. All exterior doors into the facility are designed with electronic key card access. Electronic keycard access is also provided on doors located around the perimeter of the controlled access area. The main entrance on the east side of the facility will be an aluminum storefront assembly with side-lites and full-lite glazed door (insulated). Hardware and locksets will be heavy duty type and keyed per base standards. Interior personnel doors will be heavy-duty hollow metal types. Hollow metal doors will be narrow-lite or flush and set in heavy gage steel door frames. The thermal, sound transmission, fire separation, and security performance characteristics of each door will conform to the characteristics of the partition in which the door is installed.

The indoor and outdoor individual kennels within the MWD Facility and MWD Break Area will receive a hinged, gate door keyed per base standards. The indoor kennels will receive a gate door consisting of a 6 ft high solid stainless-steel panel, with 2 ft of stainless-steel grill panel design, wire mesh partition above. The solid steel panel is meant to obstruct the view of the dogs across from one another in the interior kennels. The outdoor kennels will receive a gate door consisting of stainless-steel wire mesh in its entirety. The indoor and outdoor kennels are connected with an insulated, aluminum faced guillotine door. The guillotine door tracks are mounted on the face of the sealed CMU wall of the interior kennel wall and is operated by a pulley system.

h. Building Air Barrier System:

The roof air barrier system consists of a membrane air barrier over structural steel decking and continues over top and down roof eave blocking. The portion of the roof covering the Indoor, Outdoor and Quarantine Kennels of the facility also consists of a membrane air barrier over structural steel decking, however rather than extending out over the Outdoor Kennels, a steel bent plate provides a break in the roof structure. This allows the air barrier to fold over the bent plate and down to meet the metal deck so that the air barrier remains continuous with that of the fluid applied air barrier installed vertically on the CMU wall below.

In the administrative portion of the MWD Facility, the wall system is comprised of a continuous fluid applied air barrier over fiberglass reinforced gypsum sheathing. The indoor/outdoor kennel portion of the facility is not insulated and therefore does not contain an air barrier system.

i. Interior Walls:

All partition walls along the perimeter of the administrative controlled access area of the MWD Facility are designed as STC 50 minimum and extend to the structural metal deck above. Partition walls outside of the controlled access portion of the administrative areas will extend to the structural metal deck in order to decrease sound transmission within the facility with a minimum sound transmission rating (STC) of 45. Walls located

around the perimeter of the Veterinary Treatment and Surgery require a 1 HR fire rating and will also extend to the structural metal deck above.

In the indoor/outdoor kennel portion of the facility, interior partitions extending from floor to the deck above to separate the indoor kennel, outdoor kennel, and quarantine, consist of 8" sealed CMU walls. Partition walls that separate each individual kennel consists of 6 ft high 8 inch sealed CMU walls with 2 ft of wire mesh partition with grill panel design secured above to create an 8 ft high partition (6 ft CMU, 2 ft wire mesh). The concrete floor slab in the indoor kennel and connecting outdoor kennel has a 0.25/12 slope. The connecting Kennel Corridor located at the Outdoor Kennel also has a 0.25/12 slope. The two slopes are joined by and slope toward a continuous trench drain within the Kennel Corridor.

Quarantine kennels exist adjacent to the indoor/outdoor kennel. The Quarantine portion of the facility is separated from the rest of the facility by a sealed 8" CMU wall extending from the floor slab to the structural metal deck above to avoid contamination between sick dogs housed in the quarantine area and healthy dogs housed in the indoor/outdoor kennels. The concrete floor slab in the Indoor Quarantine Kennel and connecting Outdoor Quarantine Kennel has a 0.25/12 slope. The connecting Quarantine Corridor has a 0.25/12 slope. The two slopes are joined by and slope toward a continuous trench drain within the Quarantine Corridor. This trench drain is separate from the Kennel Corridor to avoid contamination between the two areas.

j. Interior Ceilings:

Ceilings will either be open to deck, drywall, or suspended ceiling types. Open ceilings are provided in utility spaces and outdoor kennels. Utility open ceilings are exposed metal deck and open web truss, painted. Suspended ceilings are provided throughout the rest of the facility, consisting of 2' x 2' acoustical ceiling tiles. The Indoor Kennel consists of 2' x 2' perforated acoustical ceiling tiles with insulation as an additional measure to control sound attenuation within the Kennel. Drywall type ceilings are provided in all restrooms, and the mothers room. These ceilings will be 5/8" moisture-resistant Gypsum wall board, painted.

C. Construction Process Requirements:

1. Quality Management

As in other quality management systems, achieving or increasing the level of quality is accomplished by every team member and worker on the project. This means that when anyone on the project identifies opportunities for improvement, or a potential problem, it should be brought to the immediate attention of the project manager or a member of the commissioning team. It may not be possible to incorporate every good idea on this project, but the knowledge gained shall be beneficial to future projects. Potential problems that can be avoided are to everyone's benefit. Quality Management Requirements are as follows:

- a. Provide schedule updates in a timely manner.
- b. All contractors should exhibit a high level of integrity in their work and about the entire project.
- c. Project communications should have a clear "chain of command" to be followed.
- d. Conduct regular meetings and/or conference calls to keep entire team informed on the status of project.
- e. Provide an FTP site or submittal sharing software with access for all members of construction and design team.
- f. Leave premises "broom clean".

- g. All work conforms to current OSHA safety standards with a published goal of an injury-free project. Signage shall be posted during construction noting the number of injury free workdays on the project.
- h. All HVAC equipment shall be installed per specifications and manufacturers recommendations and requirements.

D. Operation & Maintenance Requirements:

1. Maintainability Requirements:

- a. Provide Equipment Inventory Lists.
- b. Training shall be provided and videotaped to be available for all OM staff or facility occupants. Video-taped training should be provided.
- c. Provide accessibility to equipment and routine maintenance procedures.
- d. Provide adequate workspace for maintenance staff to work and store material.
- e. Involve maintenance personnel in construction walkthroughs.
- f. Provide OM Manuals and training to staff before substantial completion.
- g. Create a warranty manual for use by the maintenance staff.
- h. Provide contact information list of original contractors for project.

2. Project Documentation Requirements

To properly install, start-up, operate, troubleshoot, and maintain the HVAC systems for the life of the facility, accurate and accessible documentation is required. The owner requires all documentation to be tailored to the specific components installed. For HVAC systems, the following documentation shall be submitted prior to substantial completion:

- a. Provide very detailed startup report rather than check the box. Record setpoints and programming parameters.
- b. O&M manuals shall include necessary documentation to describe the processes, activities, tools, and standards involved with operating, administering, and maintaining any system.
- c. As-built drawings shall show the modifications made by contractors to the design during construction. The drawings shall be accurate and understandable so that the Building Maintenance Staff can perform routine maintenance and system adjustments.
- d. Test & Balance report shall be submitted by the TAB contractor and kept on site for reference.
- e. A troubleshooting matrix should be provided for typical issues anticipated for the system.
- f. Accurate start-up and shutdown procedures provide the Facility Maintenance Staff with instructions on how to enable and disable systems.
- g. Detailed sequence of operations on any low voltage system with software logic diagrams.
- h. Technical support numbers should be available to easily located technical support telephone numbers and contact information.
- i. Maintenance schedule matrix detailing what is required when, and why.
- j. Valve chart that details where each valve is located, its number, and its operation.
- k. Parts list and contact information on obtaining the parts.

3. Training Criteria:

Training needs to contain a variety of sessions that operations and maintenance personnel and building occupants shall attend. The sessions shall be digitally recorded and retained for long-term availability to changing staff. The following defines what is considered successful training:

- a. Develop a detailed training plan from each discipline. Verify O&Ms and As-Built have been submitted and approved 2 weeks prior to scheduling training.
- b. O&M (for users and O&M staff) training for building systems (HVAC, plumbing, fire alarms, emergency power, lighting controls, security, switchboards, etc.) – different levels of training for both users and O&M staff.

- c. HVAC building automation system – detailed instruction on use of the building automation system in troubleshooting and fixing problems.
- d. Training with an operational plan – provide training around an operational management plan on how the building shall actually be managed to provide direct context to the training.
- e. Safety training on building systems for O&M – include safety training for the O&M staff relative to such items as confined spaces, Lock Out Tag Out, handling of chemicals, emergency response, etc.
- f. Energy systems along with related mechanical system – training on the interaction of the mechanical systems relative to the energy efficiency of the facility.
- g. Training for O&M staff by space areas – specific attention paid to the unique needs of each area, including contact person introduction and communication procedures.
- h. Training for contractors on installing special systems/equipment – provide training by the manufacturer on the proper installation and start-up of systems and equipment.
- i. Troubleshooting on building systems – a session on typical problems that shall likely be encountered in operating the facility and guidance (matrix) on how to troubleshoot and resolve the problem.

V OPR Version History:

The changes made to this OPR document throughout the Design, Construction, and Occupancy and Operations Phases are summarized in the following table. Tracking of this information is critical in that it enables future operators and design professionals an understanding of the trade-offs made during the project and the resulting impact on the facility and achievement of the OPR.

Rev. No.	Date	Description of Revisions
0	May 2022	65% Submittal
1	Sept 2022	95% Submittal
2	Dec 2022	Corrected Final Submittal
3	Dec 2025	Corrected Final Re-Submittal
4	Jan 2026	Ready to Advertise Submittal

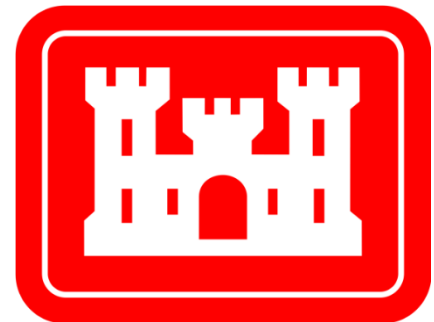
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APPENDIX B - BASIS OF DESIGN DOCUMENT

NOT A CONTRACT DOCUMENT – FOR COMMISSIONING PURPOSES ONLY

Basis of Design for the
Military Working Dog Kennel

Hunter Army Airfield, Savannah, Georgia



US Army Corps of Engineers Savannah District

Project No. 189618

Ready to Advertise Design Submittal

January 2026

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Part 1

Executive Summary

Part 1: Executive Summary

1.1 Authority

Under Contract Number W912HN-18-D-2002, Burns & McDonnell was authorized to complete the 65% Preliminary through 100% Final Design of the new Military Working Dog (MWD) Kennel at Fort Stewart-Hunter Army Airfield, Savannah, Georgia. The project number associated with this DD 1391 is PN69262. The Ready to Advertise was submitted on 27 April 2023. The project went to bid, and pricing exceeded funding, therefore the project paused for re-bidding to occur in 2026.

To support rebidding, a modification under contract Number W912HN25F2021 was issued to Burns & McDonnell in August 2025 to perform a life safety code and criteria review and submit a new corrected final design and Ready to Advertise submittal reflecting changes required from the life safety code and criteria review.

1.2 Kick-Off Meeting

In support of the modification for the life safety code and criteria review, a kickoff meeting was held on 9 September 2025.

Under the previous contract, a project kick-off meeting was held as a teleconference on 3 March 2022 to provide an open forum for exchange of ideas to obtain an understanding of the project needs, identify issues and provide solutions. During the kick-off meeting, project requirements were further reviewed, using the 35% Concept as the basis of design, and adjusted to meet the needs of the users and the budget constraints. The 65% submittal followed for submission on 12 May 2022. A 65% design review meeting was held on 2 June 2022 to review government comments and determine the path forward for further design development. The 95% design submittal was prepared and submitted 16 September 2022. A 95% design review meeting was held on 9 November 2022 to review government comments. The 100% corrected design submittal was provided 12 December 2022.

Participants in all meetings included representatives from 1/75th Ranger Battalion, Fort Stewart-Hunter Army Airfield (HAAF) Department of Public Works, USACE – Savannah District, United States Army Special Operations Command, and Burns & McDonnell Design Team.

1.3 Project Summary

Currently, 1/75th Ranger Battalion MWD Program occupies Building 1030 at HAAF. Building 1030 was adapted as an interim fix to support the new MWD mission operations for the 1/75th Ranger Battalion. This existing facility does not adequately meet the mission requirements and many of the architectural and engineering systems need upgrades or repair. This existing structure was originally constructed in the 1950's as a radio transmitter and communications building. The original facility was never envisioned to support MWD mission operations in accordance with current MWD design standards. The facility has undergone several renovations up to present day including the conversion of the facility to a kennel in the 2007-2008 timeframe.

Building 1030 has significant moisture problems that include water infiltration in the building's slab, a leaking roof, inadequate drainage in the interior and exterior of the facility and clogging and backflow of kennel drains. The building is subject to seasonal flooding due to building elevation. Low water pressure within the facility plumbing system inhibits kennel cleaning. The facility is not constructed to house the programmed number of canines which increases the risk of spread of infectious disease. The quantity of dog runs, and canine break areas is inadequate for the current number of canines within the facility. The current kennel layout does not allow for visual or physical separation between canines which poses substantial safety risks for the dogs and handlers. Renovating existing facilities or a combination of new and renovated facilities has been analyzed and deemed not viable for mission requirements.

Per the DD1391, the MWD Kennel will include kennel administration offices, veterinary exam and surgical suite, TA-50 locker area, latrines with showers, tack room, food preparation and storage areas, indoor and outdoor kennels, and building utility support areas. Fire detection and suppression, energy management control, unclassified and classified communications networks, intrusion detection, surveillance, and access control systems will be provided. Supporting

facilities include all related site-work and utilities (electrical, water, gas, sanitary sewer, and information systems distribution), lighting, parking, curb and gutter, sidewalks, storm drainage, landscaping, antiterrorism/force protection measures (AT/FP), obedience course with apparatuses, exercise and break areas, mobility equipment storage, and other site improvements. Special construction includes sustainable construction features complying with Leadership in Energy and Environmental Design LEED "Silver". The AT/FP measures include perimeter barriers, access control, mass notification system, laminated glass, and minimum stand-off distances. Access for people with disabilities will be provided in the kennel administration area. Comprehensive building and furnishings related interior design and audio-visual services are required. The project will include the demolition of building 1030 (9,851 SF). The new building air conditioning is estimated to be 70 kW (20 tons). The facilities will be designed to a minimum life span of 40 years in accordance with DoD's Unified Facilities Criteria (UFC 1-200-02), including energy efficiencies, building envelope and integrated building systems performance.

Per an updated DD1391, dated 11 February 2022, the project calls for a 11,183 SF MWD Kennel with a 500 SF of Unheated Storage Building and a 560 SF Outdoor Break Area. The revised, estimated start of construction is FY2026. Design has proceeded under a directive from USACE Savannah District assuming a new PA of \$15.75M, which would require 1391 to be revised from its current 11 February 2022 date.

1.4 Environmental

Geo-Hydro Engineers, Inc. completed the Pre-Demolition Asbestos Survey and Lead-Based Paint Screen for the Military Working Dog Kennel property located at Fort Stewart - Hunter Army Airfield. The subject property consists of a 9,000-square foot Working Dog Kennel and occupied veterinarian areas. The purpose of the pre-demolition asbestos survey and lead-based paint screen is to identify asbestos containing materials (ACMs) and lead-based paint (LBP) that will require special handling during demolition.

The asbestos containing building materials laboratory analyses detected regulated concentrations of asbestos in 3 of the 82 samples analyzed. The results of the asbestos laboratory analysis are presented in Appendix G. The quantities of ACM noted are estimates only and are not to be used for asbestos abatement cost estimates. Asbestos contractors are expected to calculate their own ACM quantities for cost estimating and regulatory notification purposes.

The lead-based paint laboratory analyses detected lead above 0.5% by weight in one of the 11 paint chip samples collected from the subject property. Lead was detected at 0.605% by weight in the white paint within sample DKL-10, collected from an interior metal window (Plate 11).

Prior to demolition, a licensed asbestos abatement contractor should remove and dispose of the asbestos containing materials identified by the report that will be disturbed during demolition. The Georgia Environmental Protection Division requires notifications for demolition or renovation of ACMs. Additionally, ACMs encompassing at least 10 square feet are regulated by the U.S. Environmental Protection Agency (USEPA) under the National Emissions Standards for Hazardous Air Pollutants and by the Occupational Safety and Health Administration (OSHA) under its worker protection regulations. These regulations require special handling and disposal procedures when asbestos containing materials are disturbed.

Regarding lead remediation, the United States Department of Housing and Urban Development (HUD) defines "lead-based paint" as paint containing more than 0.5% lead by dry weight of the paint. Based on the HUD's lead-based paint definition, paint chip laboratory analyses did detect lead-based paint associated with one paint chip sample collected. It's recommended that the demolition contractor make a specific composite sample of the demolition debris for Toxic Characteristic (TC) analysis for lead. Demolition debris from commercial projects consisting of components painted with lead-based paint requires TC analysis for lead. When the demolition debris does not exhibit TC for lead that exceeds the regulatory threshold of 5 milligrams per kilogram as a hazardous waste, then the waste may be disposed in a permitted municipal solid waste landfill or a permitted construction and demolition debris landfill. Materials containing lead-based paint are regulated by the OSHA under its worker protection regulations.

1.5 **Cost Estimate**

The current DD Form 1391 programmed amount (rounded) for the Military Working Dog is \$10,100,000. As of July 17, 2022, the government submitted a request for PA increase to \$15.75M. Design was allowed to continue assuming a new PA of \$15.75M. The target Construction Cost Limit (CCL) for the project is \$14.175M; 90% of programmed amount.

A detailed parametric design estimate for the 100% Corrected Final Design submittal was provided December 2022. The previously submitted 100% Corrected Final Design submittal had a current working estimate (CWE) of \$14,571,482 compared to the PA of \$15.75M.

A revised cost estimate will be provided upon issue of the Ready to Advertise submittal, that reflects the life safety code and criteria review updates to the design. The estimated construction cost issued with specific instructions dated 16 July 2025 indicates an estimated construction cost of \$14.276M.

1.6 **Design Schedule**

<u>Milestone</u>	<u>Date</u>
Contract NTP-65% Preliminary through 100% Corrected Final	19 JAN 2022
Design Kick-Off Meeting	3 MAR 2022
Submit Kick-Off Meeting Minutes	14 MAR 2022
65% Preliminary Design Submittal	12 May 2022
Complete Govt. Review	26 May 2022
AE Response to Gov't Review Comments	30 May 2022
65% Preliminary Design Review Meeting (Virtual)	2 June 2022
95% Design Submittal	16 Sept 2022
Complete Design Review	29 Sept 2022
AE Responses to Gov't Review Comments	.6 Oct 2022
95% Design Review Meeting (Virtual)	9 Nov 2022
100% Corrected Final Design Submittal	22 Dec 2022
Ready to Advertise Submittal	27 April 2023

MODIFICATION UNDER W912HN25F2021

Kick off call	9 September 2025
Code and Criteria Review	26 September 2025
Revised Corrected Final Design Submittal	17 December 2025
Government Review Complete	12 January 2026
Ready to Advertise Submittal	29 January 2026

Part 2

Civil

Part 2: Civil

2.1 Technical Criteria and Standards

ADA/ABAAG

Americans with Disabilities Act

EISA Section 438

Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act

MUTCD

Federal Highway Administration (FHWA), Manual on Uniform Traffic Control Devices (MUTCD)

NPDES

National Pollutant Discharge Elimination System (NPDES) for Construction Activities

Hunter Army Airfield Installation Design Guide

SDDCTEA Pamphlet 55-17

Better Military Traffic Engineering

UFC 1-200-02

High Performance and Sustainable Building Requirements

UFC 3-101-01

Architecture

UFC 3-201-01

Civil Engineering

UFC 3-201-02

Landscape Architecture

UFC 3-210-10

Low Impact Development

UFC 3-250-03

Standard Practice Manual for Flexible Pavements

UFC 3-250-04

Standard Practice for Concrete Pavements

UFC 3-600-01

Fire Protection Engineering for Facilities

UFC 4-010-01

DoD Minimum Antiterrorism Standards for Buildings

UFC 4-022-03

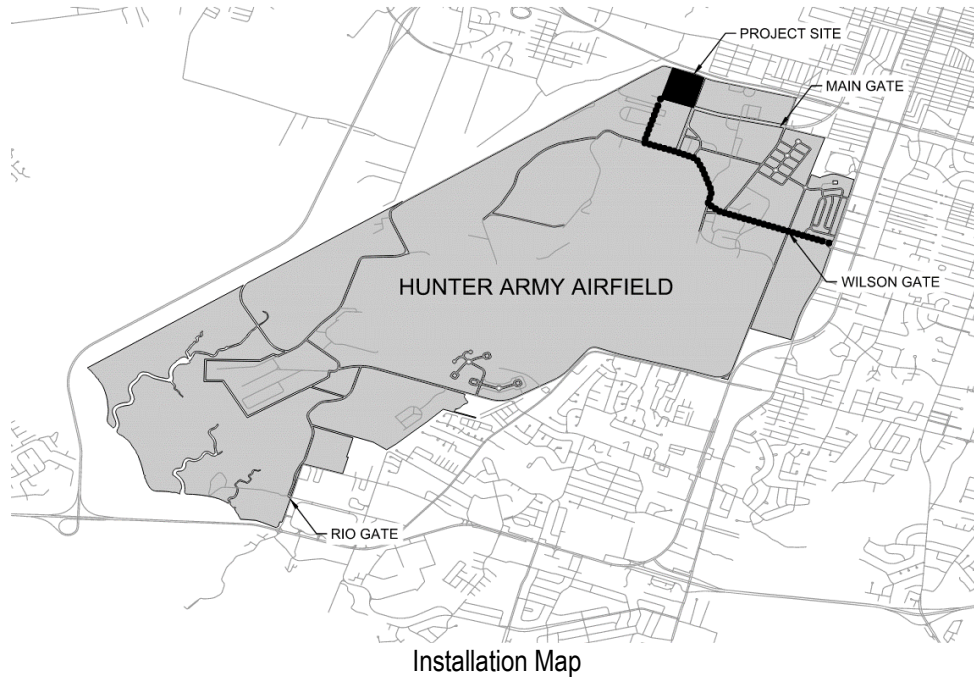
Security Fences and Gates

2.2 Site Layout

The proposed MWD Kennel Project is to be sited on an approximately 3-acre site located within the controlled perimeter of Hunter Army Airfield in Savannah, Georgia. The proposed site is bound by Perimeter Road and WM F Lynes Parkway to the North and Stephen Douglas Street to the West. The existing kennel building (Bldg. 1030), outdoor kennels, and obedience yard bounds the site to the East. Springfield Canal bounds the site to the South. Approximately 2 acres of the site is currently undeveloped, forested area.



Hunter Army Airfield Location Map



The facility will be oriented to generally face in the southern direction with frontage along Stephen Douglas Street. The proposed facility requires 14 POV parking spaces within the kennel security fence and two visitor spaces outside of the fence. A manual cantilever slide gate will control access to the facility and POV parking lot. A dumpster pad / recycling center is sited outside of the kennel security fence for ease of access.

The proposed building has been sited to meet standoff and unobstructed space requirements per UFC 4-010-01. This project is located within a controlled perimeter which has the ability to demonstrate the capability to search for and detect explosives. A proposed unobstructed space of 33 feet was utilized for the POV parking and roadways within the controlled perimeter and 141 feet clear zone to the controlled perimeter. All existing electrical and mechanical equipment within the unobstructed space will be enclosed within the proposed fenceline.

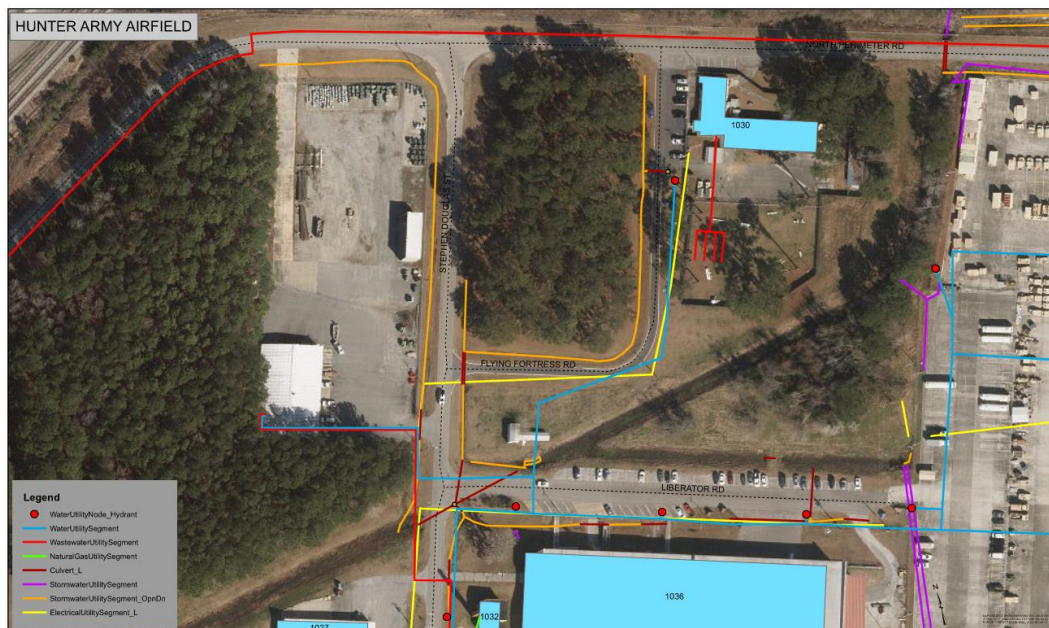
Sidewalks and ADA accessible ramps have been incorporated to accommodate pedestrian movement from the pedestrian entrances and adjacent facilities. All sidewalks interrupted by vehicle rights-of-way will have a pedestrian crosswalk, pavement markings, and signage. Sidewalks will have a minimum width of 5-feet except for portions of the sidewalk network connecting to the main building entrances have been widened to be 10-feet to accommodate multiple personnel movements. Sidewalks not in vehicular movement areas will consist of a minimum of 4-inches of PCC on compacted subgrade. Sidewalks will be light broom finish. ADA accessible ramp types will be provided with detectable warning surface system. A prominent entrance with a courtyard is designed for the building entrance with colored concrete and circular bench seating.

2.3 Subsurface Investigation

A subsurface investigation was performed by USCOE in June 2020 for this project and included in the Appendix of the design analysis. Topsoil was encountered in the soil test borings with an average thickness of 3 inches. Underlying the topsoil, sandy lean clay (CL) was encountered to depths as great as 9 feet below existing grade.

2.4 Topographical Survey

A topographical survey was completed for the project by Lowe Engineers in March 2020. The horizontal datum is Georgia State Plane (East Zone) NAD83 and the vertical datum is NAVD 1988.



2.5 Site Demolition

The existing kennel facility (Bldg. 1030) and sheds will be demolished and removed. Utilities impacted by the construction activities and actively serving adjacent facilities will be relocated. Abandoned or inactive utilities will be demolished and removed. The existing outdoor kennels, obedience yards, asphalt pavement, and concrete pavement are to be protected and remain on site.

2.6 Access Drives and Roads

An asphalt access roadway (two-lane; 26' wide) will be provided from Stephen Douglas Street to the POV parking lot. A fire access and maintenance asphalt driveway (one-lane, 20' wide) will continue from the POV parking lot to Perimeter Street.

2.7 Parking

The parking areas have been designed to meet NFPA 1, Chapter 18 for Fire Department Access. The parking lot consists of 16 parking spaces: 1 van accessible handicap, 2 visitor POV spaces. The parking lot drive aisles are 26 feet wide and the parking spaces are 9 feet wide by 18.5 feet long. The entrance driveways radii at the entrance and exit intersections will be designed to accommodate 25 ft. turning radii. All traffic related signing and pavement markings will be designed in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) and Georgia Department of Transportation (GDOT) requirements.

The drive aisles will be constructed of standard duty asphalt pavement; while access roadways that are expecting heavy duty trucks loading and unloading, such as the garbage truck route to access the dumpster pad will be constructed of heavy-duty asphalt or Portland concrete pavement.

2.8 Pavement Design

New Portland cement concrete will be designed in accordance with UFC 3-260-02 design requirements and PCASE software. All asphalt pavements will meet UFGS 32 12 16 and concrete pavements will meet UFGS 32 13 13.06. The proposed pavement sections are shown in the summary table below:

Proposed Pavement Design Summary Table:

Pavement Type	Traffic Pattern	Traffic Type	Pavement Section
Portland Cement Concrete	Custom Fleet Mix	Road Areas	9.5" PCC / 4" Drainage Layer / Geotextile / 12" Compacted subgrade / select fill
Asphalt Pavement	Custom Fleet Mix	Road Areas	3" AC / 4" Drainage Layer / 4" Compacted Graded ABC / Geotextile / 12" compacted subgrade / select fill

The following variables will be used as part of the pavement designs using PCASE:

1. A Geotechnical Investigation of the site was performed. The following pavement design parameters were utilized:
 - a. CBR: 8
 - b. k-Value: 150 pci

2. Estimated Design Life Passes based on 20-year design life.

Concrete Mix Design

The concrete mix design will be as follows.

1. 650 psi minimum flexural strength.
2. Type I or II, low-alkali cement
3. Maximum allowed slump of 2-inch for the exterior concrete pavement.
4. Air entrainment will be required for the exterior paving. Air content by volume will be 6.0% plus or minus 1.5% in accordance with ASTM C231.
5. w/c ratio of 0.45 max for exterior concrete

2.9 Pavement Jointing and Reinforcement

Pavement joints will be designed in rigid pavement to allow for contraction and expansion of concrete pavements and for load transfers between pavements. The rigid pavement jointing and reinforcement layout was established based on the following criteria:

Construction joints have been designed where the anticipated physical limits of concrete placement will occur at the beginning, end, and edges of a placement lane and where new pavement abuts existing concrete pavement.

Doweled construction joints have been designed to provide load transfer in the pavement where heavy loads or traffic is expected to transfer loads from adjoining slabs.

Doweled construction joints specifically occur at the intersections of new and old concrete with the same thickness and joint spacing. This is a practical alternative to accomplish load transfer from new pavement to existing pavement without the need of undercutting and special juncture with the existing concrete pavement.

2.10 Site Grading and Building Finish Floor Elevation

The site is to be graded to provide positive drainage away from the proposed building. To promote positive drainage, a minimum slope of 5 percent for the first 10 feet will be used around the proposed facility. The site grading will provide at least 6 inches below finished floor elevation around the perimeter of the building. The parking lot is proposed to drain surface flow to the stormwater management facilities and utilize a grassed swale on the south side. Minimum slopes for the parking lot is 2% and minimum slopes within drainage swales of 1% will be used. Side slopes for stormwater management facilities will utilize a 4:1 side slope as much as possible for maintainability.

The facility minimum finished floor elevation and mechanical/electrical equipment pads must be above the 100-year flood elevation as indicated on the Flood Insurance Rate Maps (FIRM) published by the Federal Emergency Management Agency (FEMA). According to FIRM Panel 13051C0142G, last revised 8/16/2018, the site is located within Zone AE with a Base Flood Elevation of 14 for the 100-year storm event. The site is also within the 500-year flood plain (estimated at Elevation 16). Per BCE, the FFE was set at 1' above the 500-year flood plain elevation (FFE = 18.0).

2.11 Storm Water Drainage

The site will be designed to meet UFC 3-210-10 Low Impact Development (LID) and Georgia Stormwater Management Manual requirements, which will help to maintain the site hydrology and mitigate the adverse impacts of stormwater runoff and non-source point pollution generated by this project.

LID requires that post development discharge rate, volume, and temperature be less than or equal to predevelopment conditions. To meet this requirement the LID guidelines require the retention of the 95th percentile 24-hour design storm onsite through the use of retention, infiltration, or rainwater harvesting. Per Table 8 of the UFC, the 95th percentile

rainfall depth for Savannah, Georgia is 2.03 inches. Georgia Stormwater Management Manual (GSWMM) also requires water quality treatment similar to that specified by the UFC LID guidelines. However, the volume specified by GSWMM for bio-retention systems requires retention of the 1.2 inches and channel protection (1-year) volume. The UFC requires that local or State requirements be met; however, when the local requirements are in conflict with the UFC, the most stringent shall apply. Due to a redevelopment of the impervious area to the site, the UFC-LID criteria will be less stringent than the GSWMM water quality sizing criteria. Therefore, for water quality treatment, the GSWMM criteria listed above will be utilized. The GSWMM has additional stormwater requirements that must be met in addition to the water quality treatment, including the peak flow attenuation of the 25-year 24-hour, and 100-year design storms

The proposed drainage system utilizes “rain gardens” or bio-retention areas for retaining the water quality volume for UFC requirements as well as meeting peak flow attenuation requirements. These requirements can be accomplished by designing a multi-staged outlet control structure with two-staged weir or orifices, which allow the treatment volume to percolate through the soils while rainfalls above the 95th percentile will be allowed to flow through an overflow weir system.

The existing topographic data indicates the site has one primary drainage basins, designated as Basin A. Basin A currently discharges to Springfield Canal to the south.

The proposed grading and drainage improvements will not change the existing drainage patterns from the site. A proposed retention pond with underdrain system will be used to treat water quality as well as attenuate post developed flows from Basin A to pre-developed conditions.

2.12 Erosion and Sediment Control

Fort Stewart and Hunter Army Airfield are a local issuing authority (LIA) for Ga EPD in administering a general permit program that targets construction activities that result in land disturbance of one acre or more. GAR10001 General Permit is intended to reduce pollutants, principally sediment, which are a result of soil erosion and other activities associated with land-disturbing activities. A notice of intent (NOI), a stormwater pollution prevention plan (SWPPP) and erosion and sediment control (E&SC) plans will be developed and submitted for a land disturbance permit.

2.13 Permitting

Typical permits required for MILCON projects are shown below:

1. Dig Permit
2. Air Quality Permit
3. Stormwater / Construction Stormwater

An erosion control permit and Stormwater Construction permit is required from Chatham County, GA.

Part 3

Utilities

Part 3: Utilities

3.1 Technical Criteria and Standards

UFC 3-230-01	Water Storage, Distribution, and Transmission (1 Nov 2012)
UFC 3-240-01	Wastewater Collection (1 Nov 2012)
WEF Manual of Practice No FD-5	Water Environment Federation and American Society of Civil Engineers Manual of Practice MOP FD-5/ASCE MOP 60, Gravity Sanitary Sewer Design and Construction

3.2 Utilities

Existing water, sanitary sewer, natural gas, and storm drainage networks are generally throughout the project site or are immediately adjacent to the new Facility. The existing utilities are government owned and maintained except for electrical power is owned and maintained by Canoochee Electric.

3.3 Utility Demolition and Relocation

All existing utilities that are within the proposed footprint of the Facility that will present a conflict for future structure and utility installation will be removed to the nearest tee, valve, or logical location and plugged or capped, to accommodate construction of the proposed facility, but a minimum of 10 feet from the building foundation. Existing utilities impacted by the proposed building include fire water, domestic water, sanitary sewer, and storm drainage. Utilities not identified as being demolished and removed will be abandoned-in-place and filled with flowable fill.

Removal and relocation of utilities will need to be coordinated with Canoochee and the Department of Public Works to coordinate utility shutdowns for adjacent facilities or main trunks for the base wide utility network.

3.4 Water Distribution System

The existing base water distribution system is fed off the Hunter Army Airfield potable water system. This system serves both the potable water and fire protection services required to support base operations and personnel. The overall condition of the water system is good and there is adequate water supply for the domestic system. See Part 9 for additional details concerning existing system pressure.

Proposed separate lines for domestic supply and fire protection water have been provided to the new facility. All domestic water main piping will be specified as C900 or C905 PVC with ductile valves and will be buried to the minimum depth or 36" below grade. Valves will be located on service line branches from utility mains and elsewhere as needed on the utility distribution network to isolate certain sections and routings of utilities. Concrete thrust and anchor blocks are required for all bends, tees, and elbows on pressurized piping.

All fire water piping will be specified as C900 or C905 PVC and will be buried to a minimum depth of 36" below grade. All fire hydrants will be connected to the domestic water system, located a minimum of 3-feet away from other structures, and maintain a 36-inch clear space around the front of the hydrant. Proposed fire hydrants around the facility will ensure a maximum of 300-feet spacing. Interconnect fire suppression piping between the three buildings will be installed in a precast concrete utility trench. The trench and solid lids will be H20 vehicle rated. Each trench box will have openings in the bottom section to allow for drainage. A continuous underdrain beneath the trench boxes will collect and convey the water to the site stormwater drainage system.

Construction separation distances will be incorporated to ensure against utility cross-contamination between water and sanitary sewer utility lines. All proposed sanitary sewer and water lines will be located with at least 10-feet clearance horizontally. In areas where the proposed utility layout may require a sewer to cross above a water line, the sanitary sewer line will be concrete encased for 10-feet in both directions from the crossing. Within these distances there will be no occurrence of water pipe joints.

3.5 Sanitary Wastewater Collection System

The sanitary sewer from the proposed facility will flow to a packaged pump station. A new pump station will be co-located with another packaged pump station serving the existing kennel facility. HAAF DPW determined to keep the existing kennel pump station and connect the new pump station to the existing 2-inch PVC force main. For new gravity main, the minimum flow velocity for building laterals will be 2 feet-per-second and the maximum velocity will be 10 feet-per-second.

Collection System Piping

Sanitary sewer main piping will be specified as PVC. The daily sanitary sewer flow will be collected at the building by multiple sewer service connections. The minimum size of the sanitary sewer service line from the building to the sanitary main will be 6-inches. Precast sanitary sewer manholes will be located wherever there is a direction change or intersection of sanitary sewer piping, with a maximum interval of 400-feet between manholes, per UFC criteria.

Wastewater collection systems shall be designed in accordance with the Water Environment Federation and American Society of Civil Engineers Manual of Practice MOP FD-5/ASCE MOP 60 Gravity Sanitary Sewer Design and Construction.

3.6 Gas Distribution System

An existing natural gas line runs along Stephen Douglas Street that serves Building 1032. No information for this line has been provided; however, it is anticipated a service line will branch from this utility main and serve new Facility. The gas main piping will be specified as High Density Polyethylene Pipe (HDPE) and will be buried a minimum of 36-inches below grade. Valves will be located on service line branches from utility mains and elsewhere as need on the utility distribution network to isolate certain sections and routings of utilities.

3.7 Storm Drainage System

Any storm drainage structures, and piping networks will be sized to accommodate the 10-year, 24-hour storm SCS storm design event for the proposed attributing watershed. The minimum pipe size for storm drainage piping will be 15-inches. Storm drainage piping will be Class III RCP for areas subject to vehicle loading and PVC for roof drain downspout boot connections, unless noted otherwise on the drawings or specifications. Standard concrete flared end sections will be used for all inlets and outlets as shown on the plans. Outlet control structures will be concrete designed and constructed in accordance with ASTM C913. For additional stormwater and drainage information, see Part 2 Civil.

3.8 Cathodic Protection

The base currently does not provide cathodic protection systems for existing utilities. However, the geotechnical report will determine if the soil is corrosive or if cathodic protection is required.

3.9 Utility Structures

All landside utility structures, lids, frames, and grates will be specified as H-20 rated.

Part 4

Architectural

Part 4: Architectural

4.1 Technical Criteria and Standards

ABA -Architectural Barriers Act - ABA Accessibility Standard for Department of Defense Facilities – 2015
International Building Code, 2018
NFPA 101, Life Safety Code, 2018
UFC 1-200-01, General Building Requirements, Change 1, 01 Oct. 2020
UFC 1-200-02, High Performance and Sustainable Building Requirements, Change 01, 03 Jan. 2022
UFC 3-101-01, Architecture, Change 1, 05 Jan. 2021
UFC 3-110-03, Roofing, with Change 5, 12 June, 2020
UFC 3-120-01 Design: Sign Standards, 01 March 2014 with Change 3, 12 December 2017
UFC 3-120-10 Interior Design, Change 2, 15 June 2021
UFC 3-600-01, Fire Protection Engineering for Facilities, Change 6, 06 May 2021
UFC 4-010-01, DoD Minimum Antiterrorism Standards for Buildings, Change 1, 19 August 2020
UFC 4-010-05, Sensitive Compartmented Information Facilities Planning, Design and Construction 01 Oct. 2013
Fort Stewart Hunter Army Airfield Installation Planning Standards, 2 June, 2015

4.2 Overview

The intent of this project is to construct a new Military Working Dog (MWD) Kennel at Hunter Army Airfield, Georgia. The size of the facility is approximately 11,123 square feet in size and is programmed in accordance with DD1391 dated 08 February 2022 for the SOF Military Working Dog (MWD) Kennel.

4.3 Architectural Compatibility Narrative

The overall design, includes the main MWD Facility, accompanied by two support buildings – MWD Break Area and Storage, and a prefabricated Ammo/Explosives Storage structure. The main MWD Facility is approximately 11,123 square feet and is comprised of two primary functions, the administrative areas and the indoor/outdoor kennels. A portion of the administrative areas are located within an access-controlled perimeter, to include the Kennel Master, Trainer, Locker Room, Multi-purpose Handlers, and Telecom spaces. Electronic key card access is located at perimeter doors of the controlled area, and the surrounding walls are built to a sound attenuation rating (STC) of 50. Electronic key card access is located at all exterior doors of the MWD Facility, however those without access to the controlled area of the building enter at the North Hall, and those with authorized access may enter at the main entrance on the plan East side of the facility.

The two support spaces accompanying the MWD Facility includes the MWD Break Area and Storage. The Break Area includes 16 individual kennels that rest on a covered, 2,200 square foot concrete pad. Each kennel is separated by 8 feet high 8 inch sealed CMU block walls, with a wire mesh partition and gate door on the entry side into each kennel, and a wire mesh cap across the top. The kennels are covered by a standing seam metal roof canopy. The additional Storage facility is a 529 square foot pre-engineered metal building, with a double door entrance on the plan East side.

Rooms and Sizes:

The following program areas are located within the Non-Secure portion of the MWD Facility:

Program Area	Net SF
Mens Toilet	168
Female Toilet	99
Electrical	115
Mechanical	324
Veterinary Treatment	463
Surgery	99
Food Storage	264
Tack Room	298
Mothers Room	61
Hall	418

The following program areas are located within the Secure portion of the MWD Kennel Facility:

Program Area	Net SF
Telecom	171
Multi-purpose Handlers	857
Trainer	203
Kennel Master	201
Locker Room	956
Corridor	161
Vestibule	147

4.4 Building Systems/Components Description

The following is a general description of the basic building systems/components for the MWD Facility, Break Area, and Storage Facility, and Ammo/Explosives Storage structure:

MWD Facility Exterior Wall Construction:

The exterior wall assembly surrounding the administrative portion of the building consists of an 8' high brick veneer water table to align with the Base Installation Planning Standards, capped with a 4" high precast concrete cap. The upper portion of the exterior wall consists of prefinished metal panels. This façade is installed over a 2" air space, 2" rigid insulation (R-10) over a fluid applied air barrier on 5/8" fiberglass reinforced gypsum sheathing over 6" metal studs with batt insulation (R-21) and finished with 5/8" type 'X' gypsum wall board on the interior.

The exterior wall assembly at the Indoor/Outdoor Kennel portion of the building consists of a 4' high CMU block wall, with a 4" high precast concrete cap, and a thin brick veneer adhered to the face of the CMU block. The mid-portion of this exterior wall consists of a 2'-8" high opening with a prefabricated wire mesh partition, secured with steel framing per the pre-engineered metal building manufacturer. The upper portion of the wall consists of prefinished metal panels on the exterior over fiberglass reinforced gypsum sheathing on a steel framing per the pre-engineered metal building manufacturer and finished with 5/8" gypsum wall board on the interior and ½" metal panel.

The prefinished metal paneling on each portion of the facility extends to the roof above. All finishes on the exterior wall construction align with the Fort Stewart Hunter Army Airfield Installation Planning Standards.

MWD Break Area Exterior Wall Construction:

The Break Area consists of 16 separate outdoor kennels. The exterior wall assembly at the Break Area consists of 8' high, 8" sealed CMU block walls that divide each kennel. The partition upon entry into each individual kennel consists of galvanized steel wire mesh partition with grill panel design, and gate door for access.

MWD Storage Facility Exterior Wall Construction:

The MWD Storage Facility is a pre-engineered metal building. The exterior wall assembly consists of metal framing with prefinished metal paneling on the exterior.

Roof (MWD Facility):

The roof system will consist of Steel Standing Seam Metal Roof, over underlayment over R-30 rigid insulation over air barrier and fiberglass reinforced gypsum sheathing over structural steel decking supported by steel roof trusses. Roof type will be a gable roof. All roof slopes to be 3/12. Roof soffit overhang is 2 feet deep max, with a prefinished metal fascia. The gutter discharges to exposed downspouts that are connected to the underground stormwater system.

The structural steel decking within the facility differs between the admin and indoor/outdoor kennels. The two areas are separated by an isolation joint. The structural steel decking within the admin area is a fluted, galvanized steel deck with G90 coating. Because of sounds stemming from the adjacent range and within the kennel itself, noise reduction is prioritized in this design. The Indoor/Outdoor Kennel area (to include Quarantine) is designed with a perforated acoustical galvanized steel deck with acoustical insulation batts within the fluted deck. A fluted, cellular deck in conjunction with the polyisocyanurate roof insulation has a noise reduction value (NRC) of 0.85.

Roof (Break Area):

The roof system consists of a gable roof with 3/12 slope, steel standing seam metal roof, over structural steel decking supported by light gauge roof trusses. The canopy is held up with structural columns, with an eave height of 11 feet 6 inches.

Roof (Storage Facility):

The roof system consists of a steel standing seam metal roof, over structural steel decking supported by light gauge roof trusses. Overhangs are not a typical eave condition for a pre-engineered metal building. Creating an atypical pre-engineered metal building condition increases the risk of water intrusion due to the added complexity and deviates from the standard warranty, therefore the storage facility is designed without overhangs.

Doors:

The exterior personnel doors on the MWD Kennel and MWD Storage Facility will be extra heavy duty, flush insulated hollow metal and set in heavy gage steel hollow-metal door frames. All exterior doors into the facility are designed with electronic key card access. Electronic keycard access is also provided on doors located around the perimeter of the controlled access area. The main entrance on the east side of the facility will be an aluminum storefront assembly with side-lites and full-lite glazed door (insulated). Hardware and locksets will be heavy duty type and keyed per base standards. Interior personnel doors will be heavy-duty hollow metal types. Hollow metal doors will be narrow-lite or flush and set in heavy gage steel door frames. The thermal, sound transmission, fire separation, and security performance characteristics of each door will conform to the characteristics of the partition in which the door is installed.

The indoor and outdoor individual kennels within the MWD Facility and MWD Break Area will receive a hinged, gate door keyed per base standards. The indoor kennels will receive a gate door consisting of a 6 ft high solid stainless-steel panel, with 2 ft of stainless-steel grill panel design, wire mesh partition above. The solid steel panel is meant to obstruct the view of the dogs across from one another in the interior kennels. The outdoor kennels will receive a gate

door consisting of stainless-steel wire mesh in its entirety. The indoor and outdoor kennels are connected with an insulated, aluminum faced guillotine door. The guillotine door tracks are mounted on the face of the sealed CMU wall of the interior kennel wall and is operated by a pulley system.

Building Air Barrier System:

The roof air barrier system consists of a membrane air barrier over structural steel decking and continues over top and down roof eave blocking. The portion of the roof covering the Indoor, Outdoor and Quarantine Kennels of the facility also consists of a membrane air barrier over structural steel decking, however rather than extending out over the Outdoor Kennels, a steel bent plate provides a break in the roof structure. This allows the air barrier to fold over the bent plate and down to meet the metal deck so that the air barrier remains continuous with that of the fluid applied air barrier installed vertically on the CMU wall below.

In the administrative portion of the MWD Facility, the wall system is comprised of a continuous fluid applied air barrier over fiberglass reinforced gypsum sheathing. The indoor/outdoor kennel portion of the facility is not insulated and therefore does not contain an air barrier system.

Interior walls:

All partition walls along the perimeter of the administrative controlled access area of the MWD Facility are designed as STC 50 minimum and extend to the structural metal deck above. Partition walls outside of the controlled access portion of the administrative areas will extend to the structural metal deck in order to decrease sound transmission within the facility with a minimum sound transmission rating (STC) of 45. Walls located around the perimeter of the Veterinary Treatment and Surgery require a 1 HR fire rating and will also extend to the structural metal deck above.

In the indoor/outdoor kennel portion of the facility, interior partitions extending from floor to the deck above to separate the indoor kennel, outdoor kennel, and quarantine, consist of 8" sealed CMU walls. Partition walls that separate each individual kennel consists of 6 ft high 8-inch sealed CMU walls with 2 ft of wire mesh partition with grill panel design secured above to create an 8 ft high partition (6 ft CMU, 2 ft wire mesh). The concrete floor slab in the indoor kennel and connecting outdoor kennel has a 0.25/12 slope. The connecting Kennel Corridor located at the Outdoor Kennel also has a 0.25/12 slope. The two slopes are joined by and slope toward a continuous trench drain within the Kennel Corridor.

Quarantine kennels exist adjacent to the indoor/outdoor kennel. The Quarantine portion of the facility is separated from the rest of the facility by a sealed 8" CMU wall extending from the floor slab to the structural metal deck above to avoid contamination between sick dogs housed in the quarantine area and healthy dogs housed in the indoor/outdoor kennels. The concrete floor slab in the Indoor Quarantine Kennel and connecting Outdoor Quarantine Kennel has a 0.25/12 slope. The connecting Quarantine Corridor has a 0.25/12 slope. The two slopes are joined by and slope toward a continuous trench drain within the Quarantine Corridor. This trench drain is separate from the Kennel Corridor to avoid contamination between the two areas.

Interior ceilings:

Ceilings will either be open to deck, drywall, or suspended ceiling types. Open ceilings are provided in utility spaces and outdoor kennels. Utility open ceilings are exposed metal deck and open web truss, painted. Suspended ceilings are provided throughout the rest of the facility, consisting of 2' x 2' acoustical ceiling tiles. The Indoor Kennel consists of 2' x 2' perforated acoustical ceiling tiles with insulation as an additional measure to control sound attenuation within the Kennel. Drywall type ceilings are provided in all restrooms, and the mother's room. These ceilings will be 5/8" moisture-resistant Gypsum wall board, painted.

4.5 Accessibility for the Disabled

The facility is fully accessible and is designed to comply with ABA Architectural Barriers Act - ABA Accessibility Standard for Department of Defense Facilities – 2015.

4.6 Structural Interior Design (SID)

The facility will provide an interior environment that supports the technical requirements, security requirements and the physical needs of the occupants.

4.7 Functional Finishes

The functional aspects of the interior finishes and products that are used in this environment are extremely important. Due to the function of the building, the interior finish materials are selected to represent the most durable performance for the function of the areas within the facility. The interior finishes selected are to be easily maintainable as well as durable and cost efficient over the life of the building. Future finish material updates are made easier by strategic planning. Finishes which are permanent construction (doors or tile floors) are to be neutral in color.

To achieve the goals set forth for LEED, all interior finish products and methods of installation are to be GREENGUARD certified or inherently environmentally sensitive to support a healthy building environment.

4.8 Interior Finish Assignment (SID)

Finish materials are based on facilities function and requirements. Most of the floors are a three-part epoxy. The Veterinary Treatment and Surgery space will receive seamless sheet vinyl flooring with an integral base. Ceilings include acoustical ceiling tiles in the office spaces, clean room acoustical ceiling tiles in the veterinary treatment and surgery spaces, moisture resistant gypsum board in the restroom/shower spaces and a perforated metal acoustical ceiling tile in the kennel space.

Additional requirements include providing interior identification signage as required. Signage is to meet requirements per UFC 3-120-01, Sign Standards. Interior signage includes identification, directional and informational signage utilizing permanent and changeable systems.

Millwork is to include wall and base cabinets with plastic laminate finishes for the break space and Mother's room. These cabinets are to be a minimum custom grade construction to AWI standards. Wall and base cabinets in the Food Storage and Tack Room to be stainless steel. The wall and base cabinets in the Veterinary Treatment and Surgery space to be medical quality stainless steel cabinets. Countertops are to be finished with solid-surface material for enhanced durability in the break space, Mother's room, and Restrooms. Countertops are to be stainless steel in the Food Storage, Tack Room, Veterinary Treatment and Surgery space.

4.9 Furniture, Fixtures and Equipment (FF&E)

The FF&E has been split into two packages and are created so it can be put out for solicitation. The packages are split by an Office FF&E package and a Medical Equipment package. The products are listed with the required salient characteristics and are not proprietary. Finishes will be selected after the vendor has been selected from their finish selections to match the building interior finishes. The FF&E for the project is funded with O&M monies.

4.10 Design Intent

This facility requires furnishings that respond to the physical demands of the constant utilization by different users in the facility. Furnishings must be durable, easy to maintain, have limited parts and pieces to manage and have universal modularity to respond to unknown future changes. The furnishings must integrate seamlessly with the building electrical and data systems with easily accessible wire management capability. Equally important to the function of the furnishings, ergonomic support and features will be incorporated to support a healthy work environment to the users. The furnishing size and adjustability features will accommodate a minimum of 95% of the facility population size. Other healthy / ergonomic furniture features include:

1. Integrated task light provide light in task areas to help avoid eye strain.
2. Seating for all users will be specified with easily adjustable mechanism for height, arms, and back, breathable fabric for comfort and seat pan front edges that will not cut off circulation while sitting.

3. Selecting furnishings from manufacturers that utilize sustainable manufacturing processes and produce products that are GREENGUARD or Scientific Certification Systems (SCS) Certified, with recycled content materials. When possible, furnishings will be provided that achieve the “Cradle to Cradle” environmental status to reduce future landfill use.

All furnishings will be analyzed against these criteria in combination with a cost analysis to determine the “Best Value.”

4.11 FF&E Interior Furnishings Styles and Types

The facility is to be transitional in style with clean lines and simple forms that function efficiently for the users and are cohesive with the interior finishes of the facilities. Furnishings to be included in the FF&E package are to be as follows:

Kennel Master and Trainer office will include:

1. L-shaped desk with metal construction and laminate worksurface
2. Overhead closed storage units
3. Integral task light below overhead with occupancy sensor
4. Fabric tack panel
5. File Storage
6. Ergonomic mesh task chair with lumbar support
7. Two guest chairs with metal frames with upholstered seat and back

Multi-Purpose handlers space will include:

1. 48”W x 24” D workstations
2. File storage
3. Integral task light with occupancy sensor
4. Fabric tack panel interior side of work surface
5. Ergonomic mesh task chair with lumbar support
6. Large Conference table and chairs
7. Break Space appliances: Refrigerator/Freezer, coffee machine, microwave.

Tack Room will include:

1. Metal storage shelving for storage
2. Washer and Dryer
3. Refrigerator/Freezers
4. Metal storage cabinet

Food Storage will include:

1. Metal storage shelving for storage
2. Ice machine
3. Refrigerator/Freezers
4. Microwave

5. Food prep table
6. Kitchen grade shelving
7. Veterinary Treatment will include:
8. Lab Stool
9. Undercounter refrigerator
10. Veterinary Treatment and Surgery Laboratory Equipment

Mothers Room will include:

1. Soft Seating Side Chair with tablet arm
2. Undercounter refrigerator

Accessories throughout the building include:

1. Trash receptacles
2. Recycling receptacles
3. Clocks

4.12 Government Furnished, Government Installed (GFGI) Equipment

Equipment is not included in MILCON or in the FF&E package. The following items will be procured by the government. They are indicated by halftone and dashed items with an "EQ" item code in the drawings in order to coordinate space and required building infrastructure:

1. Safes
2. Multi-function machines
3. Shredders
4. Flat panel displays

Part 5

Structural

Part 5: Structural

5.1 Technical Criteria and Standards

ACI 318-19	Building Code Requirements for Structural Concrete
AISI S100 - 17	North American Specification for the Design of Cold-formed Steel Structural Members
AISC 360-22	Specification for Structural Steel Buildings
ASCE 7-22	Minimum Design Loads for Buildings and Other Structures
AWS D1.1	Structural Welding Code – Steel
AWS D1.4	Structural Welding Code - Reinforcing Steel Including Metal Inserts and Connections in Reinforced Concrete Construction
TMS 402/602-16	Building Code Requirements for Masonry Structures
IBC 2018	International Building Code
UFC 1-200-01	DoD Building Code with Change 1, 2020
UFC 3-301-01	Structural Engineering with Change 1, 2022
UFC 4-010-01	DoD Minimum Antiterrorism Standards for Buildings with Change 1, 2020

5.2 General

The MWD Kennel building is a one-story, metal building system comprised of two independent structures overall measuring approximately 65'-0" x 192'-0". The administrative (admin) space is located on the south side of the building and the kennel space is located on the north side of the building. A covered break area will be a metal building system measuring approximately 28'-0" x 77'-0", located on the north side of the kennel building, along with a 22'-0" x 22'-0" storage building.

5.3 Framing System

The primary structural framing for all three structures, listed above, is comprised of metal building system rigid frames, portal frames, and rod bracing. The roof deck is supported on cold-formed steel purlins spanning between the rigid frames. Both the indoor/outdoor kennel/admin building and military working dog (MWD) break structure utilize portal frames perpendicular to main building frames for lateral support. The storage building utilizes rod bracing perpendicular to main building frames for lateral support. All frames have pinned bases.

The exterior wall construction in the admin area consists of brick veneer with cold-formed steel stud backup extending from the slab on grade to the roof eave. The exterior wall construction in the kennel space consists of brick veneer and metal panels with reinforced concrete masonry backup extending up from the slab on grade approximately 4'-4" on the north and south side and full height on the east side. Chain-link fencing extends from 4'-4" above finished floor to metal panels on cold-formed metal studs on girts up to the eave. The MWD break area is an open area, building walls, but with masonry demising walls between kennels. The storage building exterior wall construction consists of metal panels attached to horizontal girts.

5.4 Foundation

The foundation system for each building consists of shallow spread footings with a continuous turn-down footing around the perimeter. The reinforced slab on grade is typically 5 inches thick. All slabs are underlain with a vapor barrier and 4 inches of capillary water barrier consisting of open graded stone. Concrete curbs provide a level surface for masonry walls to bear at sloping floors. Kennel slabs are reinforced to avoid the use of slab control joints.

Interior masonry walls are on thickened slabs. Concrete curbs are used to provide level surfaces for masonry.

The following values are used for design.

1. Allowable Bearing Pressure: 1,500 psf
2. Unit Weight: 120 pcf
3. Water Table Depth: 7 feet
4. Modulus of subgrade reaction: 125 pci
5. Frost depth: 0"

5.5 Fire Resistance Statement

The kennel/admin building is sprinklered and does not require fireproofing of the structure. The MWD break area and storage building are not sprinklered.

5.6 Outstanding Structural Information

The MWD kennel is located more than 50 feet within the installation perimeter of Hunter Army Airfield with a 33' unobstructed space around the buildings.

Per ASCE/SEI 7-16, seismic design category D exempts mechanical and electrical components that are positively attached to the structure and within weight limitations indicated in Section 13.1.4. Other nonstructural components must meet seismic design and bracing requirements.

5.7 Loads

The facility is designed in accordance with UFC 3-301-01 and ASCE/SEI 7-22.

1. Building Classification: Risk Category II
2. Dead and Collateral Loads
3. Roof: per building materials
4. Admin Ceiling: 2 psf
5. Kennel/Office Fire Protection Piping: 3 psf
6. Lighting and Electrical: 3 psf
7. Kennel/Office Mechanical/Piping: 5 psf typical
8. Miscellaneous: 5 psf
9. Live Loads
 - a. Roof: 20 psf, reducible, 750 lb concentrated load concurrent with live load at Kennel/Admin only.
 - b. Floor:
 - i. Unless Noted Otherwise – 100 psf, 2000 lb concentrated load nonconcurrent.
 - ii. Mechanical Equipment (General) & Electrical Rooms – 150 psf
 - iii. Storage – 125 psf

10. Wind Loads
 - a. Basic wind speed: 134 mph
 - i. Enclosed: Admin and Storage
 - ii. Partially Enclosed: Kennel
 - iii. Open: Break Area
 - iv. Exposure category: C
 - v. $k_{zt}=1.00$
11. Snow Loads
 - a. Ground snow load: 0 psf
12. Earthquake Loads
 - a. Site Seismicity: $S_s=0.43$ g, $S_1=0.12$ g
 - b. Soil Site Class: E
 - c. Design Earthquake Spectral Response Accelerations: $S_{DS} = 0.25$ g, $S_{D1} = 0.14$ g
 - d. Seismic Design Category: C
 - e. Seismic Response Coefficient: $C_s=.071$
13. Antiterrorism/Force Protection Requirements: see Antiterrorism Force Protection

5.8 **Serviceability Criteria**

1. Foundation Settlement Limit: 1" total, 1/2" differential settlement, maximum (assumed)
2. Beam/Girder/Frame Deflection Limit: L/240 For Live Load, L/180 for Dead+Live load
3. Masonry Veneer/Stud Wall Vertical Deflection Limit: L/600
4. Overall Structure Drift Limit: H/480 based on a 10-year MRI wind speed (UFC 3-301-01).

5.9 **Materials**

1. Reinforced Concrete
 - a. Concrete f'_c : 5,000 psi UNO
 - b. Reinforcing Steel f_y : 60,000 psi
 - c. Maximum Slab Joint Spacings
 - d. Construction/Control joints: 14 ft max
 - i. No joints in kennel and break areas
2. Concrete Masonry, f'_m : 2,000 psi
3. Structural Steel
 - a. Rolled shapes and plates - ASTM A36, $F_y = 36$ ksi, UNO
 - b. Wide flange shapes and tees - ASTM A992/A572-50, $F_y=50$ ksi
 - c. Structural Rectangular HSS sections - ASTM A500, Gr C, $F_y=50$ ksi
 - d. Steel Connections

- i. Anchor Rods: ASTM F1554 Grade 55, $F_y=55$ ksi
 - i. Welding Electrode: E70XX
- e. Connection bolts: ASTM F3125 Grade A325

Part 6

Antiterrorism Force Protection

Part 6: Antiterrorism/Force Protection

6.1 Technical Criteria and Standards

UFC 4-010-01

DoD Minimum Antiterrorism Standards for Buildings, 12 December 2018

UFC 4-021-01

Design and O&M: Mass Notification Systems, 1 January 2010

6.2 Overview

All new Department of Defense (DoD) inhabited buildings are required to meet the minimum antiterrorism standards of UFC 4-010-01. This document lists these standards as they pertain to the site, structural, architectural, mechanical, and electrical design. Standards are intended to provide baseline antiterrorism protection where no known threat currently exists. Many of these standards are in place to give flexibility to the facility if the threat were ever to escalate.

The MWD Kennel will be located more than 50 feet within the installation perimeter of Hunter Army Airfield.

6.3 Site Planning

Any exterior electrical and/or mechanical equipment within the 33' unobstructed space is located in visible areas around the facility and has locked access panels to deny the opportunity for concealment of explosive devices with a size greater than or equal to a 6-inch cube. The proposed trash dumpster or recycle area will be located outside the unobstructed space.

6.4 Standards Summary

The table below indicates how each applicable standard will be met.

C – Conforming: the standard applies to the design and the design complies.

NA – Not Applicable: the standard does not apply to the design.

UFC 4-010-01 Standards Compliance Matrix			
Standard	C	NA	Comments
SITE PLANNING			
1. Standoff Distances	X		Building is located more than 50 feet within an installation perimeter.
2. Unobstructed Space	X		Landscaping, equipment, and other features within 33 feet of the building will not allow for concealment of a 6-inch cube.
3. Parking Beneath Buildings or on Rooftops		X	No parking beneath buildings or on rooftops.
STRUCTURAL DESIGN			
4. Progressive Collapse Resistance		X	Building is only one story.
5. Structural Isolation		X	Entire building is considered inhabited.
6. Building Overhangs and Breezeways		X	No overhangs or breezeways.

UFC 4-010-01 Standards Compliance Matrix			
Standard	C	NA	Comments
7. Exterior Masonry Walls	X		Exterior masonry walls are adequately reinforced.
ARCHITECTURAL DESIGN			
8. Glazing	X		Exterior glazing will have 1/4-inch nominal laminated glass in the innermost pane with structural silicone sealant or glazing tape.
9. Building Entrance Layout	X		Main entrance will not face uncontrolled vantage points.
10. Exterior Doors	X		Exterior doors that swing will open outwards.
11. Mail Rooms and Loading Docks		X	Mail and packages will be screened at a central sorting facility.
12. Roof Access		X	Roof access will not be provided
13. Overhead Mounted Architectural Features	X		Overhead features weighing 31 pounds or more will be mounted to resist appropriate horizontal and downward forces.
ELECTRICAL AND MECHANICAL DESIGN			
14. Air Intakes	X		Intakes to HVAC systems designed to move air throughout the building will be located at least 10 feet above the ground.
15. Mail Room and Loading Dock Ventilation		X	Mail and packages will be screened at a central sorting facility.
16. Emergency Air Distribution Shutoff	X		Switches will be provided at accessible locations with a maximum travel distance of 200 feet.
17. Equipment Bracing	X		Overhead utilities and other fixtures weighing 31 pounds or more will be mounted to resist appropriate horizontal and downward forces.
18. Under Building Access		X	No under building access.
19. Mass Notification	X		Mass notification system will be provided in accordance with UFC 4-021-01.

Part 7

Plumbing

Part 7: Plumbing

7.1 Technical Criteria and Standards

SDDMMC	Savannah District Design Manual for Military Construction
ASHRAE Handbooks	2019 HVAC Applications
ASHRAE 90.1-2013	Energy Standard for Buildings Except Low-Rise Residential Buildings
ASME A112.19-2018	Ceramic Plumbing Fixtures
ASPE	American Society of Plumbing Engineers Data Books – Volumes 1, 2, 3, and 4
EPACT 2005	Energy Policy Act of 2005
IBC-2018	International Building Code
IGCC	International Green Construction Code
IPC-2018	International Plumbing Code
NSF/ANSI 61-2019	Drinking Water System Components – Health Effects
PDI WH201-2017	The Plumbing and Drainage Institute: Water Hammer Arrestors
UFC 1-200-01	DoD Building Code with Change 1, 1 October 2020
UFC 1-200-02	High Performance and Sustainable Building Requirements with Change 1, 3 January 2022
UFC 3-400-02	Design: Engineering Weather Data; 20 September 2018
UFC 3-420-01	Plumbing Systems, 1 April 2021
UFC 3-450-01	Noise and Vibration Control; 15 May 2003
UFC 4-010-01	DoD Minimum Antiterrorism Standards for Buildings with Change 1, 19 August 2020
UFGS	Unified Facilities Guide Specifications

7.2 Scope of Work

The plumbing system design is in accordance with the IPC, UFCs, and the Installation Standards.

7.3 System Descriptions

Sanitary Sewer

Sanitary sewer piping will be designed to provide waste removal from the building water closets, urinals, lavatories, sinks, water coolers, trench drains and floor drains. System will gravity drain to the site sanitary sewer system. Floor drains will have a trap primer connection.

Domestic Water

A 3" domestic water connection will be provided to the facility from the utility provider. Domestic water velocity will not exceed 4 feet per second. Water entrance will be provided with a water meter (independent of utility meter) and reduced pressure zone backflow preventer, located inside the mechanical room. The water meter will have a display for direct visual reading of the meter and will be able to communicate to the building DDC. A pressure calculation was performed, and the building has adequate pressure, therefore a booster pump will not be provided. A 1-1/2" domestic water line

will continue from the mechanical room to the outdoor break kennels. Four (4) yard hydrants will be provided at the outdoor break kennels.

The domestic water heating system was evaluated based on a life cycle cost analysis (LCCA) for the facility. Solar hot water heating was evaluated against standard natural gas water heaters and found not life cycle cost effective. See domestic "DHW Solar System Life Cycle Cost Analysis" report for further information.

Domestic hot water will be provided by two 100-gallon storage type natural gas condensing water heaters, each sized for ~50% of the load. Water will be stored at 140°F. A thermostatic mixing valve will reduce the building hot water supply to 131°F. Point-of-use thermostatic mixing valves will be provided at each plumbing fixture to further reduce the water temperature to 110°F. The clothes washer will be provided with 131°F water. A domestic hot water recirculation loop with pump will be provided to keep hot water at remote fixtures throughout the building.

A non-potable protected domestic water system will be provided from the building domestic water system for trench drain washdown connections.

Domestic water piping exposed to ambient conditions in the kennel area will be heat traced for freeze protection.

A water softener will not be provided.

Roof Drainage

Roof drainage will be provided by exterior gutters and downspouts with splash blocks; no internal roof drains are required.

Natural Gas

Natural gas will be provided in the building to serve the water heaters and the mechanical gas fired heating systems. Site natural gas piping will be covered in Civil documents.

7.4 Piping Systems

Sanitary waste and vent piping aboveground will be hub-less service weight cast iron; underground piping will be service weight bell and spigot cast iron.

Domestic hot and cold-water piping will be copper tube or steel pipe and will be per UFGS standards (including insulation). Piping will be exposed in the mechanical room and kennel areas and concealed in all other areas.

Condensate piping will be DWV copper pipe.

Above ground natural gas piping will be schedule 40 steel with welded fittings.

7.5 Building Plumbing Fixtures

Cast-iron floor drains will be provided for all necessary mechanical room HVAC equipment and in each indoor kennel. Floor drains will also be provided in various locations throughout the facility as needed. Automatic trap primers will be provided on all floor drains within the admin portion of the building. A trench drain with washdown connection will be provided in the outside corridor on each side of the kennel. Area drains in the kennel areas will have a sediment basket to catch debris. Deep seal traps and trap guards will be placed in the kennel area floor drains.

A mop basin will be provided in room 114 - Tack Room for janitorial service. An animal bath will be provided, with drainage directed to a nearby floor drain incorporating a sediment basket for the collection of hair and other debris. In room 111 – Veterinary Treatment, a floor sink will be provided below the exam table. A stainless steel surgeon's scrub sink will also be provided with touch-less activation.

Freeze-proof wall hydrants will be provided on the exterior of the facility at intervals of 100 feet or less and will be located to minimize lawn hoses from being laid across walkways.

Restrooms will be provided with wall-mounted, manual flush valve water closets; wall-mounted, manual flush valve urinals, and wall-mount, vitreous china lavatories with manual fixtures and floor drains with trap primer connections.

Fixtures will include low-flow water closets (1.28 gpf), urinals (0.125 gpf) and lavatories (0.35 gpm). Showers will be complete with trench drains, mixing valves and low-flow (1.5 gpm) shower heads.

A stainless steel, double-bowl, filtered electric water cooler with bottle filling station will be provided in the main corridor.

Stainless steel, undermount, double and single compartment sinks will be provided where shown with low-flow (1.5 gpm) faucets.

All restroom fixtures, break area sinks, showers and electric water cooler will be ADA compliant.

The kennel area will be provided with surface mounted cold water hose-bibbs and hot/cold wall faucets with $\frac{3}{4}$ " garden hose connection.

Water hammer arresters will be provided in the distribution system.

Part 8

HVAC

Part 8: HVAC

8.1 Technical Criteria and Standards

SDDMMC Construction	Savannah District Design Manual for Military
ASHRAE Handbooks	2017 Fundamentals Volume, 2015 HVAC Applications, 2016 HVAC Systems and Equipment
ASHRAE Standard 55-2013	Thermal Environmental Conditions for Human Occupancy
ASHRAE Standard 62.1-2016	Ventilation for Acceptable Indoor Air Quality
ASHRAE Standard 90.1-2013	Energy Standard for Buildings Except Low -Rise Residential Buildings
ASHRAE Standard 183	Peak Cooling and Heating Load Calculations in Buildings Except Low-Rise Residential Buildings
ASHRAE Guideline 0	The Commissioning Process
ASTM Standards	American Society of Testing and Materials
ETL 01-1	Reliability and Maintainability Design Checklist
ETL 11-1	Civil Engineer Industrial Control System Information Assurance Compliance
EPACT 2005	Energy Policy Act of 2005
FM 3-19.17	Military Working Dogs
IBC-2018	International Building Code
IGCC-2018	International Green Construction Code
IMC-2018	International Mechanical Code
MIL-HDBK-1190	Facility Planning and Design Guide
USACE	US Army Corps of Engineers, Design Manual
NFPA 72	National Fire Alarm and Signaling Code
NFPA 90A	Installation of Air Conditioning and Ventilating Systems
SMACNA Guidelines	Sheet Metal and Air-conditioning Contractors' National Association
UFC 1-200-01	DoD Building Code with Change 1, 1 October 2020
UFC 1-200-02	High Performance and Sustainable Building Requirements, with Change 1, 3 January 2022
UFC 3-400-02	Design: Engineering Weather Data, 20 September 2018
UFC 3-401-01	Mechanical Engineering with Change 1, 1 October 2015

UFC 3-410-01	Heating, Ventilating, and Air Conditioning Systems, with Change 8, 21 July 2021
UFC 3-410-01	Heating, Ventilating, and Air Conditioning Systems, 28 July 2025 (Section 3-2.10 only)
UFC 3-410-02	Direct Digital Control for HVAC and Other Local Building Control Systems with Change 2, 12 April 2021
UFC 3-450-01	Noise and Vibration Control, 15 May 2003
UFC 4-010-01	DoD Minimum Antiterrorism Standards for Buildings with Change 1, 19 August 2020
UFC 4-010-06	Cybersecurity of Facility-Related Control Systems, Change 1, 18 January 2017

8.2 Design Requirements

8.2.1 Outdoor Design Conditions

Summer Conditions:	95.6°F dry bulb (0.4% dry condition)
	77.3°F wet bulb (0.4% dry condition)
	83.6°F dry bulb (0.4% humid condition)
	80.3°F wet bulb (0.4% humid condition)
Winter Conditions:	27.9°F dry bulb
Location:	N. Latitude 32.017°
W. Longitude	81.133°
Elevation	41 feet
ASHRAE Climate Zone	2A

8.2.2 Indoor Design Conditions

Offices, Mother's Room, Multi- purpose	78°F dry bulb – cooling condition
Room, Restrooms, TA-50 Locker	40-60% Relative Humidity
Room, Tack Room, Food Storage, Veterinary Treatment, Surgery, and Corridors	68°F dry bulb – heating condition
Telecom Room	78°F dry bulb – cooling condition
40-60% Relative Humidity	
68°F dry bulb – heating condition	
Indoor Kennels	78°F dry bulb – cooling condition
	40-60% Relative Humidity
	65°F dry bulb – heating condition
Outdoor Kennels	Unconditioned
Electrical & Mechanical Rooms	55°F dry bulb – heating condition

80°F dry bulb – cooling condition

8.2.3 Ventilation Air Rates

Toilet Rooms	50 cfm per fixture (water closet, urinal or shower head)
TA-50 Lockers	0.5 cfm per ft ²
Tack Room	0.9 cfm per ft ²
Indoor Kennels	10 air changes per hour
	Smoke exhaust rates determined by QFPE

8.2.4 Conditioned Outside Air Rates

Offices, Mother's room, Admin, Multi-purpose Room, Restrooms, TA-50 Locker Room, Food Storage	0.06 cfm per ft ² and 5 cfm per person – per ASHRAE 62.1-2016
Veterinary Treatment	2 ACH (ASHRAE 170-2017)
Surgery	3 ACH (ASHRAE 170-2017)
Tack Room	0.18 cfm per ft ² and 7.5 cfm per person
Corridors	0.06 cfm per ft ² – per ASHRAE 62.1-2016

8.3 Building Envelope

New walls and roof R-values will be in accordance with UFC 3-400-01 and modified per the Energy Analysis using approved software.

The proposed design values are:

Fenestration Assembly	U=0.28 Btu/h·ft ² ·°F SHGC=0.2
Above Grade Wall Assembly	U=0.092 Btu/h·ft ² ·°F
Roof/Ceiling Assembly	U=0.028 Btu/h·ft ² ·°F
Slab on Grade Floor	F=0.73 Btu/h·ft·°F

The glazing will be low “e” tinted double-glazing, using ¼-inch glass panes with a ½-inch insulated air space.

8.4 Systems Evaluated in Life Cycle Cost Analysis

Mechanical System Alternatives

Envelope and mechanical systems were evaluated as per UFC 1-200-02. The HVAC systems were selected based on a life cycle cost analysis (LCCA) for this facility. The LCCA included a building envelope load, mechanical systems first cost, energy usage and cost, maintenance effort and cost, life cycle equipment replacements, coordination with other trades, coordination with existing site utilities, acoustics, system flexibility and any other site specifics that could potentially influence the outcome of the LCCA. BMcD evaluated four HVAC system alternatives along with baseline:

Alternative 1: This alternative utilizes an indoor Variable Air Volume (VAV) Air Handling Unit (AHU) to provide cooling and heating to the space. VAV terminal units control airflow to each zone and include electric reheat coils for space heating. Cooling / Heating Coil is direct expansion (DX) with remote, outdoor heat pump with variable speed compressor. A separate heat pump (DX type air-cooled) will be used to condition the veterinary treatment and surgery

rooms. Ductless split systems will be used to condition electrical, mechanical, and telecom rooms. A DX Dedicated Outside Air System (DOAS) unit with an energy recovery wheel will condition the indoor kennel space with 100% outside air.

Alternative 2: This alternative is the same as Alternative #1, except it will utilize hot water reheat for the VAV terminal units as opposed to electric reheat. This alternative will use two boilers and two pumps to provide heating to the spaces.

Alternative 3: This alternative utilizes a packaged (ground-mounted) VAV air handling unit system with a direct expansion (DX) heat pump to provide conditioned air to the spaces. This packaged unit will feature a variable speed compressor. VAV terminal units control airflow to each zone and include electric reheat coils for space heating. A separate heat pump (DX type air-cooled) will be used to condition the veterinary treatment and surgery rooms. Ductless split systems will be used to condition electrical, mechanical, and telecom rooms. A DX DOAS unit with an energy recovery wheel will condition the indoor kennel space with 100% outside air.

8.5 **LCCA Conclusions and Recommendations**

As shown in the table below, Alternative #1: VAV AHU w/ Electric Reheat has the lowest total life cycle cost. Alternative #2 VAV AHU w/ Hot Water Reheat is the highest total life cycle cost. The additional cost of the hot water system does not save enough energy to pay back. Therefore, the recommended system is Alternative #1: VAV AHU with electric Reheat.

Alternative	Rankings (1 = Lowest Cost, 3 = Highest Cost)				
	Initial Cost	Maintenance	Energy	Replacement	Overall
1	1	1	1	1	1
2	3	3	3	3	3
3	2	2	1	2	2

See full HVAC System Life Cycle Cost Analysis document for further information.

8.6 **HVAC Systems**

General Ductwork Design

Air intakes for ventilating and air-conditioning will be located at least ten feet above the ground, except where inside a fenced-in enclosure.

Overhead items such as suspended ductwork, piping, and equipment will be braced laterally as required by DoD Antiterrorism for Buildings Standard. Specifically, mountings will be designed to resist forces equal to 1.5 times the component weight in the downward direction and 0.5 times the component weight in any other direction.

Toilets, and tack room will be provided with transfer air from adjacent spaces to makeup exhaust air requirements in addition to dedicated conditioned air systems.

Air distribution will be provided by air handling units, and exhaust fans. Conditioned air will be supplied or returned to the spaces via externally wrapped metal ductwork connected to diffusers or supply grilles. Exhaust air in the admin areas will be exhausted through uninsulated metal ductwork connected to exhaust registers or grilles. Exhaust air in the indoor kennel space will be returned to the DOAS unit via externally wrapped metal ductwork connected to grilles for heat recovery purposes. Transfer air will be transferred through internally lined metal ductwork connected to diffusers or grilles.

All ductwork will be constructed of galvanized sheet metal or stainless steel, as the application requires. Ductwork will be constructed and installed in accordance with SMACNA requirements.

Fire dampers will be provided for all rated walls as required.

Cooling and Heating System

Cooling to the Administrative and Veterinary Treatment / Surgery areas will be provided with cooling and heating through a direct-expansion, air-cooled, split system heat pump with a variable speed compressor. The administrative area will have VAV electric reheat boxes.

Cooling for the Indoor Kennel Area will be provided by a packaged, direct-expansion, air-cooled heat pump.

Heating for the Administrative area will be provided mechanically through the use of an air-cooled heat pump split system combined with electric reheat VAV boxes.

Heating for the Veterinary Treatment and Surgery areas will be provided mechanically through the use of an air-cooled heat pump split system.

Heating for the Indoor Kennel areas will be provided mechanically through the use of a packaged, air-cooled, heat pump with natural gas heat back up.

Ventilation System

Exhaust fans will be in-line centrifugal fans. Discharge air will be through wall louvers and roof gravity hoods. Outside air will be provided by the louvers with motorized dampers during occupied hours for the Administrative and Veterinary Treatment and Surgery areas.

Exhaust for the indoor kennel area will be ducted to the DOAS unit for energy recovery. Quarantine kennel exhaust will be provided by a separate exhaust fan and will not be returned to the DOAS unit for energy recovery. 100% outside air will be delivered to the indoor kennel space through the packaged outdoor unit.

Additional in-line axial exhaust fans will be utilized in the indoor and outdoor kennels to provide emergency smoke evacuation. Smoke exhaust system and associated dampers will be controlled through the fire alarm panel. Smoke exhaust fans are sized based on calculations provided by the QFPE. Limit switches and flow switches will provide positive confirmation of activation back to the fire alarm panel. Make up air will be provided through gravity hood when system is activated.

Energy Recovery

It was determined that energy recovery is not required for the administration area per ASHRAE 90.1 – 2013 Table 6.5.6.1-1. This portion of the facility will be occupied less than 8000 hours a year and will have a maximum of 48% outside air with both units being less than 5500 cfm indicating that no energy recovery is required. The largest source of exhaust will occur in the locker room, tack room and vet treatment/surgery areas.

For the indoor kennel portion of the building it was determined that energy recovery is required per ASHRAE 90.1 – 2013 Table 6.5.6.1-2. This unit is 100% outside air and is providing conditioned air to the space requiring energy recovery to be utilized. An energy recovery wheel is utilized to transfer heat between the outgoing exhaust air and the incoming outside air.

Economizer

ASHRAE 90.1 – 2013 requires economizers for all air handling units of cooling capacity greater than 54,000 Btu/h for climate zone 2A. However, the Administrative area systems exceed the 17% improved efficiency per Table 6.5.1-3, therefore no economizers for the admin areas are required.

UFC 3-410-01-3-6.3 states “For Army and Air Force projects, air economizers must not be used in ASHRAE climate zones 1, 2, 3a, and 4a.” Therefore, economizers on the indoor kennel DOAS unit will not be used.

8.7 Offices, Toilets, Mother's Room, Multi-purpose Rooms, Tack Room, Locker Room, Corridors, and Food Storage

These areas will be air-conditioned. Corresponding VAV air handling unit (VAV AHU) will be located in the corresponding mechanical room. AHU will have a mixing box section, MERV 8 and MERV 13 filters, DX-cooling/heating coil, and supply fan section. Shut-off type VAV boxes with electric reheat coils will provide zone control. Return air will be ducted from the spaces to the air handling unit. Outside air will be provided through intake louvers with a motorized control damper and will be in accordance with UFC 4-010-01.

8.8 Veterinary Treatment and Surgery

These areas will be air-conditioned. Corresponding VAV AHU will be located in the mechanical room. AHU will have a mixing box section, MERV 8 and MERV 13 filters, DX-cooling/heating coil, and supply fan section. Return air will be ducted from the spaces to the air handling unit. Outside air will be provided through intake louvers with a motorized control damper and will be in accordance with UFC 4-010-01.

8.9 Indoor Kennels

This area will be air-conditioned. Corresponding constant volume packaged DOAS unit will be located outside the building near the mechanical room. The DOAS unit will have energy recovery section, MERV 8 and MERV 13 filters, DX cooling coil and a natural gas heating. Unit will be equipped with hot gas reheat for dehumidification cycle.

8.10 Outdoor Kennels

Outdoor kennels will be unconditioned and open to the elements. This space will have a smoke evacuation system. Ceiling fans will be provided in each outdoor kennel.

8.11 Mechanical, Electrical and Telecom Room

DX cooling will be provided via ductless, non-CFC refrigerant, split-system units for the telecom, mechanical and electrical rooms. Remote air-cooled condensing units will be pad mounted on the exterior of the building in close proximity for heat rejection, while indoor evaporator coils will be in the respective communication rooms. Mechanical room ductless split will be a heat pump to provide heating and cooling.

Toilet Rooms, Locker Room, Tack Room, Veterinary Treatment and Surgery

Rooms will be exhausted via in-line exhaust fans discharging to the exterior through the exterior building wall louver with interlocked motor operated damper or through a roof hood with interlocked motor operated damper.

8.12 Control Systems

Building will have new BACnet Direct Digital Control (DDC) System connected throughout a supervisory module. The system will use BACnet MS/TP protocol. A touch screen human-machine interface (HMI) will be provided with all the factory installed DDC controllers for the building controls. Touch screen HMI will be located within the DDC panel.

The DDC controls will be stand-alone type and have the option to be interfaced with an existing base Utility Management and Control System (UMCS) in the future. The DDC system will be "user friendly," should have good graphics and touch screen operation.

8.13 Training

Training by factory certified technicians will be required for all HVAC systems. Training in a classroom type setting will include proper operating and maintenance procedures, troubleshooting procedures, routine and overhaul maintenance, testing and balancing, and calibration.

8.14 Test and Balance

Building systems will be tested, balanced, and adjusted in accordance with SMACNA and IGCC-2018 requirements for commissioning and for measurement and verification credits to verify that the systems are designed, installed, and calibrated to operate effectively.

8.15 Commissioning

Building systems will be commissioned in accordance with IGCC-2018 requirements to verify that the systems are designed, installed, and calibrated to operate effectively.

8.16 AT/FP

Outside Air Intakes: All outside air intakes will be at least 10 feet above the ground except where located in a fenced-in enclosure.

Emergency Shut Off Switches for HVAC Systems: Emergency HVAC shut off switches will be strategically located in the building to be easily accessible by building occupants. The travel distance to the nearest shut off switch will not exceed 200 feet.

Low Leakage Dampers: Provide all outside air intakes, relief air, and exhaust openings with low leakage dampers that are automatically closed when the emergency HVAC shut off switch is activated. The low leakage dampers will have a maximum leakage rate of 3 cfm/sq. ft with a differential pressure of one-inch water gauge across the damper.

8.17 Energy Budget Analysis

An energy analysis has been performed for the building to demonstrate compliance with the Energy Policy Act 2005 and to evaluate amount of energy cost savings to be applied towards HPSB II: Optimize Energy Performance.

To comply with Energy Policy Act 2005, an energy model has been performed for the building to predict the amount of energy savings compared to an ASHRAE 90.1, Appendix G building (neglecting plug loads in accordance with EPA Act 2005 calculation method). Estimated energy savings are shown in greater detail in the Energy Analysis report.

A comparison of this Proposed building to an ASHRAE 90.1, Appendix G Baseline building has been performed to estimate the amount of LEED points attainable for energy efficiency (EA Credit 1). See the Energy Analysis document for predicted energy savings and LEED points available under EAc1 – Optimizing Energy Performance.

Part 9

Fire Protection

Part 9: Fire Protection

9.1 Applicable Criteria

International Code Council (ICC)

IBC

International Building Code, 2024 Edition

National Fire Protection Association (NFPA)

NFPA 1

Fire Code, 2024 Edition

NFPA 10

Standard for Portable Fire Extinguishers, 2026 Edition

NFPA 13

Standard for the Installation of Sprinkler Systems, 2025 Edition

NFPA 24

Standard for the Installation of Private Fire Service Mains and Their Appurtenances, 2025 Edition

NFPA 70

National Electrical Code, 2026 Edition

NFPA 72

National Fire Alarm and Signaling Code, 2025 Edition

NFPA 90A

Standard for the Installation of Air-Conditioning and Ventilating Systems, 2024 Edition

NFPA 92

Standard for Smoke Control Systems, 2024 Edition

NFPA 99

Health Care Facilities Code, 2024 Edition

NFPA 101

Life Safety Code, 2024 Edition

NFPA 150

Fire and Life Safety in Animal Housing Facilities, 2025 Edition

NFPA 291

Recommended Practice for Fire Flow Testing and Marking of Hydrants, 2025 Edition

NFPA 1225

Standard for Emergency Services Communications, 2022 Edition

U.S. Department of Defense (DOD)

UFC 1-200-01

DoD Building Code (General Building Requirements), Change 4, 2024 Edition

UFC 3-301-01

Structural Engineering, Change 4, 2025 Edition

UFC 3-600-01

Fire Protection Engineering for Facilities, Change 6, 2021 Edition

UFC 4-010-01

DoD Minimum Antiterrorism Standards for Buildings, Change 3, 2024 Edition

UFC 4-021-01

Design and O&M: Mass Notification Systems, Change 1, January 2010 Edition

UFC 4-510-01

Military Medical Facilities, Change 4, 2025 Edition

ECB 2018-17

New Requirements for Visual Notification for Mass Notification Systems, Revision 4, 2025 Edition

9.2 **Building Description**

See Architecture Section for the building descriptions.

9.3 **Life Safety**

The UFC 1-200-01 requires the use of several codes and standards, primarily the International Building Code (IBC), NFPA 101 Life Safety Code, NFPA 150 Fire and Life Safety in Animal Housing Facilities and UFC 3-600-01 Fire Protection Engineering for Facilities. In accordance with UFC 1-200-01, the IBC's focus is on allowable floor area, building height limitations, and building separation distance requirements. NFPA 101 is used for building construction related to egress and safety to life.

A separate life safety analysis is provided for the main facility and the support storage/break area facilities.

Main MWD Facility:

9.3.1 *Type of Construction (IBC 601)*

Building Element	Type of Construction	Fire Resistance Rating
Primary Structural Frame	IIB	0 hour
Bearing Exterior Wall	IIB	0 hour
Bearing Interior Wall	IIB	0 hour*
Non-Bearing Exterior Wall	IIB	0 hour
Non-Bearing Interior Wall	IIB	0 hour*
Roof Construction Including Supporting Beams and Joists	IIB	0 hour

*Except as required for occupancy separation, incidental use, and other passive fire protection.

9.3.2 *Classification of Occupancy*

Area	IBC Occupancy	NFPA 101 Occupancy	NFPA 150 Animal Housing Category
Office, Food Storage, Toilets, Mothers Room, Multipurpose Handler, Tack Room, Circulation	Business Group B Section 304.1	Business Section 6.1.11	N/A
Veterinary Treatment, Surgery	Business Group B Section 304.1	Business Section 6.1.11	Category 1-B Section 6.2.1.3
Kennels, Quarantine	Business Group B Section 304.1	Business Section 6.1.11	Category 6-B Section 6.2.6.3

9.3.3 Allowable Building Height/Stories

The allowable building height shall be based on the applicable provisions of IBC Section 504.3 for the occupancies of the building. The maximum number of stories shall be based on IBC Section 504.4 for the occupancies of the building and a completely sprinklered building.

Occupancy / Animal Housing Category	Allowable Height (ft)	Allowable Stories	Code
All	75	4	IBC Table 504.3, 504.4 NFPA 150 7.2.1

9.3.4 Building Allowable Area

Occupancy / Animal Housing Category	Building Factor	Allowable Area (SF) *	Actual Area (SF)	Code
Group B	S1	92,000	11,028	IBC Table 506.2
Category 1-B	S1	40,000	603	NFPA 150 Table 7.2.2
Category 6-B	S1	64,000	5,142	NFPA 150 Table 7.2.2

*Areas with an occupancy classification and animal housing category must comply with the most stringent criteria.

9.3.5 Building Separation (IBC Table 705.5)

Occupancy	Elevation	Fire Separation Distance (ft)*	Fire Resistive Rating of Exterior Wall
Group B	North/South/East/West	≥10	No Rating

*Fire separation distance is defined as the distance from the building face to the closest interior lot line, to the centerline of a street, alley, or public way, or to an imaginary line between two buildings.

9.3.6 Passive Fire Protection

Component	Required Rating	Code
Corridor	No Rating	NFPA 101 38.3.6
Separation of Animal Housing from Facility	1 Hour Barrier	UFC 3-600-01 4.7-3
Separation of Category 6-B and Category 1-B	1 Hour Barrier	NFPA 150 6.3.4.1

9.3.7 Passive Fire Protection Penetration Protection

Component	Doors	Fire Damper Requirements	Other Penetrations	Code
Fire Barrier (1 hr)	¾ hour	1 ½ hour on air transfer openings	1 hour	NFPA 150 9.8.4, 9.8.5 NFPA 101 8.3.4.8

9.3.8 Minimum Interior Finish Ratings

Occupancy / Animal Housing Category	Exits*	Exit Access Corridors* **	Other Spaces	Code
Category 1-B, Category 6-B	Class B	Class B	Class C	NFPA 150 10.1
Business	Class C	Class C	Class C	NFPA 101 Table A.10.2.2

*Areas with an occupancy classification and animal housing category must comply with the most stringent criteria.

**All areas used for egress from an animal housing category must meet the minimum exit access rating for the category.

9.3.9 Egress Analysis

For the purposes of occupant loading, the use of a space can be different than the occupancy classification. For example, Assembly areas less than 750 square feet have an occupancy classification of the overall building's classification, but the occupancy load would still be Assembly.

9.3.9.1 Occupant Load Calculations (NFPA 101 Table 7.3.1.2, UFC 3-600-01 Table 10-1)

Floor	Area*	Function of Space	Area (sf)	Occupant Load Factor (sf / Person)	Occupants
Level 1	Offices, Food Storage, Toilets, Mothers Room, Multipurpose Handler, Veterinary Treatment, Surgery, Quarantine, Tack Room, Indoor Kennel, Outdoor Kennel, Circulation	Business	9,424	150 (Gross)	63
	Mechanical, Electrical, Telecom	Mechanical, Electrical, and other Building Equipment Spaces	623	500 (Gross)	2
	Locker Room	Locker Room	981	50 (Gross)	20
		Total	11,028		85

*Category 1-B and 6-B animal housing categories are treated as business areas for the purpose of occupant load in accordance with NFPA 150 11.1.7 and 16.1.7.

9.3.9.2 Occupant Load Summary and Minimum Exits from the Building

Floor	Occupants	Required Exits (NFPA 101)	Required Exit Separation (NFPA 101)
Level 1	85	2 (7.4.1.1)	1/3 Diagonal (7.5.1.3.3)

9.3.9.3 *Minimum Exits or Exit Accesses from a Space or Area*

Occupancy	Conditions Permitting One Exit	Condition Requiring Two Exits	Code
Business	Less than 100' travel distance, less than 100 occupants, and exit discharges directly to the outside	100' or greater common path, 100 occupants or more, or exit does not discharge directly to the outside	NFPA 101 38.2.4.3

9.3.9.4 *Minimum Egress Widths*

Component	Requirement	Width (in)	Code
Doors in Egress Access	Per component	32 or one-and-one-half times the largest animal using the door and any associated egress equipment, whichever is greater	NFPA 150 8.2.1.1
Level Components	Per occupant	0.2	NFPA 101 Table 7.3.3.1
Corridor Serving Less Than 50 Occupants	Minimum	36	NFPA 101 7.3.4

9.3.9.5 *Common Path, Dead-End, and Travel Distance Limits*

Occupancy / Animal Housing Category	Common Path Limit (ft) (NFPA 101 Table A7.6)	Dead End Limit (ft) (NFPA 101 Table A7.6)	Travel Distance Limit (ft)*
Category 1-B, Category 6-B	100	50	100 (NFPA 150 8.7.1)
Business	100	50	300 (NFPA 101 Table A7.6)

*Areas with an occupancy classification and animal housing category must comply with the most stringent criteria.

9.3.10 *Smoke Management Systems (UFC 3-600-01 7-5, 9-20)*

Smoke Control System	Smoke and Heat Vents	Passive Smoke Management
Required*	Not required	Not required

*Required by DFPE in accordance with UFC 3-600-01 4-7.5.

9.3.11 *Emergency Lighting and Exiting*

Occupancy	Emergency Lighting	Exit Signage
Business	Provided / Not Required (NFPA 101 38.2.9.1)	Provided / Required (NFPA 101 38.2.10)

Break Area / Storage Facility:

For life safety purposes, the Break Kennels and the Storage Building will be considered "buildings on the same lot" in accordance with IBC Section 503.1.2.

9.3.12 *Type of Construction (IBC 601)*

Building Element	Type of Construction	Fire Resistance Rating
Primary Structural Frame	IIB	0 hour

Bearing Exterior Wall	IIB	0 hour
Bearing Interior Wall	IIB	0 hour
Non-Bearing Exterior Wall	IIB	0 hour
Non-Bearing Interior Wall	IIB	0 hour
Roof Construction Including Supporting Beams and Joists	IIB	0 hour

9.3.13 Classification of Occupancy

Area	IBC Occupancy	NFPA 101 Occupancy	NFPA 150 Animal Housing Category
Break Area	Business Group B Section 304.1	Business Section 6.1.11	Category 6-B Section 6.2.6.3
Storage	Storage, Group S-1 Section 311.1	Storage Section 6.1.13	N/A

9.3.14 Occupancy Separation

Floor / Occupancy	Separation	Floor / Occupancy	Separation Rating	IBC
Level 1 / B	Nonseparated	Level 1 / S-1	Not required	508.3.3

9.3.15 Allowable Building Height/Stories

The allowable building height shall be based on the applicable provisions of IBC Section 504.3 for the occupancies of the building. The maximum number of stories shall be based on IBC Section 504.4 for the occupancies of the building and a completely sprinklered building.

Occupancy / Animal Housing Category	Allowable Height (ft)	Allowable Stories	Code
All	75	4	IBC Table 504.3, 504.4 NFPA 150 7.2.1

9.3.16 Building Allowable Area (NFPA 150 Table 7.2.2, IBC Table 506.2)

Occupancy / Animal Housing Category	Building Factor	Allowable Area (SF) *	Actual Area (SF)	Code
Group B	S1	92,000	2,200	IBC Table 506.2
Group S-1	S1	70,000	482	IBC Table 506.2
Category 6-B	S1	64,000	2,200	NFPA 150 Table 7.2.2

*Areas with an occupancy classification and animal housing category must comply with the most stringent criteria.

9.3.17 Building Separation (IBC Table 705.5)

Occupancy	Elevation	Fire Separation Distance (ft)*	Fire Resistive Rating of Exterior Wall
Group B, S-1	North/South/East/West	≥10	No Rating

*Fire separation distance is defined as the distance from the building face to the closest interior lot line, to the centerline of a street, alley, or public way, or to an imaginary line between two buildings.

9.3.18 Minimum Interior Finish Ratings

Occupancy / Animal Housing Category	Exits	Exit Access Corridors	Other Spaces	Code
Category 6-B	Class B	Class B	Class C	NFPA 150 Table 10.1
Storage	Class C	Class C	Class C	NFPA 101 Table A.10.2.2

9.3.19 Egress Analysis

For the purposes of occupant loading, the use of a space can be different than the occupancy classification. For example, Assembly areas less than 750 square feet have an occupancy classification of the overall building's classification, but the occupancy load would still be Assembly.

9.3.19.1 Occupant Load Calculations (NFPA 101 Table 7.3.1.2, UFC 3-600-01 Table 10-1)

Floor	Area*	Function of Space	Area (sf)	Occupant Load Factor (sf / Person)	Occupants
Level 1	Break Area	Business	2,200	150 (Gross)	15
	Storage	Mechanical, Electrical, and other Building Equipment Spaces	482	500 (Gross)	1
		Total	2,682		16

*Category 6-B animal housing categories are treated as business areas for the purpose of occupant load in accordance with NFPA 150 16.1.7.

9.3.19.2 Occupant Load Summary and Minimum Exits from the Building

Floor	Occupants	Required Exits (NFPA 101)	Required Exit Separation (NFPA 101)
Level 1	16	1 (7.4.1.1)	N / A

9.3.19.3 *Minimum Exits or Exit Accesses from a Space or Area*

Occupancy	Conditions Permitting One Exit	Condition Requiring Two Exits	NFPA 101 Section
Business	Less than 100' travel distance, less than 100 occupants, and exit discharges directly to the outside	100' or greater common path, 100 occupants or more, or exit does not discharge directly to the outside	38.2.4.3
Storage	Less than 100' travel distance	100' or greater travel distance	42.2.4.1

9.3.19.4 *Minimum Egress Widths*

Component	Requirement	Width (in)	Code
Doors in Egress Access	Per component	32 or one-and-one-half times the largest animal using the door and any associated egress equipment, whichever is greater	NFPA 150 8.2.1.1
Level Components	Per occupant	0.2	NFPA 101 Table 7.3.3.1

9.3.19.5 *Common Path, Dead-End, and Travel Distance Limits*

Occupancy / Animal Housing Category	Common Path Limit (ft) (NFPA 101 Table A7.6)	Dead End Limit (ft) (NFPA 101 Table A7.6)	Travel Distance Limit (ft)
Category 6-B	100	50	100 (NFPA 150 8.7.1)
Storage	100	100	400 (NFPA 101 Table A7.6)

9.3.20 *Smoke Management Systems (UFC 3-600-01 7-5, 9-20)*

Smoke Control System	Smoke and Heat Vents	Passive Smoke Management
Not required	Not required	Not required

9.3.21 *Emergency Lighting and Exiting*

Occupancy	Emergency Lighting	Exit Signage
Business	Not required (NFPA 101 38.2.9.1)	Not required (NFPA 101 38.2.10)
Storage	Not required (NFPA 101 42.2.9)	Not required (NFPA 101 42.2.10)

9.4 Fire Suppression and Water Supply9.4.1 *Fire Suppression Requirements (UFC 3-600-01 4-7.1, 9-10, 9-17)*

Sprinklers	Standpipe	Fire Extinguishers
Provided / Required (UFC 3-600-01 4-7.1)	Not provided / Not required (UFC 3-600-01 9-10)	Provided / Required (UFC 3-600-01 9-17)

9.4.2 *Water Supply*

A water flow test was performed on 23 September 2025. The results showed a static pressure of 60 psi, a residual pressure of 50 psi, and a flow of 1,662 gpm. Preliminary hydraulic calculations indicate the fire sprinkler system will require 616 gpm at 46 psi including a 250-gpm hose flow. An additional 12.6 psi is available based on the water supply characteristics. A fire pump will not be required to meet the demand of the facility sprinkler system.

Provide an approved double check backflow preventer with supervised indicating shut off valves. Hydraulic calculations shall provide a minimum pressure loss across the backflow preventer of 8 psi or the manufacturer's pressure loss criteria, whichever is greater.

A post indicator valve (PIV) will be provided.

9.4.3 Fire Hydrant Distribution and Fire Department Access (UFC 3-600-01 9-1.1, 9-1.4, 9-3.5)

All parts of the building will be located within 350 feet of a hydrant. At least one fire hydrant will be located within 150 feet of the fire department connection. A fire hydrant will be located inside the perimeter fence as required for code compliance spacing and fire department access requirements.

Maximum Distance to Building Perimeter (ft)	Distance to FDC (ft)	Distance to Corner of Building (ft)	Fire Truck Access (ft)
350	150	NA	33

9.4.4 Fire Suppression Systems

Occupancy Hazard Classification (UFC 3-600-01 Table 9-3, Table 9-4 and Appendix B)

Hazard Classification	Density (gpm/sf)	Remote Area (sf)	Maximum Area per Head (sf)	K Factor	Hose Demand (gpm)
Light Hazard (Wet)	0.10	1500	225	5.6	250
Ordinary Hazard (Wet)	0.20	2500	130	8.0	250
Light Hazard (Dry)	0.10	1950	225	5.6	250
Ordinary Hazard (Dry)	0.20	3500	130	8.0	250

*Increase the remote area by 30% where the slope of the ceiling exceeds 2 in 12.

The buildings will be completely protected by a hydraulically designed automatic wet pipe and dry pipe sprinkler systems in accordance with UFC 3-600-01. Dry-pipe sprinkler systems will be used in any areas subject to freezing. The dry pipe system will extend to the Break Area and Storage Building using an underground trench.

Sprinkler piping 2-in and less will be minimum schedule 40 black steel. Sprinkler piping larger than 2- in will be minimum schedule 10. Welded or flanged connections will be provided upstream of the system valves and threaded or grooved couplings will be provided downstream of the system valves. Recessed pendent sprinklers will be provided in areas with lay-in ceilings, and upright sprinklers will be provided in areas without ceilings. Sprinkler mains will be routed in the ceiling space with branch piping routed to serve the individual room sprinklers. Hazard classifications will be as indicated on the drawings.

Special extinguishing systems such as clean agent systems or wet chemical hood suppression are not used in the facility.

A yard fire department connection (FDC) will be provided per UFC 3-600-01 and coordinated with the location of fire hydrants and fire department access lanes.

Hazardous materials are not used or stored in the facility in general, other than what is needed for janitorial supplies.

9.4.5 Hydraulic Analysis

Preliminary hydraulic demands are estimated to be 460 gpm for the wet-pipe system at 38.7 psi. A 250 gpm hose stream demand is included in hydraulic calculations as well as a 25-gpm domestic demand, making the total fire water demand approximately 735 gpm at 38.7 psi including industrial demands.

Preliminary hydraulic demands are estimated to be 341 gpm for the dry-pipe system at 46 psi. A 250 gpm hose stream demand is included in hydraulic calculations as well as a 25-gpm domestic demand, making the total fire water demand approximately 616 gpm at 45.8 psi including industrial demands.

The existing water supply is capable of producing the necessary pressure required for the sprinkler suppression systems. As such, a fire pump will not be provided. See section 9.4.2 Water Supply for more information.

9.4.6 Seismic Requirements

A Fire Sprinkler system is to be provided with supports and bracing as required by UFC 3-600-01 and NFPA 13.

9.5 **Fire Alarm and Mass Notification System**

9.5.1 Fire Alarm Requirements (UFC 3-600-01 9-18.1, UFC 4-021-01)

Manual Initiation	Automatic Initiation	Occupant Notification
Manual fire alarm pull stations at all exits	Sprinkler flow switches	Speakers
	Spot smoke detection	Clear strobes
	Heat detectors where environment is not suitable for smoke detectors	Text signs
	Duct smoke detectors	
	Carbon monoxide detection	

A combined addressable fire alarm and mass notification system (FA/MNS) will be provided throughout the buildings. The Break Area and Storage Building will be served by the Main Building fire alarm/mass notification control unit. Fire alarm control unit, mass notification autonomous control unit, and sub-panels are to be located in the electrical room. A remote annunciator panel will be mounted at the main building entry point and locked for use by the fire department only. The system utilizes Class A SLC circuits and Class B IDC and NAC circuits. The fully addressable fire alarm/mass notification system will be provided with battery backup power supply with rechargeable batteries in accordance with UFC 3-600-01, UFC 4-021-01, ECB 2018-17 and NFPA 72 requirements.

All fire alarm circuits are installed in conduit. Fire alarm conduit and junction boxes are painted red in unfinished areas and are permitted to be painted to match the room finishing in finished areas. All junction boxes are labeled. Wire nuts and crimp connectors are not permitted. Conductors and conduits extending from the Main Building to the Break Area and Storage Building will be routed through an underground trench. All fire alarm circuits entering or leaving the facility and all power supply circuits to the FACU/ACU and subpanels are protected by a surge protection device (SPD).

All fire alarm and mass notification devices located in the outdoor portion of the kennel area shall be weatherproof.

For mass notification, an autonomous control unit (ACU) is provided to monitor and control the notification appliance network. The ACU allows personnel in the facility to initiate delivery of a pre-recorded voice message, provide live voice messages and instructions, and initiate visual strobes. The ACU is integrated with the building FACU to form one combined system which performs fire alarm and mass notification as required by UFC 4-021-01. Local Operating Consoles (LOC) will be provided every 200 feet of egress travel inside the building and be accessible to building occupants. A combined fire alarm annunciator and LOC is not allowed, and LOCs are to include a latch, but not be locked.

Notification will include speakers with different voice messages to alert occupants as to the nature of the emergency and provided functional instructions. Text signs will be provided over substantial means of egress. Fire alarm and mass notification announcements shall be indicated with clear strobes. Exterior speakers will be provided in accordance with UFC 4-021-01. Audible notification provides a minimum 15 dBA above ambient in all locations in the facility, measured with all openings closed (e.g. doors). Intelligibility requirements will be met in accordance with

UFC 4-021-01. Audible notification is to achieve a CIS score of 0.80 in each room measured at five feet above finished floor as required by UFC 4-021-01. Fire alarm notification will not be provided in the surgery room.

Manual pull stations will be provided at each exit. Manual pull stations at the outdoor portion of the kennel shall be waterproof. Smoke detection is limited to duct smoke detection at large HVAC equipment, surgery areas, veterinary treatment areas, kennel areas, and at locations at fire alarm and mass notification control panels. Carbon monoxide detection will be provided above the fuel-fired water heaters. The system will control passive fire protection features such as fire dampers where applicable and will activate the smoke control system where provided.

The fire alarm system will monitor the fire suppression systems and transmit signals to the fire department through the Base Monaco radio transceiver system. A Monaco BT-XM transceiver is to be used to transmit fire alarm signals via an antenna on the exterior of the building configured to the existing Base Monaco system frequency. Signals to be transmitted include alarm signals by alarm initiating device; common supervisory signals; and common trouble signals.

Part 10

Electrical

Part 10: Electrical

10.1 Applicable Criteria

ADA	Americans with Disabilities Act
ANSI C2	National Electrical Safety Code (NESC)
ASHRAE 90.1	Energy Standard for Buildings Except Low-Rise Residential Buildings
IEEE 142	Recommended Practice for Grounding of Industrial and Commercial Power Systems
IESNA	Illuminating Engineering Society of North America Handbook, Current Edition
ICD/ICS 705	IC Tech Spec for ICD/ICS 705
NFPA 70	National Electrical Code (NEC) 2017
NFPA 70E	Standard for Electrical Safety in the Workplace - 2018
NFPA 72	National Fire Alarm Code
NFPA 101	Safety to Life from Fire in Buildings and Structures
NFPA 780	Lightning Protection Code
UFC 3-501-01	Electrical Engineering, with Change 1 (01 Nov 2019)
**Note that 3-501-01 is the Top Level Document for Electrical Engineering,	
All documents that fall under 3-501-01 are also included in this design effort.	
Including but limited to 3-520-01 and 3-530-01**	
UFC 3-520-01	Interior Electrical Systems, with Change 2 (12 Apr 2021)
UFC 3-520-05	Stationary Battery Areas, with Change 2 (09 Jan 2020)
UFC 3-530-01	Interior and Exterior Lighting Systems and Controls, with Change 4 (01 Nov 2019)
UFC 3-540-01	Engine-Driven Generator systems for Prime and Standby Power Applications, with Change 2 (01 Aug 2014)
UFC 3-550-01	Exterior Electrical Power Distribution, with Change 3 (01 Nov 2019)
UFC 3-560-01	O&M Electrical Safety, with Change 2 (31 Oct 2019)
UFC 3-575-01	Lightning and Static Electricity Protection Systems (1 Jul 2012)
UFC 3-580-01	Telecommunications Building Cabling Systems Planning and Design, with Change 1 (1 Jun 2016)
UFC 4-010-01	DoD Minimum Antiterrorism Standards for Buildings, with Change 1 (12 December 2018)
UL 96A	Installation Requirements for Lightning Protection Systems

10.2 Design Requirements

This project consists of complete installation of all electrical systems for the new Military Working Dog (MWD) Kennel at Hunter Army Airfield as described herein.

10.3 Demolition

Existing building will be demolished. Existing service feed to existing building will be removed back to transformer.

10.4 System Descriptions

10.4.1 *Primary Power Distribution System*

The primary electrical distribution system is owned and operated by Canoochee Electric Membership Corporation (CEMC). The proposed primary tie-in location will be at the nearest manhole/handhole or pole. The underground primary ductbank, conductors, pad mounted transformer, transformer pad and primary terminations at the transformer will be provided and installed by CEMC. The new transformer will be sized to meet the calculated electrical loads of the new facility.

10.4.2 *Secondary Power Distribution System*

The secondary duct bank, secondary conductors will be provided and installed by the Contractor. The secondary terminations will be completed by CEMC. Service entrance conductors will extend from the pad-mounted transformer through new electrical duct bank to the 208Y/120V Main Distribution Panel (MDP) located in the electrical room. The service entrance conductors will be copper with type XHHW insulation. The main distribution panel will be a 208Y/120V, 3-phase, 4-wire and will be provided with digital metering capable of transmitting energy usage.

Feeders will extend from the MDP to large load mechanical equipment, lighting panel, and smaller load panels. 120-volt branch circuits will have dedicated neutrals (no shared neutrals.) All panel neutrals will be 100% rated.

A special standby panel 208Y/120V will be provided to serve the Veterinary Treatment room. The special standby panel will feed Un-interruptible Power Supply (UPS) system and critical panel 208Y/120V for surgery operations equipment. Refer to paragraphs 10.4.4 Backup Power Systems and 10.4.5 Un-interruptible Power Supply (UPS) system for more information.

Panelboards and associated feeders will be sized for 20 percent spare capacity. All panelboards will contain 20 percent spare circuit breakers and surge protection device (SPD) modules. Voltage drop will be limited to 2 percent from main distribution panelboard to panelboard and 3 percent from panelboard to load for a maximum total of 5 percent.

10.4.3 *Site Grounding*

Grounding will consist of a bare copper ground counterpoise with ¾-inch x 10-foot copper-clad steel ground rods around the building. This counterpoise system will be connected to building columns, derived source transformer secondary neutrals, service entrance equipment, main grounding bar, telecommunication main grounding bar, and the lightning protection system. All connections will be exothermic welded connections. The building ground will be designed for 5 ohms or less.

10.4.4 *Backup Power Systems*

A standby generator system will be provided and will provide standby power for Veterinary Treatment / Vet Surgical Procedures rooms, the (4) exhaust fans within the kennel area, and the fire panel.

Uninterruptible Power Supplies (UPS) will be provided and will provide power for the Veterinary Treatment/Vet surgical procedure room.

Generator will be natural gas fueled, 208Y/120V, 3-phase, 4-wire and will be installed in a sound attenuated, weatherproof enclosure. Generator shall be TIER 4 permitted for air quality to comply with Federal, state, and local regulations.

An automatic transfer switch (ATS) will be provided for switch between normal power and generator for standby panel, UPS, and critical panel.

10.4.5 Un-interruptible Power Supply (UPS) System

An Uninterruptible Power Supply (UPS) will be provided to power critical surgical procedure equipment during generator startup period.

The UPS shall provide a minimum of 10 minutes back-up power.

10.4.6 Interior Grounding

Grounding will be provided in accordance with the NEC. All feeder and branch circuits will have a “green” insulated equipment ground conductor in addition to the conduit being used as a grounding path.

A main ground bar will be provided in the main electrical room. A primary bonding busbar will be provided in the communication room. A ground conductor will be routed from the main grounding bar to the primary bonding busbar as well as a ground conductor from the main ground bar to the building counterpoise system. This ground counterpoise will be connected to building columns, service entrance equipment, and the lightning protection system.

10.4.7 Lightning Protection Systems

A traditional franklin rod type Lightning Protection System (LPS) in accordance with NEC, NFPA 780 and UFC 3-575-01 will be provided for the facility. An array of roof mounted air terminals, roof conductors and down conductors will be included with the system. The lightning protection system will be interconnected to the building counterpoise system. Test wells will be provided for the grounding system. The lightning protection system will be installed under the supervision of an LPS certified master installer. The LPS will be required to obtain a UL Master label per UL96A.

10.4.8 Interior Lighting

Lighting levels will be designed to meet illuminance values recommended in the UFC 3-530-01 and IES Lighting Handbook. The basic fixtures, not necessarily all fixtures, which will be provided are:

1. 1' x 4' industrial fixtures in unfinished areas
2. 2' x 2' fixtures in transitional spaces, vestibules
3. 2' x 4' fixtures for finished offices, administrative areas, classrooms, conference rooms
4. Linear indirect type fixtures in laboratories and open office areas.
5. low bay light fixtures
6. 6 or 8 inch downlights

Lighting in general throughout the facility will consist primarily of recessed and suspended or pendant mounted LED fixtures. LED color temperature will be 4000 degrees K and the color rendering index (CRI) will be greater than 80. All interior lighting for the facility will be 120V. LED lighting will be provided with 10 year manufacturer's warranty per UFC 3-530-01.

Lighting power densities will be included in the “Calculations” of each submittal demonstrating compliance with ASHRAE 90.1-2013

10.4.9 Lighting Controls

Lighting controls will be provided per ASHRAE 189.1-2014 and 90.1-2013. No complex systems controlled by mobile devices are allowed. Dual level lighting will be installed in presentation rooms and other areas accepted as general practice in the industry.

Occupancy sensors will be provided for automatic controls, reduce energy costs and to address LEED criteria. The occupancy sensors will be dual-technology (ultrasonic and infrared) and will be ceiling or wall mounted in open office

areas, administrative areas, lobby entrance, corridors, vestibules, and other rooms that are not kennel or veterinary type spaces. Automatic lighting controls will not be provided in kennel or utility spaces.

10.4.10 Exterior Lighting

Exterior lighting shall be LED type and designed per, UFC 3-530-01 requirements and IESNA standards. Exterior lighting fixtures for the roadways and parking lots will be pole mounted. All poles and pole mounted fixtures will be provided by CEMC. Exterior lighting fixtures for the building will be wall mounted. All exterior lighting will be automatically controlled by photocells or by a programmable lighting control panel with astronomical timeclock.

Computer generated photometric calculations will be analyzed to optimize the lighting distribution.

10.4.11 Emergency Egress and Exit Lighting

Emergency lighting will be in accordance with the NEC, NFPA 101, International Building Code, and UFC. The facility will be equipped with a stand-by generator and a separate automatic transfer switch for life-safety loads. Lighting fixtures designated as emergency egress lighting will have an integral battery connected to them. Red LED-type illuminated exit signs will have a 90-minute integral battery as well.

10.4.12 Cathodic Protection

Cathodic protection requirements will not be required based on the soil type listed in the Geotech Report and material type of the water and natural gas pipes.

10.5 Materials

Threaded galvanized rigid steel conduit or intermediate metal conduit will be used in all outdoor locations and when exposed to physical damage.

EMT with compression couplings will be installed indoors concealed in walls and in areas not exposed to physical damage.

MC cable will be prohibited. Manufacturer provided wired whips will be allowed for flexible connections to lighting and systems furniture only.

PVC SCH40 or EB-20 conduit will be used in concrete-encased underground duct banks.

All interior electrical cables will be copper. All conductors #8 and greater will be stranded copper. The minimum size will be #12 AWG for power and #14 for control circuits. All wiring will have 600V THHN/THWN insulation.

All panelboards will be of the circuit breaker type with copper busses. Each panelboard supplying power to sensitive equipment will have adjacent transient voltage surge protection.

All power wiring will be routed in conduit with a minimum size of 3/4-inch. Threaded galvanized rigid steel conduit will be utilized outdoors and in equipment rooms. Indoor conduit in exposed areas above 10 feet will be EMT with compression fittings.

All electrical equipment will be UL listed where UL listings are available.

All equipment located outside will be NEMA 4X stainless steel.

10.6 Life Cycle Cost Analysis (LCCA) for Photovoltaic Systems and Lighting

We propose that an LCCA for different types of lighting systems is not required since the base standard is LED. This design will utilize LED lighting per the base standard. LED lighting is the most efficient type of lighting system available on the market today. We have conducted an LCCA for Photovoltaic Solar System and it was determined that a solar system should not be considered in the design of the facility due to the Base Case (Utility Power) having the lowest life-cycle cost.

Part 11

Electronics and Communications

Part 11: Electronics and Communications

11.1 Applicable Criteria

ANSI C2	National Electrical Safety Code (NESC)
ANSI/TIA	Commercial Building Telecommunication Cabling Standard
ANSI/TIA	Commercial Building Standard for Telecommunications Pathways and Spaces
ANSI/TIA	Customer-Owned Outside Plant Telecommunications Cabling Standard
CNSSAM TEMPEST/1-13	RED/BLACK Installation Guidance (17 January 2014)
CNSSI 7003	NTISSI 7003 Protective Distribution System
I3A	Technical Criteria for the Installation Information Infrastructure Architecture (Feb 2010)
ICD/ICS 705	IC Tech Spec for ICD/ICS 705
NFPA 70	National Electrical Code (NEC) 2017
NFPA 72	National Fire Alarm Code
NFPA 1225	Standard for Emergency Services Communications.
SIPRNET Technical Implementation Criteria	
TIA	Telecommunications Industries Association
UFC 3-501-01	Electrical Engineering, with Change 1 (01 Nov 2019)
UFC 3-550-01	Exterior Electrical Power Distribution, with Change 3 (01 Nov 2019)
UFC 3-520-01	Interior Electrical Systems, with Change 2 (12 Apr 2021)
UFC 3-570-01	Cathodic Protection (14 Jan 2019)
UFC 3-580-01	Design: Telecommunications Building Cabling Systems Planning and Design, with Change 1 (1 Jun 2016)
UFC 4-010-05	Sensitive Compartmented Information Facilities Planning, Design, and Construction, with Change 1 (01 Oct 2013)
UFC 4-010-06	Cybersecurity of Facility-Related Control Systems, with Change 1 (18 Jan 2017)
UFC 4-021-02	Electronic Security Systems, with Change 1 (11 Sept 2019)
USASOC Information Technology (IT) Technical Design Guide	
Memorandum for Record: Controlled Access (CAA) Working Definition for Army	

11.2 Electronic Access Control System (EACS)

The Electronic Access Control System (EACS) will use hardware compatible with existing Technical Security infrastructure at Hunter Army Airfield.

The EACS will be activated using Common Access Card (CAC) and keypads. The EACS design will provide head-end equipment, sensors, locking devices, monitoring workstation, and card readers that are proxy/pin. EACS will be provided at:

1. Building Entrance Doorways
2. Building Telecommunication Server Room
3. Access into Controlled Access Area (CAA)
4. Entrance from Kennel into Office Space

Only infrastructure for the EACS system will be provided through this project.

11.3 Intrusion Detection (IDS)

The IDS will provide IDS control boards with-in the EACS system, PIR motion sensors, and high security switches (HSS) and other devices as required to make for a complete IDS for each area requiring monitoring. The spaces that will include individual IDS systems are:

1. Overall facility
2. Telecomm Rooms

All doors requiring monitoring will have high security switches that are completely sealed, co-planar magnetic type with pry-tamper circuit and narrow read angle that have a high defeat resistance.

In addition to HSS located at the doors, each door will be covered by a passive infrared (PIR) motion detector on the inside of the monitored space. PIR units will also be in other areas deemed as requiring monitoring, such as corridor areas where Protective Distribution System (PDS) is routed. PIR coverage zones are indicated on plans. Premise Control Unit (PCU) will also be located inside the entry door to allow authorized personnel to enable or disable the IDS system for that area.

All IDS will be compatible with the EACS system.

Only infrastructure for the IDS system will be provided through this project.

11.4 Internet-Protocol Closed Circuit Television Systems (IPCCTV)

Fixed IPCCTV cameras will cover the entire building exterior. Interior fixed IPCCTV cameras will monitor interior and exterior kennel areas, building entrances, hallways, and the entrances to IDS protected spaces. Cameras will be monitored at the Staff Duty Office in the Battalion Headquarters.

The IPCCTV design will provide head-end equipment, cabling, PoE network switches, and control equipment in the telecommunications room. Multi-sensor fixed IP cameras will be utilized in areas that require multiple views such as intersecting hallways and exterior corners of the facility. IPCCTV will be provided at:

1. Building Entrances / Exits
2. Interior Hallways
3. ARMAG building

Only infrastructure for the IPCCTV will be provided through this project.

11.5 Telephone and Data Communication Systems

Exterior communications will connect to the building network infrastructure through new and existing underground infrastructure per UFC 3-580-01. The components provided for the site communications will include new underground concrete encased duct bank, copper cable, fiber optic cable, terminations, splice enclosures, cable vaults, and copper and fiber optic entrance facilities. New underground communication duct bank consisting of concrete-encased conduits will be provided from the new building to existing manhole. New cabling and their terminations into the new facility will be by the contractor. Underground boring systems shall be used for all underground utilities that cross active road crossings to tie into existing utilities.

The building will be provided with two separate networks: NIPRNET and SIPRNET. Interior telecommunication system will be provided in accordance with UFC 3-580-01, ANSI/TIA, Secret Internet Protocol Router Network Technical Implementation Criteria, and RED/BLACK Installation Guidance.

The main equipment will consist of telecommunications racks, floor and wall mounted cabinets, plywood backboards, patch panels, conduit, cable tray, and copper and fiber horizontal cabling. Copper backbone cable will be voice grade. Fiber optic backbone cable will be single-mode type. Horizontal cabling will be category 6, unshielded twisted pair, and plenum rated. Modular jacks will be RJ-45. A facility specific color coding and labeling scheme will be developed for the outlets and cables. Secured data network cables and jacks will be red in color and will be installed in a Protected Distribution System (PDS) where required.

Communication outlets will be provided as required by UFC 3-580-01. For each private office, two communications outlets with outlets mounted on different walls in order to accommodate future furniture relocations. Typical standard communication outlets shall be provided with three category 6 cables and RJ-45 jacks to support the faceplate configuration of 1-voice, 2-data.

Communication outlets will be provided for building Direct Digital Control (DDC) system, electric meter, and water meters.

NIPR equipment shall utilize open 19" racks. SIPR equipment shall utilize lockable, enclosed, floor mounted communications cabinets. There will be a minimum two communications racks/cabinet in each telecommunications room. Two (2) NEMA 5-20R receptacles shall be mounted within the SPIR cabinet near the floor. The receptacles should be placed on the outer wall of the cabinet. Double gang floor boxes with duplex NEMA 5-20R receptacles will be provided behind the vertical cable management of the racks.

Telecommunications grounding will be in accordance with the UFC 3-580-01, all TIA standards and regulations. Grounding for red/black systems shall comply with CNSSAM TEMPEST/1-13 RED/BLACK Installation Guidance. Telecommunications grounding systems will generally consist of the following major components: primary bonding busbar (PBB) and a telecommunications bonding backbone (TBB). All TRs shall be connected to the building earth electrode subsystem (EES).

11.6 Public Address Systems

A Public Address system will be required for the facility. Only the infrastructure of the public address system will be provided through this project.

11.7 Cable Television (CATV) System

CATV is not required for the facility.

11.8 Public Safety Systems

A public safety Distributed Antenna System (DAS) will be implemented to ensure reliable emergency communication coverage within the building. The system will be passive and will consist of a donor antenna to receive signals, a Bi-Directional Amplifier (BDA) to boost those signals, and multiple in-building antennas to distribute coverage. This configuration is designed to support first responder radio communications in compliance with NFPA 1225 standards.

Part 12

Sustainable Design

Part 12: Sustainable Design

12.1 Applicable Criteria

Army SDD Policy	Army Sustainable Design and Development (SDD) Policy
HPSB Guiding Principles	(2016) Guiding Principles for Sustainable Federal Buildings and Determining Compliance with the Guiding Principles for Sustainable Federal Buildings
LEED BD+C: NC	U.S. Green Building Council (USGBC) – LEED v4 for Building Design and Construction: New Construction and Major Renovations
UFC 1-200-02	High Performance and Sustainable Building Requirements

12.2 High Performance and Sustainable Building (HPSB) Requirements

UFC 1-200-02 High Performance and Sustainable Building Requirements is organized around the “Guiding Principles for Sustainable Federal Buildings” to guide transformation in performance of the DOD facility inventory. Design approaches and technologies focus on compliance with the Guiding Principles including sustainable site development, water savings, energy efficiency, materials and resources selection and indoor environmental quality specific to the site, mission, and programmatic needs of the MWD Kennel.

Integrated Design: The integrated design process evaluates strategies to meet the requirements of federal mandates that reinforce the importance of sustainable development through the planning, design, construction, and operation of facilities. Such policies were enacted to reduce environmental impacts, lower energy, and operating costs, optimize performance and conserve water, while increasing occupant satisfaction and productivity through improved health and well-being.

Commissioning: A robust commissioning program is integrated with design and construction to optimize building performance, reduce energy use, improve indoor air quality and occupant productivity, extend equipment life and reduce maintenance costs. The Commissioning Authority (CxA) participates in the project from the beginning of design through completion of construction.

Optimize Energy Performance: The building envelope, mechanical systems, lighting fixtures and controls are designed to maximize energy savings and exceed the requirements of ASHRAE 90.1-2013, with meters to monitor utility consumption and verify operational performance over time. Multiple systems and the baseline capital costs, annual energy costs, annual maintenance costs and replacement costs are compared and selected based on energy and life cycle cost analysis. Whole building energy simulation is used to validate energy savings of the selected system, with a goal of achieving a 30% energy use reduction as compared to the ASHRAE 90.1-2013 baseline. To further reduce dependence on grid-based energy and in compliance with EISA 2007, solar hot water and photovoltaic solar power systems are evaluated based on life-cycle cost analysis. Roofing and hardscape materials are anticipated to comply with SRI requirements for solar reflectance. Exterior lighting reduces light pollution through an efficient, but secure, lighting design.

Protect and Conserve Water: Stormwater design focuses on low impact design strategies to reduce runoff volumes and improve water quality. Permanent irrigation systems are eliminated by selecting native and drought-tolerant landscaping. Water use within the buildings is anticipated to be reduced over 40% through selection of low flow plumbing fixtures.

Indoor Environmental Quality: Good indoor air quality reduces health risks and promotes occupant productivity. Strategies include a no smoking policy, outside air ventilation rates above ASHRAE 62.1 minimums with automatic controls and reduction of indoor pollutants. IAQ management during construction and before occupancy reduces air quality problems resulting from the construction process. Pollutant source control, increased filtration at outside air supply, and the use of low-emitting interior finishes contribute to a healthier indoor environment. Thermal comfort is

maintained through efficient system design, while occupant well-being is aided by controllability of systems and providing a connection to the exterior environment to the greatest extent possible.

Environmental Impact of Materials: Recycling, both during construction and throughout facility operation, is prioritized to reduce the amount of waste directed to landfills. Receptacles for co-mingled recyclables are located throughout the facility, with collection at a central location. Building materials with high recycled content and longevity reduce impact to the waste stream, and locally available materials benefit the local economy and reduce transportation impacts. Rapidly renewable and bio-based materials, as well as certified wood products, are specified to further reduce negative impact to natural resources.

Climate Change Risk: Building design solutions evaluate and respond to mission criticality in order to maintain resiliency to the impact of climate change.

12.3 Third Party Certification

The project will use LEED v4 Silver to validate compliance with the Guiding Principles and will be registered on LEED Online and submitted for third party certification.

The Federal High Performance Sustainable Building Checklist (see Appendix) provides a summary of Guiding Principles compliance. The LEED-NC v4 Checklist (see Appendix) provides a summary of LEED Silver compliance. Both documents are submitted at each design milestone, with final submittal by the General Contractor after construction is complete. The HPSB and LEED checklists will be included in Contract Documents as attachments to Section 01 33 29 Sustainability Reporting.

Documentation will be provided in accordance with the “USACE LEED-NC v4 Submittals for Registered Projects” spreadsheet. Burns & McDonnell will complete design-phase documentation and the General Contractor will complete construction-phase documentation. The “USACE LEED-NC v4 Submittals for Registered Projects” spreadsheet will also be included in Contract Documents as an attachment to Section 01 33 29 Sustainability Reporting to provide clear documentation requirements to the General Contractor.

Part 13

Cybersecurity Design

Part 13: Cybersecurity

13.1 Applicable Criteria

Committee on National Security Systems (CNSSI)

CNSSI 1253	Security Categorization and Control Selection for National Security Systems

Department of Defense Instruction (DODI)

DODI 8500.01	Cybersecurity

DODI 8510.01	Risk Management Framework (RMF) for DoD Information Technology (IT)

Engineering and Construction Bulletin (ECB)

ECB 2018-11	Control System Cybersecurity Coordination Requirement

National Institute of Standards and Technology (NIST)

NIST SP 800-30 Rev 1	Guide for Conducting Risk Assessments

NIST SP 800-37	Guide for Applying the Risk Management Framework to Federal Information Systems: A Security Life Cycle Approach

NIST SP 800-53	Security and Privacy Controls for Federal Information Systems and Organizations

NIST SP 800-53A	Guide for Assessing the Security Controls in Federal Information Systems and Organizations

NIST SP 800-82	Guide to Industrial Control Systems (ICS) Security

Department of Defense (DOD)

UFC 04 010 06	Cybersecurity of Facility Related Control Systems, with Change 1

13.2 Overview

The design of cyber secure facility-related control systems sets the foundation for long-term successful cybersecurity of the facility. To achieve success during the MILCON stage and beyond into operations, it requires a multi-disciplined effort executed by members of the DPW, IMCOM, USACE, the designer, the contractor, system-specific installers and integrators, and the new MWD Kennel staff.

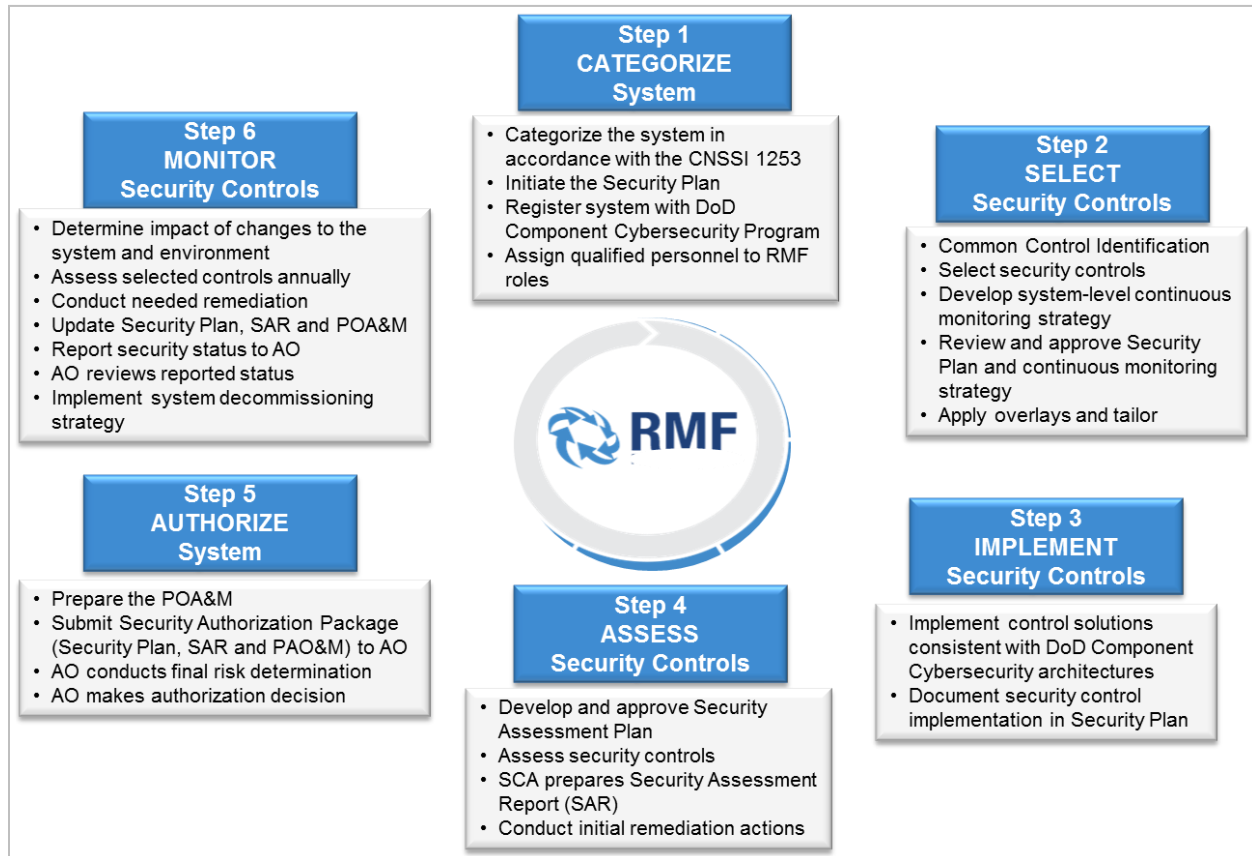
Cybersecurity design and implementation is defined in UFC 4-010-06 and the other supporting references listed above for all facility-related control systems with networked digital controllers (e.g., building control systems, utility control systems, lighting control, electronic security systems, UPS Monitoring System, and fire and life safety systems). Deliverables during the design process include an explanation in the Design Analysis, the creation of guide specifications tailored to each system that will be included in the RFP, and other supporting documentation. The goals of the UFC requirements are to supply enough information so bidding contractors can generate realistic cost proposals, to support HAAF in achieving control system accreditation, and to provide the appropriate level of cybersecurity for Facility Related Control Systems.

Design of these control systems and the documentation supplied to the contractor are consistent with the baselines already established or with Risk Management Framework (RMF) guidelines. Coordination with Fort Stewart, USACE, and IMCOM/AMC staff will occur throughout to enable the contractor to continue the process through construction.

Control systems subject to these cybersecurity requirements in the MWD Kennel include HVAC DDC Controls and Fire Alarm/Mass Notification. Government Furnished Government Installed (GFGI) systems, both Information Technology (IT) and Operational Technology (OT), are usually not part of the design scope and are excluded. Electronic Security System (ESS) design is limited to infrastructure only. All switches and head-end devices are GFGI.

13.3 **RMF Process Overview**

DoD utilizes the Risk Management Framework (RMF) Process to achieve an acceptable level of risk related to cybersecurity and provide a baseline for accrediting systems to operate in DoD's IT and OT environments. The RMF process is broken into six steps as shown below.



UFC 4-010-06 applies to all planning, design and construction, renovation, and repair of new and existing facilities and installations that result in DoD real property assets, regardless of funding source. This UFC provides criteria for the inclusion of cybersecurity in the design of control systems in order to address appropriate RMF security controls. The rationale for applying RMF to control systems is discussed in FIPS PUB 200 and DODI 8500.01. The specifics of the RMF process and related controls are set forth in DODI 8510.01, NIST SP 800-37, NIST SP 800-53, and NIST SP 800-82.

13.4 **RMF Design Scope and Specification Development**

As discussed above, the RMF process is broken into six steps with Step 5 achieving the Authority to Operate (ATO). This process requires coordination and participation between the designer, constructor, and government personnel throughout. For the MWD Kennel project, the designer and the government are responsible for Steps 1 and 2. The constructor and the government are responsible for tailoring Step 2 to match as-built conditions and Steps 3-5, and the government is responsible for Step 6.

Step 2 involves applying the system categorization for C-I-A to the security controls specified by CNSSI 1253. The design phase provides a draft set of controls that will need to be addressed during construction and Step 3. Once controls have been selected and agreed upon by the AO for all systems, it is the contractor's responsibility to ensure that all applicable controls are met during the build process. Some controls have requirements for documentation or deliverables and must be provided to the government to support the accreditation process.

The designer will also supply, as applicable and practicable, high-level network diagrams, and control-specific versions of UFGS 25 05 11. Once these have been reviewed and approved by the government, these documents become artifacts for the contractor to utilize during construction, commissioning, and accreditation support.

The awarded contractor is responsible for detailed design drawings (topology and dataflow diagrams), and detailed Hardware / Software listings. These artifacts are also detailed in the SUBMITTALS section of the UFGS 25 05 11 specifications provided as part of design.

13.5 Impact of Facility and Mission Ratings on C-I-A Categorization

The criticality rating of the facility and the mission may impact the number of cybersecurity controls that are required to be addressed during design and construction. Mission support activities require the lowest level of rigor (C-I-A levels of L-L-L), while mission essential and mission-critical ratings generally require higher C-I-A levels, and thus a higher level of effort among all parties to deliver cyber-secure control systems. Final determination is the responsibility of the AO in concert with Fort Stewart-HAAF staff, IMCOM and AMC.

Based on past project experience and guidance from DoD / USACE, the C-I-A categorization of HVAC DDC is Low-Low-Low (L-L-L). Since FARS addresses life safety, the categorization at Army installations is usually Low-Medium-Medium (L-M-M). These ratings are captured in the below table.

System Name	C-I-A Impact Levels
HVAC DDC	L-L-L
FARS / Fire Suppression	L-M-M

13.6 Existing Accreditations

It is our current understanding that neither of the listed systems has explicitly gone through the RMF process.

13.7 HVAC DDC Controls

The building will have new BACnet Direct Digital Control (DDC) System connected throughout a supervisory module. The system will use BACnet MS/TP protocol. A touchscreen human-machine interface (HMI) will be provided with all the factory-installed DDC controllers for the building controls. Touchscreen HMI will be located within the DDC panel.

The DDC controls will be stand-alone type and have the option to be interfaced with an existing base Utility Management and Control System (UMCS). However, as part of this design effort, there is no intention of integrating with the base-wide UMCS, and therefore no connections to that system will be shown or detailed. Additionally, no 25 10 10 specification will be provided.

There are no computers in the design. However, the DDC Control Panel will have an ethernet port capable of connecting to a computer or laptop, as well as an ethernet connection for a future connection to a base-wide utility monitoring system. Cybersecurity for contractor configuration of the system is detailed in the accompanying 25 05 11 specification.

A high-level diagram of the HVAC DDC control system is provided below:

Typical Network Diagram to Support Building Level RMF Artifact Submission
MWD KENNEL HUNTER ARMY AIRFIELD
HVAC CONTROLS ARCHITECTURE



13.8 Fire Alarm and Mass Notification System

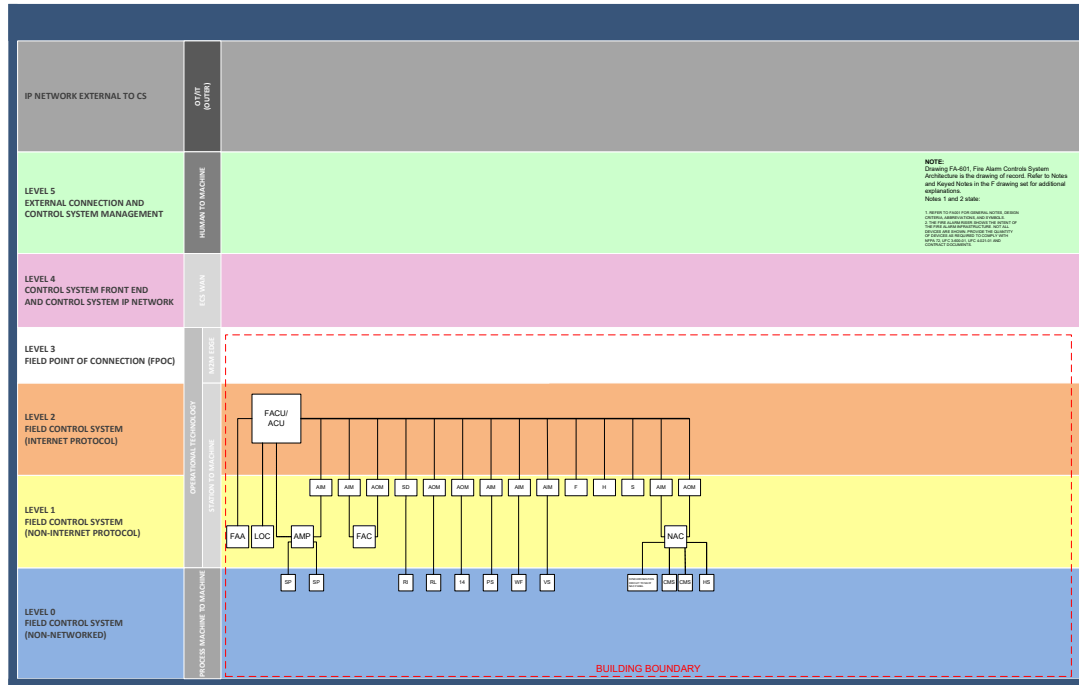
A combined addressable fire alarm and mass notification system (FA/MNS) will be provided throughout the tower building. The fire alarm control unit (FACU) and mass notification autonomous control unit (ACU) will be located in a year around environmentally conditioned space that complies with the environmental conditions required in the control unit approval or listing. Fire alarm control units and sub-panels are to be located in the electrical room.

The fire alarm/mass notification system will be fully addressable and electrically supervised with battery backup in accordance with NFPA 72.

The fire alarm system will monitor the fire suppression systems and transmit signals to the fire department through the Base Monaco radio transceiver system. A Monaco BT-XM transceiver is to be used to transmit fire alarm signals via an antenna on the exterior of the building configured to the existing Base Monaco system frequency.

A high-level diagram of the Fire Alarm and Mass Notification System is provided below.

Typical Network Diagram to Support Building Level RMF Artifact Submission
FA-601 HUNTER ARMY AIRFIELD, GEORGIA
MWD KENNEL HUNTER ARMY AIRFIELD
FIRE ALARM AND MASS NOTIFICATION SYSTEM ONE-LINE DIAGRAM



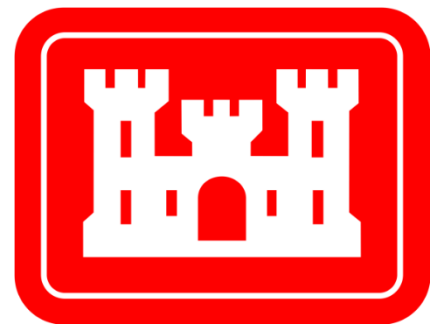
Item	Item Code	Description
1	FA-601	Fire Alarm Controls System
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5	FA-601	Fire Alarm Controls System
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100	FA-601	Fire Alarm Controls System

APPENDIX C - COMMISSIONING PLAN DOCUMENT

NOT A CONTRACT DOCUMENT – FOR COMMISSIONING PURPOSES ONLY

Commissioning Plan for the
Military Working Dog Kennel

Hunter Army Airfield, Savannah, Georgia



US Army Corps of Engineers Savannah District

Project No. 189618

Ready to Advertise Design Submittal

January 2026

prepared for

US Army Corps of Engineers Savannah District
Military Working Dog Kennel

Revision 4.0
January 2026

prepared by

Burns & McDonnell Engineering Company, Inc.

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LIST OF ABBREVIATIONS

<u>Abbreviation</u>	<u>Term / Phrase / Name</u>
AHJ	Authority Having Jurisdiction
ASHRAE	American Society of Heating, Refrigeration, Air-Conditioning Engineers
BMcD	Burns & McDonnell
CC	Controls Contractor
COR	Contracting Officer's Representative
Cx	Commissioning
CxC	Contractor's Commissioning Specialist
CxD	Commissioning Specialist for the Design Phase
CxG	Governments Commissioning Authority
DOR	Designer of Record
EC	Electrical Contractor
FPT	Functional Performance Test
GC	General Contractor
HVAC	Heating, Ventilation, and Air Conditioning
MC	Mechanical Contractor
OAC	Owner, Architect/Engineer, and Contractor
OPR	Owner's Project Requirements
PC	Plumbing Contractor
PFC	Pre-Functional Checklist
SOO	Sequence of Operation
TAB	Testing, Adjusting and Balancing
UPS	Uninterruptable Power Supply
USACE	United States Army Corps of Engineers

1.0 OVERVIEW

The purpose of this Commissioning Plan is to provide details/structure related to the implementation of the commissioning process. This plan describes commissioning protocols and activities that shall occur throughout the design, construction, acceptance, occupancy, and warranty phases. This is a transient document that will be updated by the Commissioning Agent throughout the commissioning process; updates will be provided to the Commissioning Team for review and comment prior to edits being noted as final.

1.1 Project Description

Currently, 1/75th Ranger Battalion MWD Program occupies Building 1030 at HAAF. Building 1030 was adapted as an interim fix to support the new MWD mission operations for the 1/75th Ranger Battalion. This existing facility does not adequately meet the mission requirements and many of the architectural and engineering systems need upgrades or repair. This existing structure was originally constructed in the 1950's as a radio transmitter and communications building. The original facility was never envisioned to support MWD mission operations in accordance with current MWD design standards. The facility has undergone several renovations up to present day including the conversion of the facility to a kennel in the 2007-2008 timeframe.

Building 1030 has significant moisture problems that include water infiltration in the building's slab, a leaking roof, inadequate drainage in the interior and exterior of the facility and clogging and backflow of kennel drains. The building is subject to seasonal flooding due to building elevation. Low water pressure within the facility plumbing system inhibits kennel cleaning. The facility is not constructed to house the programmed number of canines which increases the risk of spread of infectious disease. The quantity of dog runs, and canine break areas is inadequate for the current number of canines within the facility. The current kennel layout does not allow for visual or physical separation between canines which poses substantial safety risks for the dogs and handlers. Renovating existing facilities or a combination of new and renovated facilities has been analyzed and deemed not viable for mission requirements.

Per the DD1391, the MWD Kennel will include kennel administration offices, veterinary exam and surgical suite, TA-50 locker area, latrines with showers, tack room, food preparation and storage areas, indoor and outdoor kennels, and building utility support areas. Fire detection and suppression, energy management control, unclassified and classified communications networks, intrusion detection, surveillance, and access control systems will be provided. Supporting facilities include all related site-work and utilities (electrical, water, gas, sanitary sewer, and information systems distribution), lighting, parking, curb and gutter, sidewalks, storm

drainage, landscaping, antiterrorism/force protection measures (AT/FP), obedience course with apparatuses, exercise and break areas, mobility equipment storage, and other site improvements. Special construction includes sustainable construction features complying with Leadership in Energy and Environmental Design LEED "Silver". The AT/FP measures include perimeter barriers, access control, mass notification system, laminated glass, and minimum stand-off distances. Access for people with disabilities will be provided in the kennel administration area. Comprehensive building and furnishings related interior design and audio-visual services are required. The project will include the demolition of building 1030 (9,851 SF). The new building air conditioning is estimated to be 70 kW (20 tons). The facilities will be designed to a minimum life span of 40 years in accordance with DoD's Unified Facilities Criteria (UFC 1-200-02), including energy efficiencies, building envelope and integrated building systems performance.

Per an updated DD1391, dated 11 February 2022, the project calls for a 11,183 SF MWD Kennel with a 500 SF of Unheated Storage Building and a 560 SF Outdoor Break Area. The revised, estimated start of construction is FY2026. Design has proceeded under a directive from USACE Savannah District assuming a new PA of \$15.75M, which would require 1391 to be revised from its current 11 February 2022 date.

1.2 Introduction to the Commissioning Process

Commissioning is a quality focused process for enhancing the delivery of a project. The process focuses on evaluating and documenting that all commissioned systems and assemblies are planned, designed, installed, tested, and maintained to meet the design and Owner's Project Requirements. The commissioning process includes an evaluation of the Basis of Design (BOD), design, and as-built commissioned systems/assemblies against the documented and approved Owner's Project Requirements (OPR). The commissioning process includes the following:

Design:

1. The CxD develops the Owner's Project Requirements based on input from USACE and previously created design development documentation including DD Form 1391, Project Charrette Report, and the Design Analysis, which functions as the DOR's Basis of Design.
2. The CxD develops a comprehensive commissioning specification and works with the DOR to incorporate into the project's construction documents.

3. The CxD performs design reviews of 65%, and 95% design submittals. This consists of reviewing equipment and systems for installation, integration, testing, operations, maintenance, training, and warranty requirements. The CxD participates in comment resolution meetings with the DOR.
4. The CxD develops a comprehensive and project specific Design Phase Commissioning Plan which provides the preliminary structure, schedule, and coordination for the Commissioning Process.

Construction:

1. The CxC facilitates a Commissioning Kickoff meeting; all Commissioning Team members shall be present as the process, roles and responsibilities and commissioning related questions will be addressed.
2. Additional commissioning meetings may be required throughout construction. These will be scheduled by the CxC with coordination and assistance from the GC. All necessary parties shall plan on attending as the scope, schedule and coordination of future commissioning activities will be discussed.
3. The CxC reviews the OPR, BOD, and design documents for continuity and with respect to an operability/maintenance standpoint. The CxC advises the COR of any discrepancies between the BOD and OPR, deficiencies of the design to comply with the OPR and BOD, and deficiencies that would prevent the building systems and features from operating or performing effectively and from being adequately maintainable.
4. The CxC develops the Construction Phase Commissioning Plan which provides the structure, schedule and coordination for the Commissioning Process as well as the project specific Construction Checklists and Functional Test Procedures.
5. Equipment documentation and submittals shall be concurrently submitted to the DOR, CxC, and CxG for review. Documentation and submittals shall include, but not be limited to shop drawings, equipment to be commissioned, detailed start-up procedures, completed start-ups forms, O&M's, and warranty information. All review comments shall be coordinated with the DOR.
6. The CxC develops equipment specific Pre-Functional Checklists. Contractor(s), under their own direction, shall execute and document completion of initial system checkouts, system start-ups and execution of Pre-Functional Checklists. The CxC and CxG review all initial checkout, start-up, and Pre-Functional Checklist documentation to ensure they were completed according to approved contract documents. The CxC may witness start-up of selected equipment.

7. The CxC develops Building Envelope Checklists. The CxC witnesses and documents the completion of the Building Envelope Checklists as well as reviews completed Test Reports. The CxG shall track completion of Building Envelope Checklists and testing.
8. The CxC and CxG will review all Pre-Functional Checklists and startup documentation. Functional performance testing will not begin until the equipment to be tested has met the prerequisites for functional testing outlined in the Contractors Roles and Responsibilities. In addition to this requirement, the CxC will track the completion progress of checklists at each commissioning meeting. If the Contractors are not completing construction checklists within a timely manner (at the discretion of the CxC), the COR and GC will be notified.
9. The CxC and CxG will review the pre-final TAB report and conduct TAB verification on no less than 10% of reported TAB measurements using TAB Contractor's personnel and calibrated equipment.
10. The CxC develops specific equipment and system Functional Performance Test (FPT) procedures; test procedures will systematically test each systems mode of operation. The FPTs will be submitted formally to the COR and construction team. All parties shall review the FPTs to ensure test steps are feasible, safe and equipment protection is provided with necessary written alarm limits to be used during the test; FPTs are executed by the Contractor(s), under the oversight of, and documented by the CxC and CxG.
11. Items of non-compliance in material, installation or setup are documented by the CxC and corrected at the Contractor's expense. If the Contractor does not agree the items identified by the CxC are non-compliant or deficient, they will bring these issues to the attention of the COR and GC within 10 business days in writing. All non-compliant systems will be retested.
12. The CxC will issue reports to all commissioning team members after all site visits including functional testing site visits. Site visits will occur at least monthly during system rough-in phase and will increase when closer to system testing. The CxC may adjust the reporting frequency as needed. The reports contain general observed progress of work and a list of items or deficiencies noted, and a description of commissioning progress corresponding to the plan.
13. The CxC and CxG review O&M documentation for systems being commissioned ensuring completeness and compliance with contract documents.

14. Commissioning should be completed before substantial completion and building occupancy. If the project requires a phased turnover approach, the CxC will functionally test those systems included within the scope of the project which are required to operate the area(s) which will be turned over. A preliminary commissioning report will be generated for those systems being turned over.
15. The CxC and CxG review training plans provided by the Contractor(s) and documents training was completed in a manner acceptable to the Owner.
16. The CxC issues the Final Commissioning Report and Systems Manual to the COR in accordance with the LEED v4.
17. The CxG completes the mandatory LEED v4 templates and uploads the supporting documentation accordingly.

Occupancy:

1. Deferred functional testing, including any seasonal testing, is conducted as contracted or required.
2. 9-months after each substantial completion milestone, the CxC shall meet with the COR and facility maintenance personnel to review the facility operating procedures and determine if any warranty related issues shall be resolved by the GC and Contractor(s).
3. The CxC provides a Final Commissioning Report Amendment to the COR which includes updates from the 9-month review.

This commissioning process does not diminish the responsibility of the Contractor(s), nor is it intended to be a redundant testing or inspection function. Commissioning is performed to document and validate the efforts of the Contractor(s), ensuring the quality and functionality of the systems meets the OPR as documented by the BOD.

1.3 Commissioning References

Commissioning for this project will be executed in accordance with the following guidelines and standards:

1. ER 1110-345-723, "Total Building Commissioning Procedures"
2. ASHRAE Guideline 0-2019, "The Commissioning Process."
3. ASHRAE Guideline 1.1-2007, "HVAC&R Technical Requirements for The Commissioning Process."
4. ASHRAE Standard 202-2018, "Commissioning Process for Buildings and Systems."
5. LEED v4, "Fundamental and Enhanced Commissioning Requirements."

6. Council on Environmental Quality, “Guiding Principles for Sustainable Federal Buildings and Determining Compliance with the Guiding Principles for Sustainable Federal Buildings (2020)”

1.4 Commissioning Team

The Commissioning Team consists of key individuals that will plan and execute the overall commissioning process. The commissioning team list is preliminary and will be updated as the project develops. See Appendix A – Cx Team List for the complete list of contacts. The team is composed of the following parties:

- 1) Owner (OR): USACE
- 2) Government’s Commissioning Specialist (CxG): TBD
- 3) Contractor’s Commissioning Specialist (CxG): TBD
- 4) Designer of Record (DOR): Burns & McDonnell
- 5) Contractor(s): TBD

Personnel identified at the beginning of the job in this role/team shall continue until completion of the project to the extent practicable. Where personnel changes are beyond the team’s control, reasonable effort shall be made to transmit institutional knowledge gained in this position to the replacement personnel.

To help understand the delegated roles and responsibilities, a commissioning leadership structure has been defined as follows (*refer to Roles and Responsibilities Matrix – Appendix B for additional details*):

1. **Owner** - The Owner is the United States Army Corps of Engineers (USACE). USACE shall participate in the Cx process as a full partner. USACE shall review, provide comments, and recommend approval/disapproval of all required Cx documents, submittals, results, and reports. USACE shall be the authority that provides formal approval/disapproval. End user/facility operators are also encouraged to participate in the commissioning process.
2. **Government’s Commissioning Specialist (CxG)** – The Government’s commissioning specialist reports directly to the Owner. The CxG provides oversight assurance of the entire commissioning process and represents the third-party requirement.
3. **Contractor’s Commissioning Specialist (CxG)** – The GC is to designate a Commissioning Specialist (CxG) for this project. The CxG must have experience in the

commissioning of facilities of a scope and complexity comparable to the individual project. The CxC must be employed regularly in building commissioning and is the individual responsible for coordinating the commissioning activities during the construction and post-occupancy phases.

4. **DOR** - The design team shall be indicated as the Designer of Record (DOR) in this document and perform duties typical for the A/E.
5. **Contractors** – The installing Subcontractor(s) and vendors are required to support the commissioning process. This includes the Mechanical, Electrical, Plumbing, Controls, and Test and Balance subcontractors along with manufacturer's installing representatives.

1.5 Communication Plan and Protocols

All communications sent out for the project shall be considered confidential and shall only be sent to people related to the project.

1. Email:
 - a. All emails sent out for the project shall be considered confidential and shall only be forwarded to people related to the project.
 - b. Emails subject line shall start with the project name; for example, "MWD Kennel – HAAF AHU-XXX FPT Test Scripts."
2. Radios:
 - a. Two-Way Radios may be used during the commissioning process to the extent possible and where appropriate.

1.6 Photographs and Cameras

Use of cameras on-site to document commissioning activities shall follow the Owner's requirements for construction site security.

1.7 Safety

All members of the Commissioning Team shall follow Contractor established safety procedures applicable to performing their jobs safely. Prior to any dynamic testing of equipment and systems, Functional Test procedures shall be reviewed and all safety protocols, as outlined in the Contractor Safety Plan, shall be followed.

1.8 Commissioned Systems

Appendix D – Equipment to be Commissioned, includes a list of equipment that will require commissioning.

1.9 Test Equipment

1. Contractor(s) shall provide the necessary equipment to fully test the commissioned systems as defined in the Functional Test procedures provided by the CxC.
2. Test equipment used during start-up and commissioning shall be of sufficient quality and accuracy to test and measure system performance within the tolerances required to determine adequate performance. Tolerances shall be as indicated in the specifications.
3. All instruments shall conform to the standards specified in the most recent edition of “NEBB Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems” regarding accuracy and calibration status. Current calibration certificates must be available to the CxC if requested.
4. Test instrument accuracy and resolution must match or exceed that of the system component being verified or calibrated.
5. Test instruments must be used within guidelines as recommended by instrument manufacturer. All measuring methods must be appropriate to the instrument application and measurements must be repeatable under equivalent conditions.
6. Standard Testing Instrumentation: Standard instrumentation normally used for performance assessment and diagnosis shall be provided by Contractor performing the test. These include, but are not limited to:
 - a. Electronic Manometer (for Air and Flow Hood)
 - b. Electronic Manometer (for Water)
 - c. Temperature Instruments
 - d. Pressure Instruments
 - e. Humidity Instruments
 - f. CO2 Instrument
 - g. Sound Meter
 - h. Electronic Multimeter
 - i. Tachometer
 - j. Ultrasonic Flow Meter
 - k. Others as required

1.10 Commissioning Software

The CxC shall utilize a commissioning software platform intended to streamline the commissioning process by providing status in real time for the entire team. The software shall meet FedRAMP requirements and be accessible to all Cx team members to access checklist, tests, and issues.

The project shall utilize the software to create and store the following:

1. Meeting Agenda/Minutes
2. Site Observation and Progress Reports
3. Pre-Functional Checklists and Functional Tests
4. Issues logging and resolution tracking



2.0 COMMISSIONING PROCESS

The following is a detailed description of the commissioning tasks and activities listed sequentially by phase.

2.1 Construction Phase

2.1.1 Construction Phase Cx Plan

The CxC develops a project specific Commissioning Plan which provides the preliminary structure, schedule, and coordination for the Commissioning Process.

2.1.2 Kickoff Meeting

The initial kickoff meeting shall be held at the initiation of the beginning of construction to ensure commissioning activities are followed throughout the process.

1. The CxC shall conduct a commissioning kick-off meeting after Contractor has notice to proceed, to introduce the members of the commissioning team. The meeting shall establish the protocol for project reporting and decision making. The meeting shall also include a discussion of and development of the construction phase building commissioning activities and schedule. The CxC shall prepare and distribute minutes of the meeting.

2. Additional “kickoff” meetings shall be required as additional team members are added to the project (Contractors). The CxC shall prepare and distribute minutes of the meeting.

2.1.3 Other Meetings

Cx Progress Meetings: Commissioning meetings will be required throughout the construction process. These will be scheduled by the CxC with support from the CxG and GC. All necessary parties shall attend to plan, scope, coordinate, schedule commissioning activities and resolve open issues. Frequency shall be established by construction activities. The CxC shall prepare and distribute minutes of the meeting(s).

2.1.4 Cx Scheduling Meeting

The General Contractor, CxG, and CxC shall develop a detailed commissioning schedule, with all tasks and deliverables required to complete the Commissioning Process. The schedule is a living document and shall be monitored throughout the project and updated as needed. The CxC works with the Contractor to schedule tasks in a timely manner.

2.1.5 Phased Commissioning

Non-interdependent systems of the project may be phased. When applicable, FPTs shall be coordinated between CxC, General Contractor and USACE Project Manager.

2.1.6 Issue Tracking and Site Observation Reports

The CxC is responsible for the maintenance of the issues recorded in the commissioning software which are an ongoing record of identified deficiencies, problems or concerns pertaining to the commissioned equipment and systems or individual pieces of equipment. The issues identify where the responsible party has deviated from the OPR, contract documents, applicable codes or industry practices. It becomes the CxC's responsibility to follow up and review each item on the list with the appropriate Contractor(s) and provide feedback. See Appendix G – Sample Issues Log.

1. The issue shall only be closed by the individual that identified (opened) the issue.
2. The CxC is required to provide feedback to the following fields in the designated commissioning software:
 - a. Description: The CxC shall provide a description of the issue.
 - b. Identified Date: The CxC shall identify the date the issue was first logged.
 - c. Identified By: The CxC shall identify the individual that first created the issue.

- d. Status: The CxC shall initially designate issues as “Open”; based on response from applicable party, the CxC shall change the designation to “Pending” or “Closed” as appropriate.
 - e. Date Corrected: Date that the issue was corrected or that notes regarding the issue were made.
 - f. Corrected By: Identifies the specific Contractor that corrected or shall correct the issue.
- 3. CxC will provide this list to the Cx Team during regular project meetings as appropriate to keep all parties informed.
 - 4. All issue log data can be exported to BIM 360 as needed.
 - 5. Site Observation Reports
 - a. A site visit report shall be generated by the CxC that details progress. The report shall list issues or non-issues that were observed during the site visit. A copy of the report shall be distributed to the Commissioning Team.

2.1.7 Submittal Reviews

Submittals of commissioned equipment shall be reviewed concurrently by CxC and CxG for concurrence with the OPR, BOD and design documents. The CxC and CxG will concurrently submit comments to DOR for review and consideration.

2.1.8 Pre-Functional Checklists, Start-up, and TAB

Pre-Functional Checklists (PFCs) are established to ensure equipment and systems are properly installed and fully operational prior to execution of Functional Test procedures. Each piece of equipment receives a full construction checkout by the Contractor(s). No sampling strategies are to be utilized. The PFC for all components within a given system must be successfully completed prior to the start of formal Functional Testing for that given system. For some systems the CxC will not generate PFCs, but still track Contractor installation and testing. See Appendix D for specific systems.

PFCs are primarily static inspections and procedures to prepare the equipment for initial operation (e.g., oil levels OK, fan belt tension, labels affixed, gages in place, sensor calibration, etc.). PFCs may require simple functional testing of a component or a piece of equipment (such as measuring the voltage imbalance on a three-phase pump motor). PFCs are to be combined with the manufacturer's start-up documentation. PFCs will be generated

and completed through the commissioning software platform. See Appendix E – Sample Pre-Functional Checklist.

1. Start-up

- a. The Contractor(s) are responsible for development of start-up plans for all equipment.
- b. The Contractor obtains manufacturer installation, start-up, and checkout data, including actual field checkout sheets used by the field technicians, provides them to the CxC, and attaches them to the PFC for each piece of equipment.
- c. The CxC will witness start-up of all major equipment.
 - i. For like equipment and systems (terminal units, fan coil units, etc.), the CxC shall witness a sample of the start-up activities.

2. Pre-Functional Checklist Development

- a. CxC will create PFC's for each piece of equipment being commissioned.
- b. Contractor(s) are responsible for the completion of the PFC's prior to the start of Functional Testing.
- c. Associated specification required testing documents should be attached to the associated Pre-Functional Checklist or submitted under separate cover.

3. Execution of Pre-Functional Checklists

- a. The Contractor or site technician performing the line-item task initials and dates each through the commissioning software. Only individuals having direct knowledge of a line item being completed shall check or initial the forms.
- b. Deficiencies:
 - i. The Contractor(s) shall list any outstanding items of the initial start-up and Pre-Functional Checklists. Contractor(s) and vendor(s) shall work to correct and retest deficiencies on uncompleted items. The Contractor(s) shall correct all areas that are deficient or incomplete according to the checklists and tests.

4. TAB

CxC & CxG activities shall include:

- Review of the TAB Contractor's TAB plan (CxC & CxG)
- Participate in a TAB coordination meeting with the TAB Contractor, Controls Contractor, and Mechanical Contractor prior to TAB execution (CxC)
- Witness verification of the TAB measurements, performed by the TAB Contractor (CxC)

- Review the Final TAB Report and data to ensure project requirements are satisfied (CxC & CxG)
 - a. The TAB Contractor is to submit an outline of the TAB plan and approach to the CxC, CxG, and Controls Contractor for review prior to initiating testing, adjusting and balancing. Included in this plan should be an explanation of the intended use of the building control system. The CxC and CxG review the plan for understanding and coordination issues and the Controls Contractor reviews the feasibility of using the building control system for assistance in the TAB work.
 - b. The TAB Contractor submits weekly written reports of discrepancies, contract interpretation requests and lists of completed tests to the CxC, CxG and GC; this facilitates quicker resolution of problems.
 - c. During functional testing the CxC shall work with the TAB Contractor to verify selected samples of TAB report data including flow rates, pressure differentials, etc.

2.1.9 Development of Functional Performance Test Procedures

Functional performance testing is the root of the commissioning process. During this process, each system (equipment/components) is dynamically tested to confirm the system meets operational requirements along with the design intent. Functional Performance Test procedures (FPT's) are developed to test operational sequences that would cause, or be likely to cause, a system shutdown; i.e., safeties, failure modes, operator shutdown, unoccupied mode, etc., and verify the system shuts down per the sequence, and in some instances, returns to normal operation automatically, such as during a power failure. The FPT's shall also verify the system starts according to the sequence and the start-up is controlled. The systems shall be tested under modes such as: low load, high load, occupied and unoccupied, fire alarm, etc.

Before test procedures are finalized, the CxC obtains all requested documentation; a current list of change orders and design revisions affecting equipment or systems, including an updated points list, control sequences and setpoints. Contractor(s) shall provide O&M data to the CxC prior to finalization of test procedures. O&M data must be approved prior to execution of functional tests.

The CxC develops project specific test procedures to verify proper operation of each piece of equipment and system. The CxC obtains clarification, as needed, from Contractors and the

DOR regarding sequences of operation to develop these tests. Prior to execution, the CxC provides a copy of the FPT's to the Commissioning Team for a review of the test's feasibility, safety, warranty, and equipment protection. Prior to the start of functional testing the Contractor(s) must have completed and signed all Pre-Functional Checklists. See Appendix F – Sample Functional Performance Test.

2.1.10 Development of Integrated Systems Test Procedures

Integrated system verification will be carried out for special systems. The purpose of Integrated System Testing (IST) is to verify that the installation of systems has been completed and complies with the BOD, OPR, and Contract Documents. These tests will include only the integrated functions which are shared between these systems. (Example: Power Generating System Functioning in alignment with Fire Alarm, Life Safety, Control System, Etc.). All subsystems must have successfully completed FPT's before carrying out the integrated systems test.

Before test procedures are finalized, the CxC obtains all requested documentation; a current list of change orders and design revisions affecting equipment or systems, including an updated points list, control sequences and setpoints. Contractor(s) shall provide O&M data to the CxC prior to finalization of test procedures. O&M data must be approved prior to execution of IST's.

The CxC develops project specific test procedures to verify proper operation of integrated equipment and systems. The CxC obtains clarification, as needed, from Contractors and the DOR regarding sequences of operation to develop these tests. Prior to execution, the CxC provides a copy of the IST's to the Commissioning Team for a review of the test's feasibility, safety, warranty, and equipment protection. Prior to the start of IST the Contractor(s) must have completed and signed all FPT's.

2.2 Acceptance Phase

2.2.1 Execution of Functional Performance Test Procedures

The CxC coordinates functional test schedules with the general Contractor and CxG. The CxC facilitates, witnesses, and documents the functional testing of all equipment and systems according to contract documents. Contractor(s) execute the functional tests.

The control systems are tested before use to verify operation and performance of other components or systems. The air balancing and water balancing is completed and debugged before functional testing of air-related or water-related equipment or systems. Testing proceeds from components, to subsystems, to systems, and, finally, to interlocks and connections between systems.

1. Functional Test Procedures

- a. All Contractor(s) are encouraged to utilize the CxC issued Functional Test procedures in their own sequence testing to minimize the number of deficiencies identified during the functional testing process.
- b. Functional Test execution typical procedure:
 - i. Prior to execution, Functional Test procedures shall be reviewed by the Commissioning Team to ensure all safety protocols, as outlined in Contractor safety plan, shall be followed and there is no anticipated damage to equipment based on proposed test steps.
 - ii. All startup, factory authorized testing, and TAB procedures shall be complete. Control systems must be tested and operational for the respective system or component.
 - iii. Testing of systems/equipment shall begin by recording initial conditions. CxC shall be looking to verify the system is operating normally and meeting specific conditions.
 - iv. For equipment with the same Sequences of Operation, it is typically best practice to complete testing on a single unit and allow time for the Contractor(s) to make corrections on the unit tested, as well as correcting any issues that are considered to be typical to all units.

2. TAB Verification

- a. During functional testing the CxC shall work with the TAB Contractor to verify selected 10% of TAB report data, including air and water flow rates, pressure differentials, etc.
- b. For all readings, a deviation of more than 10% between the verification reading and reported data shall be considered as failing the FPT. The maximum failure rate for the sample is 10%.
- c. If greater than 10% of sample readings have failed, the TAB Contractor shall justify all noted failures or rebalance and re-document the system.

3. Controls (DDC) Checkout

- a. The Controls Contractor develops and submits a written start-up/checkout plan to the Commissioning Team, which describes the process they intend to follow in checking out the control system and the forms on which they shall document the process. The Controls Contractor shall meet with the TAB Contractor prior to the start of TAB, and review the TAB plan to determine the capabilities of the control system for use in TAB.
 - i. All required controls point-to-point verification, calibrations, start-up and selected functional tests of the system shall be submitted to the CxC & CxG.
- b. The Controls Contractor shall maintain all controller network hardware and software to allow for trend logs during functional testing. The checkout shall be conducted from the developed graphic page at an operator workstation.

4. Enclosure Testing

- a. CxC to attend preparatory meetings and perform site walkthroughs to observe enclosure components and system installation.
- b. Contractor to perform enclosure testing per the project documents. CxC shall witness and track the completion of the enclosure testing by contractor.

5. Deficiencies and Retesting

- a. Minor deficiencies can be corrected during the testing procedure and noted in FPT
- b. Non-conformance issues are noted and tracked in the ITF and reported to CxG and USACE.
- c. Contractor is responsible for informing the CxC of retesting schedules.
- d. For areas of dispute the final authority resides with USACE Project Manager.
- e. The cost to retest a FPT lies with the Contractor(s) if they are responsible for the deficiency, including cost incurred by the CxC, CxG, and USACE for retesting.
- f. Retesting shall not be considered a reason for a claim of delay or for a time extension by the Contractor(s).

6. Owner Participation

- a. The Owner's facility operations staff are encouraged to attend and participate in the testing process. The CxC will notify USACE when the commissioning events shall occur.

2.2.2 Sampling Strategy

Sampling percentage of each equipment type or system shall be as defined in specification section 01 91 00.15 10 Total Building Commissioning.

2.2.3 Execution of Integrated Systems Test Procedures

The CxC coordinates integrated systems test schedules with the general Contractor and CxG. The CxC facilitates, witnesses, and documents the integrated systems testing of all equipment and systems according to contract documents. Contractor(s) execute the integrated systems tests.

Execution of integrated systems tests will be carried out only after successful completion of the Functional Performance Tests by the Contractor(s).

1. Integrated Systems Test Procedures

- a. All Contractor(s) are encouraged to utilize the CxC issued Integrated Systems Test procedures in their own sequence testing to minimize the number of deficiencies identified during the functional testing process.
- b. Integrated Systems Test execution typical procedure:
 - i. Prior to execution, Integrated Systems Test procedures shall be reviewed by the Commissioning Team to ensure all safety protocols, as outlined in Contractor safety plan, shall be followed and there is no anticipated damage to equipment based on proposed test steps.
 - ii. All startup, factory authorized testing, and functional testing shall be complete. Control systems must be tested and operational for the respective system or component.
 - iii. Contractor and CxC will simulate different sequences or scenarios to document the results of the interactions between systems.
 - iv. If systems do not react per the Integrated Systems Test procedures, the issues will be documented by the CxC and reviewed with the Cx Team.

2. Deficiencies and Retesting:

- a. Minor deficiencies can be corrected during the testing procedure and noted in IST documents.
- b. Non-conformance issues are noted and tracked in the ITF and reported to CxG and USACE.
- c. Contractor is responsible for informing the CxC of retesting schedules.

- d. For areas of dispute the final authority resides with USACE Project Manager.
 - e. The cost to retest a IST lies with the Contractor(s) if they are responsible for the deficiency, including cost incurred by the CxC, CxG, and USACE for retesting.
 - f. Retesting shall not be considered a reason for a claim of delay or for a time extension by the Contractor(s).
3. Owner Participation:
- a. The Owner's facility operations staff are encouraged to attend and participate in the testing process. The CxC will notify USACE when the commissioning events shall occur.

2.2.4 Monitoring Based Commissioning

Monitoring Based Commissioning (MBCx) is the comprehensive process of tracking and logging data to assess system performance. The key elements of MBCx are collection of performance data, analysis of performance data, and implementation of improvements based on that analysis. MBCx allows for tracking of energy consumption, detection of faulty equipment or operation, and identification of unusual energy or power consumption patterns as they occur. MBCx will be accomplished via systems submetering, operational points trending, and real-time analyses, with sequence verification.

During the construction phase, the CxC will determine project specific points to be monitored and will determine the limits of acceptable values for tracked points and metered values. The CxC will develop trend log requirements for each energy and water consuming system to evaluate their impact on critical building parameters and energy and water consumption. Trend logs will consist of points such as temperatures, valve positions, damper positions, setpoints, motor speeds, etc. These logs will assist in demonstrating the operation of individual and integrated systems.

Deficiencies identified by the CxC during trend logging/monitoring will be documented in the ITF and reported to the appropriate parties for correction. Subcontractors correct deficiencies, notify the CxC, and return documentation certifying correction. The CxC will then collect new trend data verifying correction of deficiencies. Commissioning trend logs will be used by O&M staff as a baseline against which to evaluate performance of the systems after occupancy. Commissioning trend logs should not be used by O&M staff as a target for continuing trending, but as a minimum performance standard.

Sample items to be monitored:

1. Domestic water consumption
2. Total building electrical consumption and demand
3. HVAC electrical consumption and demand
4. Chilled water consumption (BTU & Flow Meter)
5. Lighting consumption and demand

Sample equipment and points to be monitored:

<u>Air Handling Unit</u>		
Point	Sensor Tag	Units
Outside Air Temperature	<i>OAT-1</i>	<i>°F</i>
Outside Air Humidity	<i>OA_HUM</i>	<i>%RH</i>
Outside Air Dewpoint	<i>OA_DPT</i>	<i>°F</i>
Outside Air Enthalpy	<i>OA_ENTH</i>	<i>BTU/lbm</i>
Duct Static Pressure 1	<i>DPS-1</i>	<i>" w.c.</i>
Building Diff Pressure 1	<i>DPS-5</i>	<i>" w.c.</i>

2.2.5 O&M Manuals

Contractor(s) shall submit copies of the O&M manuals, start-up, and preventative maintenance data for the equipment/systems being commissioned at the same time of the equipment submittal process for early development of proper test procedures and field testing. The O&M Manuals shall comply with the following:

1. O&M Manual Review – The CxC and CxG shall review O&M manuals applicable to commissioned equipment and systems and verify that O&M materials are complete and in compliance with Specifications.
2. The CxC and CxG review the O&M manuals as early as possible in the procurement and construction phase so that O&M information is available for development of Construction Checklists, Functional Test Procedures, and Integrated Systems Test. The CxC and CxG shall submit review comments to the DOR.

2.2.6 Training

1. The Contractor(s) are responsible for training coordination, scheduling and ultimately for ensuring Owner's Training is completed. The CxC and CxG are responsible for overseeing training content and adequacy of the training for commissioned equipment.

2. The Contactor(s) shall submit Training Plans for each discipline, equipment, and system. The CxC and CxG shall review these plans to verify compliance with the specifications. The Owner shall review the training plan for content, scheduling, and coordination. All training plans shall be submitted and approved prior to the start of any training.
3. A copy of completed training records shall be compiled by the CxC, reviewed by the CxG, and included in the Final Commissioning Report.

2.2.7 Final Commissioning Report and Systems Manual

CxC shall provide a Final Commissioning Report and Systems Manual to the CxG and USACE detailing all commissioning activities carried out during the project. The report shall include all acquired documentation, logs, minutes, reports, deficiency lists, communications, findings, unresolved issues, etc., compiled in appendices, and provided with the summary report. These electronic documents shall provide the Owner with a searchable reference of all as-built drawings, specifications, O&M manuals and important documentation for successfully operating and maintaining the facility in the future.

Report shall be an electronically searchable document and shall include, but not be limited to, the following:

1. Executive summary of commissioning process and results, system deficiencies identified and resolution, and outstanding issues
2. Project Directory
3. Commissioning Plan
4. List of Systems Commissioned
5. PFCs, Start-Up Reports, and Functional Tests
6. Issues Log, detailing open and closed issues

The Systems Manual shall be an electronically searchable documents and include the following:

1. Owner's Project Requirements
2. Basis of Design
3. System Single-Line Diagrams
4. Construction Record Documents and Specifications
5. Approved Submittals
6. As-Built Drawings

7. As-Built Sequence of Operation and Original Setpoints
8. Recommended Schedule for Recommissioning and Sensor Calibration
9. Equipment Operations and Maintenance Manuals
10. Equipment Preventive Maintenance Schedules
11. Training Records
12. Ongoing System Optimization Procedures
13. Final Commissioning Report

2.3 Warranty Phase

2.3.1 Seasonal Testing

1. During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this contract.
2. The CxC shall coordinate this activity with the USACE Project Manager, CxG, and the Contractor(s).
3. Tests will be executed, documented and deficiencies corrected by the appropriate parties, with USACE maintenance staff, CxC, and CxG witnessing.
4. Any final adjustments to the Final Commissioning Report and Systems Manual due to the testing will be made by the responsible parties.

2.3.2 Warranty Walkthrough

1. Warranty walkthrough shall occur 9 months after substantial completion. Deficiencies identified during the warranty walkthrough shall be recorded and tracked in Issues Log.
2. CxC to participate in walk through along with Contractor(s) and USACE Project Manager. Schedule and agenda of walkthrough will be issued 4 weeks prior for coordinating.

3.0 SCHEDULE

3.1 Schedule

The CxC shall be responsible for coordinating with the General Contractor to integrate commissioning activities into the master construction schedule for the construction phase of the project.

The following requirements for the Commissioning schedule apply:

1. Major milestones and substantial completion dates.
2. All factory testing or equipment startups for HVAC, Electrical, and Plumbing Systems.
3. All preparatory walkthroughs and functional testing of Building Envelope Systems.
4. Electrical energization and testing activities.
5. Test & Balance and DDC Controls testing.
6. Phased turnover dates.
7. Training durations and completion for all systems.
8. Operations and Maintenance Manual submissions for all systems.

APPENDIX A – CX TEAM

Team Member	Company Contact	Email Phone
Owner Contracting Officer's Representative	USACE TBD	TBD TBD
General Contractor Project Manager	TBD TBD	TBD TBD
Commissioning Services Governments Commissioning Authority (CxG)	TBD TBD	TBD TBD
Commissioning Services Lead Commissioning Specialist (CxC)	TBD TBD	TBD TBD
Commissioning Services Lead Commissioning Specialist for the Design Phase (CxD)	Burns & McDonnell Mark Gaddy	mgaddy@burnsmcd.com 470-268-9623
Commissioning Services Envelope Commissioning	TBD TBD	TBD TBD
Commissioning Services Mechanical Commissioning	TBD TBD	TBD TBD
Commissioning Services Electrical Commissioning	TBD TBD	TBD TBD
DOR Team Project Manager	Burns & McDonnell Vince Bredickas	vrbredickas@burnsmcd.com 678-448-7203
DOR Team Mechanical Engineer	Burns & McDonnell Luke Leibkuchler	lg Leibkuchler@burnsmcd.com 407-484-5211
DOR Team Electrical Engineer	Burns & McDonnell Jacob Van Wagoner	jdvanwagoner@burnsmcd.com 678-740-0528
DOR Team Architect	Burns & McDonnell Caitlin Tosloskie	ctosloskie@burnsmcd.com 757-916-4377
Mechanical Contractor Project Manager	TBD TBD	TBD TBD
Plumbing Contractor Project Manager	TBD TBD	TBD TBD
Electrical Contractor Project Manager	TBD TBD	TBD TBD
Temperature Controls Contractor Project Manager	TBD TBD	TBD TBD
Test & Balance Contractor Project Manager	TBD TBD	TBD TBD

APPENDIX B – ROLES AND RESPONSIBILITIES

The Roles and Responsibilities matrix identifies major components of the commissioning efforts along with parties involved. Responsibilities are organized into project phases where the activity typically occurs however the indicated responsibilities apply throughout all phases of the project.

Roles and Responsibilities		Responsible Party								
		L= Lead, R = Review, S = Supporting, A = As Required								
		COR	CxC	CxG	GC	DOR	MC	EC	TAB	TC
Communication and Coordination										
1	Ensure commissioning tasks align with Owners requirements		L	S						
2	Participate in commissioning meetings (scoping, kick-off, coordination, misc.)	S	L	S	S	A	A	A	A	A
3	Publish progress reports along with Issue Tracking Form (ITF) for the following activities: field observations, functional testing, and warranty review		L	S	S		S	S	S	S
4	Coordinate participation of Contractor(s) throughout the commissioning process		S	S	L		S	S	S	S
5	Provide meeting space and presentation equipment (as required) for all commissioning meetings		S	S	L	S	S	S	S	S
6	Coordinate installation progress inspections and punch list efforts for applicable work		L	S	S	A				
7	Coordinate and publish minutes for commissioning meetings		L	S						
8	Promptly notify the CxC of any issues which may affect the commissioning process or final system performance	S		S	L	S	S	S	S	S

Roles and Responsibilities		Responsible Party								
		L= Lead, R = Review, S = Supporting, A = As Required								
		COR	CxC	CxG	GC	DOR	MC	EC	TAB	TC
9	Provide information regarding substitutions, change orders, RFIs and Engineer's supplemental instructions which may affect commissioning	S			L	S	S	S	S	S
Design Phase										
10	Develop commissioning specifications for incorporation into design documents	R		L		R				
11	Review design documents for compliance with Owner's Project Requirements	R		L		S				
Construction Phase										
12	Develop project specific Commissioning Plan. Provide revisions, as necessary, throughout the project	R	L	R	S	R	S	S	S	S
13	Plan and conduct a Commissioning Kick-off meeting along with other commissioning meetings, as necessary	S	L	S	S	S	S	S	S	S
14	Coordinate and incorporate commissioning activities into the master construction schedule. Distribute construction schedule updates to Cx team.		S	S	L					
15	Provide copies of submittals, O&M manuals and as-built drawings to CxC (submittals provided through Aconex)				L	S	S	S	S	S
16	Perform focused submittal reviews for compliance with commissioning needs. Occurs concurrent with A/E review		L	R		R				

Roles and Responsibilities		Responsible Party								
		L= Lead, R = Review, S = Supporting, A = As Required								
		COR	CxC	CxG	GC	DOR	MC	EC	TAB	TC
17	Provide design narrative and sequences of operations for all pieces of equipment to be commissioned in areas where specifications, control drawings or equipment documentation is not sufficient to allow for detailed Functional Test Procedures to be written		R	S	S	L	S	S		S
18	Prepare Construction Checklists and Functional Test procedures from approved equipment submittals, specifications, and design documentation	R	L	R	S	R	S	S	S	S
19	Perform site observations to verify integrity of equipment installation		A	A		A				
20	Coordinate participation of Contractor(s) in the commissioning process		S	S	L		S	S	S	S
21	Identify, review, supplement and monitor completion status of Construction Checklists.		L	S	S		S	S	S	S

Roles and Responsibilities		Responsible Party								
		L= Lead, R = Review, S = Supporting, A = As Required								
		COR	CxC	CxG	GC	DOR	MC	EC	TAB	TC
22	Coordinate completion of Construction Checklists and testing procedures as required by specifications and manufacturer's recommendations (i.e. pipe clean, flush, fill, pressure test; equipment efficiency/performance testing, etc.). Provide completed documentation to CxC.		R	R	L		S	S	S	S
23	Submit copies of BAS point-to-point documentation to CxC upon completion of each system		R	R	S					L
24	Coordinate TAB activities with Mechanical, Electrical and specialty Contractor(s). Verify coordination, installation, quality control and final Contractor(s) testing has been completed to allow for system balancing to be completed		S	S	L		S	S	S	S
25	Provide CxC with access to BAS front end to allow for completion of Functional Test Procedures			S	S					L
26	Verify coordination, installation, quality control, and final Contractor(s) testing has been completed such that installed systems and equipment comply with contract and design documents		L	S	S		S	S	S	S
27	Witness equipment and system start-ups		L	S	S		S	S		S

Roles and Responsibilities		Responsible Party								
		L= Lead, R = Review, S = Supporting, A = As Required								
		COR	CxC	CxG	GC	DOR	MC	EC	TAB	TC
28	Review completed Contractor start-up and Construction Checklists, point-to-point checkout, sensor calibration and TAB documentation as well as the punch lists provided by the team to confirm systems are ready for Functional Testing. Provide copies of all documentation to CxC.		L	R	S		S	S	S	S
29	Provide any necessary BAS graphics or trend data to CxC for review		R	R	S					L
Acceptance Phase										
30	Coordinate required Contractor(s) and schedule Functional Testing		S	S	L		S	S	S	S
31	Coordinate with Contractor(s) to provide tools, equipment, facility access and instruction as required throughout the commissioning process			S	L		S	S	S	S
32	Operate equipment and systems as required to complete Functional Testing. This will include manipulation of the building automation system to simulate different control sequences				A		S	S		L
33	Witness execution of Functional Testing per written test procedures. Complete required documentation	A	L	S	S		S	S	S	S
34	Assist CxC during TAB verification			S	S				L	S

Roles and Responsibilities		Responsible Party								
		L = Lead, R = Review, S = Supporting, A = As Required								
		COR	CxC	CxG	GC	DOR	MC	EC	TAB	TC
35	Participate in resolution of identified system deficiencies, fine-tuning or troubleshooting of system performance, as required to meet contract documents	S	S	S	S	S	S	S	S	S
36	Provide completed O&M's and as-built drawings to the CxC, CxG, DOR and Owner for review, verification and distribution		R	R	L	R	S	S	S	S
37	Assemble and provide Owner's training plan to the Commissioning team for review (this is to be approved prior to implementing the training program)	R	R	R	L	R	S	S	S	S
38	Provide training records to be completed during the training sessions	R	R	R	L	R	S	S	S	S
39	Arrange for facility operating and maintenance personnel to attend field training sessions, as required	L		S						
40	Provide training for the systems, as required by contract documents. Provide CxC with copy of training documents and sign-in sheets		R	R	L		S	S	S	S
Post-Occupancy Phase										
41	Coordinate and schedule seasonal or deferred testing, as necessary. Participate in resolution of identified system deficiencies. Coordinate retesting, as necessary.	S	S	S	L		S	S	S	S

Roles and Responsibilities		Responsible Party								
		L= Lead, R = Review, S = Supporting, A = As Required								
		COR	CxC	CxG	GC	DOR	MC	EC	TAB	TC
42	Operate equipment and systems as required for seasonal or deferred testing				A		S	S		L
43	Witness execution of seasonal or deferred testing and complete required documentation	A	L	S	S		S	S	S	S
44	Participate in 10-month warranty review meeting	S	L	S	S		S	S	S	S
45	Provide information requested by CxC for final Commissioning documentation. Final documentation should be provided within 10 business days of 10-month review.			S	L		S	S	S	S
46	Assemble all commissioning documentation and test results required for compilation of final report		L	S	S	S	S	S	S	S
47	Prepare final Systems Manual	R	L	R			S	S	S	S

Owner - USACE (COR), Commissioning Authority (CxG), Contractor's Commissioning Specialist (CxC), General Contractor (GC), Designer of Record (DOR), Mechanical Contractor (MC), Electrical Contractor (EC), Test and Balance Contractor (TAB), Temperature Controls Contractor (TC)

APPENDIX C – CX WRITTEN WORK PRODUCTS

Product	Developed By	Reviewed By	Approved By	Phase
Owner's Project Requirements	DOR	CxG, COR	COR	Pre-Design
Cx Plan	CxG, CxC	All Cx Team	COR	All
Cx Specifications	CxG	DOR, COR	DOR, COR	Design
Cx Design Review Comments	CxG	DOR	DOR	Design
Cx Meeting Minutes	CxC	All Cx Team	N/A	All
Cx Schedules	CxC, GC	All Cx Team	COR	Construction
Issue Tracking Form (Deficiencies)	CxC	All Cx Team	N/A	Construction / Acceptance
Cx Site Visit Reports	CxC	All Cx Team	N/A	Construction
Equipment Submittal	Contractors	CxC, DOR, CxG	DOR	Construction
Temperature Control Submittal	TC	CxC, DOR, CxG	DOR	Construction
Cx Submittal Review Comments	CxC, CxG	DOR	DOR	Construction
Construction Checklists	CxC	All Cx Team	N/A	Construction
Start-up and Initial Checkout Plan	Contractors	CxC, CxG	CxC, CxG	Construction
Start-up and Checkout Forms Completed	Contractors	CxC, CxG	CxC, CxG	Construction
Balancing Plan and Procedures	TAB	CxC, DOR, CxG	DOR	Construction
Final Balancing Report	TAB	CxC, DOR, CxG	DOR	Construction
Temperature Controls Checkout Forms	TC	CxC, DOR, CxG	DOR	Construction
Functional Test Forms	CxC	All Cx Team	N/A	Acceptance
Completed Functional Tests	CxC	CxG, COR	OR	Acceptance
O&M Manuals	Contractors	CxC, DOR, CxG	DOR	Construction / Acceptance
Training Plans	Contractors	CxC, COR, CxG	COR	Acceptance
Training Records	Contractors	CxC, COR, CxG	COR	Occupancy
Commissioning Report & Systems Manual	CxC	CxG, COR	COR	Occupancy

APPENDIX D – EQUIPMENT TO BE COMMISSIONED

Commissioned Systems	Tag (if applicable)	Construction Checklist (CC)	Functional Test (FT)
HVAC Systems			
Air Handling Units	AHU	CC TBD	FT TBD
Dedicated Outdoor Air System	DOAS	CC TBD	FT TBD
Heat Pumps	HP	CC TBD	FT TBD
Ductless Split Systems	DSCU/DSFCU	CC TBD	FT TBD
Variable Air Volume Boxes	VAV	CC TBD	FT TBD
Exhaust Fans	EF	CC TBD	FT TBD
Ceiling Fans	CF	CC TBD	FT TBD
Plumbing Systems			
Water Heaters	WH	CC TBD	FT TBD
Recirculation Pump	RP	CC TBD	FT TBD
Thermostatic Mixing Valve	TMV	CC TBD	FT TBD
Electrical Systems			
Interior/Exterior Lighting Control	-	CC TBD	FT TBD
Power Distribution	-	CC TBD	FT TBD
Standby Natural Gas Generator	-	CC TBD	FT TBD
Automatic Transfer Switch	ATS	CC TBD	FT TBD
Uninterruptible Power Supply	UPS	CC TBD	FT TBD
Breaker Coordination	-	CC TBD	FT TBD
Building Envelope			
Whole Building Air Leakage Testing (performed by test agency) in conjunction with diagnostic testing (thermography and additional diagnostic tests as necessary); Witness Testing and review Testing Report.	-	CC TBD	N.A.
Thermal Envelope Continuity; Witness Testing and review Testing Report.	-	CC TBD	N.A.
Fluid Applied Air Barrier; Construction Mock-up, Witness Testing or Review of Testing Reports, and Construction Site Visits.	-	CC TBD	N.A.
Exterior Joint Sealants; Construction Mock-Up, Witness or Review of Testing Reports, and Construction Site Visits.	-	CC TBD	N.A.
Roofing Systems; Submittal Review and Site Visits.	-	CC TBD	N.A.
Glazing, Skylights, Doors, and Translucent Panels; Submittal Review and Construction Site Visits.	-	CC TBD	N.A.
General Systems			
Building Automation System	BAS	CC TBD	FT TBD
Utility Monitoring and Control System	-	CC TBD	FT TBD
Energy, Gas, and Water Utility Metering Systems	-	CC TBD	FT TBD
Testing, Adjusting and Balancing Verification	-	CC TBD	FT TBD

APPENDIX E – SAMPLE PRE-FUNCTIONAL CHECKLIST

CONSTRUCTION CHECKLIST: AIR HANDLING UNIT (AHU-01)**CC-01**

Date: January 2026
Project Name: Military Working Dog Kennel, HAAF
Owner: US Army Corps of Engineers Savannah District
Proj No.: 189618

1. EQUIPMENT INFORMATION

Equipment Tag: AHU-01	Manufacturer: _____
System: HVAC	Model No: _____
Location: _____	Area Served: _____
Put in Service: _____	

2. SUBMITTAL

Submittal: The above equipment and systems integral to them are complete and ready for functional testing. The checklist items are complete and have been checked off only by parties having direct knowledge of the event, as marked below. This pre-functional checklist is submitted for approval, subject to an attached list of outstanding items yet to be completed. A Statement of Correction will be submitted upon completion of any outstanding areas. None of the outstanding items preclude safe and reliable functional tests being performed.

_____ Mechanical Witness	_____ Date	_____ Controls Witness	_____ Date
_____ Electrical Witness	_____ Date	_____ Manufacturer's Rep. or Equipment Supplier	_____ Date
_____ Other Witness (As Appropriate)	_____ Date		

3. REQUESTED DOCUMENTATION

Document	Supplied Yes / No	Comments/Notes	Initials
Specifications			
Manufacturer's cut sheets			
Performance data (fan curves, coil data, etc.)			
Installation and startup manual			
Sequences and control strategies			
O&M manuals			
Start-up Report			
Testing, Adjusting and Balancing Report			

4. MODEL VERIFICATION

Please note any changes:

		Design Data	As Submitted
Tag		AHU-01	AHU-01
Service			
Location			
Fan Data	Number of Fans		
	Air Flow		
	Min & Max OA Flow		
	Total SP		
	ESP		
	RPM		
	Drive		
	Air Volume Control Type		
Fan Motor Data (per fan)	Power (HP)		
	RPM		
	Volts/Ph/Hz		
Cooling Coil Data	EAT DB		
	EAT WB		
	LAT DB		
	LAT WB		
	Total Capacity		
	Sensible Capacity		
	SP		
	Min Face Area		
	Max Face Velocity		
	Water Flow		
	EWT		
	LWT		
	DP		
	Max # of Rows		
	Fin Density		
Heating Coil Data	EAT DB		
	EAT WB		
	LAT DB		
	LAT WB		
	Total Capacity		
	SP		
	Min Face Area		
	Max Face Velocity		
	Water Flow		
	EWT		
	LWT		

		Design Data	As Submitted
	DP		
	Max # of Rows		
	Fin Density		
Filter Data	MERV Rating		
	Airflow		
	Face Area		
	Filter Depth		
	Initial SP		
	Final SP (i.e. Dirty Filter)		
Manufacturer			
Model			

Please record all nameplate information (clearly visible picture is acceptable in lieu of handwriting):

AHU-01: NAMEPLATE INFORMATION

5. INSTALLATION CHECKS (Note any comments or deficiencies in notes section)**Abbreviations:**

The following abbreviations are to be used to denote the contracting party for each checklist item in this section:

Mech = Mechanical Contractor

Ctrl = Controls Contractor

Elec = Electrical Contractor

Mfr. = Manufacturer's Rep. or Equipment Supplier

-Add appropriate abbreviation above for any additional witnessing parties

Check	Contractor	Initials & Date				Note #
		HWP-1	HWP-2	HWP-3	HWP-4	
EXAMPLE						
EXAMPLE: Pump type differential pressure status is installed per design and correctly integrated into PCS controls.	Mech	ABC 4/18/12		ABC 4/18/12	N/A	1

Notes:

1. Example: 4/18/12 HWP-2 DP sensor is not communicating with PCS.

Check	Contractor	Initials & Date	Note #
		AHU-01	
General Installation			
General appearance good, no apparent damage.	Mech		
Access doors close tightly - no leaks.	Mech		
Flexible connection installed properly.	Mech		
Proper vibration isolators installed.	Mech		
Unit is anchored per installation specifications.	Mech		
Maintenance access acceptable for unit and components.	Mech		
Instrumentation installed according to specification (thermometers, pressure gages, filter gauges, etc.).	Mech		
Verify shipping, blocking, and bracing are removed. Clean-up equipment and installed ductwork of all debris prior to unit start-up per specifications.	Mech		
Piping, valves and equipment are insulated and labeled according to plans, specifications, and manufacturer's recommendations.	Mech		

Check	Contractor	Initials & Date	Note #
		AHU-01	
Piping			
Hydronic piping installed per plans, specifications and manufacturer's recommendations.	Mech		
Piping supported independently of the equipment.	Mech		
Strainer installed per design drawings and start-up strainer has been removed.	Mech		
All coils are clean and fins are in good condition.	Mech		
All condensate drain pans clean and slope to drain, per specification.	Mech		
Condensate drain line insulated per design drawings and specifications.	Mech		
All control, isolation and balancing valves are installed and properly labeled.	Mech		
Air vents and bleeds at high points of systems functional.	Mech		
Test plugs (P/T) installed near all control sensors according to specifications.	Mech		
Fans and Dampers			
Fans and motors properly aligned.	Mech		
Fans and motors properly lubricated.	Mech		
Fan vibration isolation equipment and any seismic controls installed.	Mech		
Filter pressure differential measuring devices installed and functional (gauge and control platform sensor).	Mech		
OA damper operates freely and closes tightly.	Mech		
OA damper linkage has minimum play.	Mech		
Backdraft damper provided on each array fan.	Mech		
Ductwork (preliminary check)			
No apparent severe duct restrictions.	Mech		
Ductwork seams and connections sealed to prevent air leakage.	Mech		
Outside supply air intakes located away from pollutant sources & exhaust outlets.	Mech		

Check	Contractor	Initials & Date	Note #
		AHU-01	
Electrical and Controls			
Power disconnects in place and labeled.	Elec		
All electric connections tight.	Ctrl/Elec		
Proper grounding installed for components and unit.	Elec		
Safeties in place and operable.	Elec		
All control devices and wiring complete and operational.	Elec/Ctrl		
Variable Frequency Drives			
Permanent label affixed.	Elec		
Securely mounted.	Elec		
VFD powered (wired to controlled equipment).	Elec		
VFD location not subject to excessive temperatures, moisture or dirt.	Elec		
VFD size matches motor size.	Elec		
VFD connected to control system and operational.	Ctrl		
All controlling sensors properly located per drawings and calibrated.	Ctrl		
Unit is programmed and tested with a copy of the startup test report attached to this checklist.	Mfr		
Test and Balance			
Construction (temporary) air filters removed from unit and replaced with final acceptance filters prior to final TAB measurements.	Mech		
Hydronic piping flushed, filled and hydrostatically tested per specifications.	Mech		
Final			
Startup report completed and attached to this checklist.	Mech		

6. OPERATIONAL CHECKS

Check	Contractor	Initials & Date	Note #
		AHU-#	
No air or water leaking apparent during operation.	Mech		
No condensation forming on CHW piping during operation.	Mech		
Both supply fan rotations verified correct.	Elec		
No unusual noise or vibration.	Mech/Mfr		
Specified sequences of operation have been implemented with any deviations documented and provided to CxA and design engineer for review.	Ctrl		
Provide calibration data and results for all field and factory installed sensors and actuators. Attach copy of results to this Checklist. (A copy of the manufacturer's test report showing factory sensor calibrations is also acceptable)	Ctrl/Mfr		
Piping/duct gages and control platform temperature and pressure readouts match.	Mech/Ctrl		
All dampers (OSA, RA, EA, etc.) stroke fully without binding, spans calibrated and control platform communication verified.	Ctrl		
Valves stroke fully and easily and spanning is calibrated.	Ctrl		

*****End of Checklist*******Notes:**

1.

7. APPROVALS

This completed Pre-functional Checklist has been reviewed. Its completion is approved with the exceptions noted below.

**Burns & McDonnell
Commissioning Authority**

Print Name

Signature

Date**Contracting Officer's
Representative**

Print Name

Signature

Date

APPENDIX F – SAMPLE FUNCTIONAL PERFORMANCE TEST

FUNCTIONAL TEST: AIR HANDLING UNIT (AHU-01)**FT-01**

Date: January 2026
Project Name: Military Working Dog Kennel, HAAF
Owner: US Army Corps of Engineers Savannah District
Proj No.: 189618

1. EQUIPMENT INFORMATION

Equipment Tag:	AHU-101	Manufacturer:	_____
System:	HVAC	Model No:	_____
Location:	_____	Area Served:	_____
Put in Service:	_____		

2. PARTICIPANTS

<u>Party</u>	<u>Participation</u>
_____	Controlling & monitoring the BAS
_____	Commissioning Authority
_____	Witnessing the test
_____	Witnessing the test
_____	Witnessing the test

Party filling out this form and witnessing testing: _____

Date of Testing	_____	Weather	_____
Date of Testing	_____	Weather	_____
Date of Testing	_____	Weather	_____
Date of Testing	_____	Weather	_____
Date of Testing	_____	Weather	_____

3. TEST PREREQUISITES & STARTUP COMPLETION STATEMENT

- Contractor submitted Construction Checklists (CCs) for equipment associated with this functional test have been verified by the Commissioning Authority (CxC)
- Any and all applicable contractor and manufacturer start-up reports have been provided to the CxC and reviewed

With the exception of any applicable outstanding Commissioning Issue Tracking Form items pending contractor response, I hereby certify that the aforementioned pre-functional commissioning activities are substantially complete for the equipment associated with this test document.

Commissioning Authority

Date

4. TESTING PROCEDURES AND RECORD

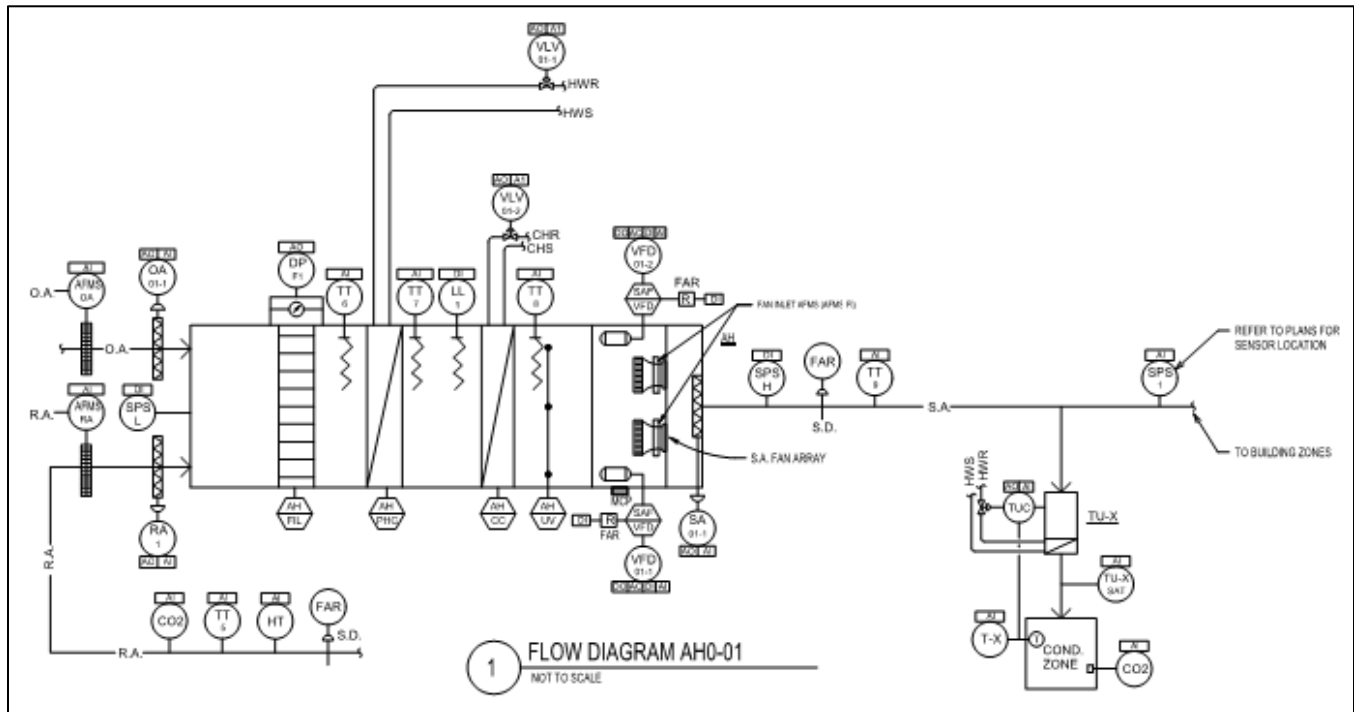
Point-to-Point Checkout:

In this section DDC point data is collected to provide a 'snapshot' of the system operation at one moment. This data is then compared to the Plans, Specs and industry standards for logic.

For Example:

- Does the controller display values that are within acceptable ranges, based on design specifications and operating conditions?
- Are the 'units' displayed properly from the Front-End? Missing or mismatched units need to be resolved.

Screen Captures:



[illegible]

NOTES:

1. FAILURE MODES:
O - OPEN OR ON
C - CLOSE OR OFF
L - LAST COMMAND

2. WHERE FAILURE MODE IS INDICATED, THE INDICATED POSITION SHALL OCCUR ON INTERRUPTION OF ELECTRIC POWER TO THE DDC PANEL.



REFER TO PLANS FOR
SENSOR LOCATION

Notes:

1.

Sequence of Operation:

In this section the system's sequences of operation are tested in a Dynamic manner. All functionality called for in the plans and specifications should be demonstrated and thoroughly tested to ensure that the design intent is achieved.

Sequence of Operation	Pass	Fail	Comments
Example. Supply fan runs during occupied period.	Pass		
Example. Duct static maintained at set point.		Fail	<i>Fire Smoke Damper is closed. XYZ contractor needs to open it, to provide air to the duct static sensor.</i>
Normal Operation			
Outdoor Air Control			
Verify that the following occurs: OA damper slowly opens from closed to maintain the OA flow setpoint as read from the air flow meter.			<i>Min OA Flow Stpt: 3,800 CFM</i>
Verify that the outside air fan (SF-1) is integrated into the air handling unit controls per design documents.			
Unit Startup Control			
Verify that the following occurs when the OAT is below 50°F: - CHW valve shall close. - HW preheat valve shall modulate to maintain 70°F DAT. - Unit startup control terminates when RAT is between the startup temperature range setpoints for a time duration greater than the startup control timer setpoint.			<i>Startup Temp. Range: 68°F-78°F Startup Control Timer: 10 minutes</i>
Verify that the following occurs when the OAT is above 65°F: - HW preheat valve shall close. - CHW valve shall modulate to maintain 54°F DAT. - Unit startup control terminates when RAT is between the startup temperature range setpoints for a time duration greater than the startup control timer setpoint.			<i>Startup Temp. Range: 68°F-78°F Startup Control Timer: 10 minutes</i>
Fan Array Control			
Verify that the following occurs with respect to duct static pressure and control of the fan arrays: - During unit startup control DSP setpoint shall be 1.25" WC. - VFD shall modulate fan array speed to maintain DSP setpoint. - DSP setpoint shall be reset every 10 minutes. - If any VAV is greater than 90% open, DSP setpoint shall be increased. - If all VAVs are less than 90% open, DSP setpoint shall be decreased. - All VAVs over 90% open are identified in the BAS.			<i>Startup DSP Stpt: 1.25" WC Startup DSP Lock Timer Stpt: 20 minutes DSP Reset Timer Stpt: 10 minutes DSP Reset Increment: _____" WC Minimum DSP Stpt: _____" WC Maximum DSP Stpt: _____" WC</i>

Sequence of Operation	Pass	Fail	Comments
Discharge Temperature Control			
Lower the discharge cooling temperature setpoint down below the current discharge temperature and verify the following: - CHW coil valve shall modulate to maintain the new discharge air temperature setpoint. - HW preheat valve shall remain closed.			<i>Discharge Clg. Temp. Stpt: 54°F</i>
Raise the discharge cooling temperature setpoint up above the current discharge temperature and verify the following: - CHW coil valve shall remain closed. - HW preheat valve shall modulate to maintain the new discharge air temperature setpoint.			<i>Discharge Htg. Temp. Stpt: 52°F</i>
Humidity Control			
Lower the return air relative humidity setpoint down below the current relative humidity and verify the following: Discharge temperature setpoint shall be decreased by 2°F every 10 minutes down to the minimum DAT setpoint of 50°F.			<i>Return Air RH Max Stpt: 55% RH</i>
Raise the return air relative humidity setpoint up above the current relative humidity and verify the following: Discharge temperature setpoint shall be increased by 2°F every 10 minutes up to the maximum DAT setpoint of 54°F.			<i>Return Air RH Min Stpt: 49% RH</i>
Building Exhaust Fan Control			
Verify that the building exhaust air fan (OE-1) is integrated into the air handling unit controls per design documents.			
Safeties & Alarms			
Freezestat			
Simulate mixed air temperature below the freezestat setpoint of ____°F and verify the following: - Cooling coil valve shall fully open. - Both supply fans shall disable. - OA damper shall fully close. - Alarm shall be initiated at the BAS.			<i>Freezestat Temp. Stpt: °F</i>
Smoke/Fire Detection			
Simulate a supply air smoke detection and verify the following: - OA damper closes. - RA damper opens. - CHW & HW control valves close. - SF array disables. - Alarm shall be initiated at the BAS.			

Sequence of Operation	Pass	Fail	Comments
Simulate a return air smoke detection and verify the following: • OA damper closes. • RA damper opens. • CHW & HW control valves close. • SF array disables. • Alarm shall be initiated at the BAS.			
Simulate a fire alarm relay detection and verify the following: • OA damper closes. • RA damper opens. • CHW & HW control valves close. • SF array disables. • Alarm shall be initiated at the BAS.			
Verify that the following condition initiates an alarm at the BAS: • High static pressure alarm as indicated by the duct pressure sensor being above setpoint.			<i>High Duct Static Alarm Stpt: 4.0" WC</i>
Verify that the following condition initiates an alarm at the BAS: • Low static pressure alarm as indicated by the OA/RA duct pressure sensor being below setpoint.			<i>Low Duct Static Alarm Stpt:</i>

*** End of Test ***

Notes:

1.

5. APPROVALS

This completed Functional Performance Test has been reviewed. Its completion is approved with the exceptions noted below.

**Burns & McDonnell
Commissioning Authority**

Print Name

Signature

Date**Contracting Officer's
Representative**

Print Name

Signature

Date

APPENDIX G – SAMPLE ISSUES LOG



Military Working Dog Kennel, HAAF
Savannah, Georgia
Name (CxG), Name (CxC), and Name (COR)
Commissioning Issues Tracking Form
Jan-26

The following comments are intended to identify Commissioning related issues as they pertain to constructability, testability, control, energy efficiency, maintainability, and user operability. No design direction is inferred or implied. Engineer-of-Record maintains all responsibility for the intent of the design as identified by the contract documents.

Item	Date Found	Status	Equipment Type	Issue	Recommendation / Solution	Responsible Parties	Date Corrected	Corrected By	Comments	Date Verified
1	Jan-26	Open								
2	Jan-26	Open								
3	Jan-26	Open								
4	Jan-26	Open								
5	Jan-26	Open								
6	Jan-26	Open								
7	Jan-26	Open								
8	Jan-26	Open								
9	Jan-26	Open								
10	Jan-26	Open								
11	Jan-26	Open								
12	Jan-26	Open								
13	Jan-26	Open								
14	Jan-26	Open								
15	Jan-26	Open								
17	Jan-26	Open								



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Burns & McDonnell Engineering
4004 Summit Blvd NE, Suite# 1200
Atlanta, GA, 30319
O 770-587-4776
www.burnsmcd.com

SECTION 02 41 00

DEMOLITION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

AHRI Guideline K (2009) Guideline for Containers for Recovered Non-Flammable Fluorocarbon Refrigerants

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP A10.6 (2006) Safety & Health Program Requirements for Demolition Operations - American National Standard for Construction and Demolition Operations

CARPET AND RUG INSTITUTE (CRI)

CRI 104 (2015) Carpet Installation Standard for Commercial Carpet

CRI 105 (2015) Carpet Installation Standard for Residential Carpet

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2024) Safety -- Safety and Occupational Health (SOH) Requirements

U.S. DEFENSE LOGISTICS AGENCY (DLA)

DLA 4145.25 (Jun 2000; Reaffirmed Oct 2010) Storage and Handling of Liquefied and Gaseous Compressed Gases and Their Full and Empty Cylinders
<http://www.aviation.dla.mil/UserWeb/aviationengineerir>

U.S. DEPARTMENT OF DEFENSE (DOD)

DOD 4000.25-1-M (2006) MILSTRIP - Military Standard Requisitioning and Issue Procedures

MIL-STD-129 (2014; Rev R; Change 1 2018; Change 2 2019) Military Marking for Shipment and Storage

U.S. FEDERAL AVIATION ADMINISTRATION (FAA)

FAA AC 70/7460-1

(2016; Rev L; Change 2) Obstruction
Marking and Lighting

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 61

National Emission Standards for Hazardous
Air Pollutants

40 CFR 82

Protection of Stratospheric Ozone

49 CFR 173.301

Shipment of Compressed Gases in Cylinders
and Spherical Pressure Vessels

1.2 PROJECT DESCRIPTION

1.2.1 Definitions

1.2.1.1 Demolition

Demolition is the process of wrecking or taking out any load-supporting structural member of a facility together with any related handling and disposal operations.

1.2.1.2 Deconstruction

Deconstruction is the process of taking apart a facility with the primary goal of preserving the value of all useful building materials.

1.2.1.3 Demolition Plan

Demolition Plan is the planned steps and processes for managing demolition activities and identifying the required sequencing activities and disposal mechanisms.

1.2.1.4 Deconstruction Plan

Deconstruction Plan is the planned steps and processes for dismantling all or portions of a structure or assembly, to include managing sequencing activities, storage, re-installation activities, salvage and disposal mechanisms.

1.2.2 Demolition/Deconstruction Plan

Prepare a Demolition Plan and submit proposed demolition and removal procedures for approval before work is started. Include in the plan procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress, a disconnection schedule of utility services, and airfield lighting, a detailed description of methods and equipment to be used for each operation and of the sequence of operations. Identify components and materials to be salvaged for reuse or recycling with reference to paragraph Existing Facilities to be Removed. Append tracking forms for all removed materials indicating type, quantities, condition, destination, and end use. Coordinate with Waste Management Plan in accordance with Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL. Provide procedures for safe conduct of the work in accordance with EM 385-1-1. Plan shall be approved by Contracting Officer's Representative prior to work beginning.

1.2.3 General Requirements

Do not begin demolition or deconstruction until authorization is received from the Contracting Officer. The work of this section is to be performed in a manner that maximizes the value derived from the salvage and recycling of materials. Remove rubbish and debris from the project site; do not allow accumulations on airfield pavements. The work includes demolition of identified items and materials and removal of resulting rubbish and debris. Remove rubbish and debris from Government property daily, unless otherwise directed. Store materials that cannot be removed daily in areas specified by the Contracting Officer. In the interest of occupational safety and health, perform the work in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections.

1.3 ITEMS TO REMAIN IN PLACE

Take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Government. Repair or replace damaged items as approved by the Contracting Officer. Coordinate the work of this section with all other work indicated. Construct and maintain shoring, bracing, and supports as required. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as may be required as a result of any cutting, removal, deconstruction, or demolition work performed under this contract. Do not overload structural elements and pavements to remain. Provide new supports and reinforcement for existing construction weakened by demolition, deconstruction, or removal work. Repairs, reinforcement, or structural replacement require approval by the Contracting Officer prior to performing such work.

1.3.1 Existing Construction Limits and Protection

Do not disturb existing construction beyond the extent indicated or necessary for installation of new construction. Provide temporary shoring and bracing for support of building components to prevent settlement or other movement. Provide protective measures to control accumulation and migration of dust and dirt in all work areas. Remove snow, dust, dirt, and debris from work areas daily.

1.3.2 Weather Protection

For portions of the building to remain, protect building interior and materials and equipment from the weather at all times. Where removal of existing roofing is necessary to accomplish work, have materials and workmen ready to provide adequate and temporary covering of exposed areas.

1.3.3 Trees

Protect trees within the project site which might be damaged during demolition or deconstruction, and which are indicated to be left in place, by a 6 foot high fence. Erect and secure fence a minimum of 5 feet from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Replace any tree designated to remain that is damaged during the work under this contract with like-kind or as approved by the Contracting Officer.

1.3.4 Utility Service

Maintain existing utilities indicated to stay in service and protect against damage during demolition and deconstruction operations. Prior to start of work, utilities serving each area of alteration or removal will be shut off by the Government and disconnected and sealed by the Contractor.

1.3.5 Facilities

Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities. Floors, roofs, walls, columns, pilasters, and other structural components that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, must remain standing without additional bracing, shoring, or lateral support until demolished or deconstructed, unless directed otherwise by the Contracting Officer. Ensure that no elements determined to be unstable are left unsupported and place and secure bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, deconstruction, or demolition work performed under this contract.

1.4 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Demolition Plan; G

Existing Conditions

SD-07 Certificates

Notification; G

SD-11 Closeout Submittals

Receipts

1.6 QUALITY ASSURANCE

Submit timely notification of demolition projects to Federal, State, regional, and local authorities in accordance with 40 CFR 61, Subpart M. Notify the local air pollution control district/agency and the Contracting Officer in writing 10 working days prior to the commencement of work in accordance with 40 CFR 61, Subpart M. Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements

of the "Contract Clauses," conform to the safety requirements contained in ASSP A10.6. Comply with the Environmental Protection Agency requirements specified. Use of explosives will not be permitted.

1.6.1 Dust and Debris Control

Prevent the spread of dust and debris on airfield pavements and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution. Sweep pavements as often as necessary to control the spread of debris that may result in foreign object damage potential to aircraft.

1.7 PROTECTION

1.7.1 Traffic Control Signs

- a. Where pedestrian, driver, or aircraft safety is endangered in the area of removal work, use traffic barricades with flashing lights. Anchor barricades in a manner to prevent displacement by wind, jet or prop blast. Notify the Contracting Officer prior to beginning such work.

Provide a minimum of 2 FAA type L-810 steady burning red obstruction lights on temporary structures (including cranes) over 100 feet, but less than 200 ft, above ground level. The use of LED based obstruction lights are not permitted. For temporary structures (including cranes) over 200 ft above ground level provide obstruction lighting in accordance with FAA AC 70/7460-1. Light construction and installation shall comply with FAA AC 70/7460-1. Lights shall be operational during periods of reduced visibility, darkness, and as directed by the Contracting Officer. Maintain the temporary services during the period of construction and remove only after permanent services have been installed and tested and are in operation.

1.7.2 Protection of Personnel

Before, during and after the demolition work continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the project site. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

1.8 FOREIGN OBJECT DAMAGE (FOD)

Aircraft and aircraft engines are subject to FOD from debris and waste material lying on airfield pavements. Remove all such materials that may appear on operational aircraft pavements due to the Contractor's operations. If necessary, the Contracting Officer may require the Contractor to install a temporary barricade at the Contractor's expense to control the spread of FOD potential debris. The barricade shall include a fence covered with a fabric designed to stop the spread of debris. Anchor the fence and fabric to prevent displacement by winds or jet/prop blasts. Remove barricade when no longer required.

1.9 RELOCATIONS

Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Repair or replace items to be relocated which are damaged by the Contractor with new undamaged items as approved by the Contracting Officer.

1.10 EXISTING CONDITIONS

Before beginning any demolition or deconstruction work, survey the site and examine the drawings and specifications to determine the extent of the work. Record existing conditions in the presence of the Contracting Officer showing the condition of structures and other facilities adjacent to areas of alteration or removal. Photographs sized 4 inch will be acceptable as a record of existing conditions. Include in the record the elevation of the top of foundation walls, finish floor elevations, possible conflicting electrical conduits, plumbing lines, alarms systems, the location and extent of existing cracks and other damage and description of surface conditions that exist prior to before starting work. It is the Contractor's responsibility to verify and document all required outages which will be required during the course of work, and to note these outages on the record document. Submit survey results.

PART 2 PRODUCTS

2.1 FILL MATERIAL

- a. Comply with excavating, backfilling, and compacting procedures for soils used as backfill material to fill basements, voids, depressions or excavations resulting from demolition or deconstruction of structures. Fill material shall be waste products from demolition or deconstruction until all waste appropriate for this purpose is consumed.
- b. Fill material shall conform to Section 31 00 00 EARTHWORK.

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

Inspect and evaluate existing structures onsite for reuse. Existing construction scheduled to be removed for reuse shall be disassembled. Dismantled and removed materials are to be separated, set aside, and prepared as specified, and stored or delivered to a collection point for reuse, remanufacture, recycling, or other disposal, as specified. Materials shall be designated for reuse onsite whenever possible.

3.1.1 Structures

- a. Remove existing structures indicated to be removed completely including the full depth of foundations. Remove sidewalks, curbs, gutters and street light bases as indicated.
- b. Demolish structures in a systematic manner from the top of the structure to the ground. Complete demolition work above each tier or floor before the supporting members on the lower level are disturbed. Demolish concrete and masonry walls in small sections. Remove structural framing members and lower to ground by means of derricks, platforms hoists, or other suitable methods as approved by the

Contracting Officer.

- c. Locate demolition equipment throughout the structure and remove materials so as to not impose excessive loads to supporting walls, floors, or framing.
- d. Building, or the remaining portions thereof, not exceeding 80 feet in height may be demolished by the mechanical method of demolition.

3.1.2 Utilities and Related Equipment

3.1.2.1 General Requirements

Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by the Contracting Officer. Do not interrupt existing utilities serving facilities occupied and used by the Government except when approved in writing and then only after temporary utility services have been approved and provided. Do not begin demolition or deconstruction work until all utility disconnections have been made. Shut off and cap utilities for future use, as indicated.

3.1.2.2 Disconnecting Existing Utilities

Remove existing utilities, as indicated, and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Contracting Officer. When utility lines are encountered but are not indicated on the drawings, notify the Contracting Officer prior to further work in that area. Remove meters and related equipment and deliver to a location in accordance with instructions of the Contracting Officer.

3.1.3 Chain Link Fencing

Remove chain link fencing, gates and other related salvaged items scheduled for removal and transport to designated areas. Remove gates as whole units. Cut chain link fabric to 25 foot lengths and store in rolls off the ground.

3.1.4 Paving and Slabs

Remove and sawcut concrete and asphaltic concrete paving and slabs including aggregate base as indicated. Provide neat sawcuts at limits of pavement removal as indicated. Pavement and slabs designated to be recycled and utilized in this project shall be moved, ground and stored as directed by the Contracting Officer. Pavement and slabs not to be used in this project shall be removed from the Installation at Contractor's expense.

3.1.5 Masonry

Sawcut and remove masonry so as to prevent damage to surfaces to remain.

3.1.6 Concrete

Saw concrete along straight lines to a depth of a minimum 2 inch. Make each cut in walls perpendicular to the face and in alignment with the cut in the opposite face. Break out the remainder of the concrete provided that the broken area is concealed in the finished work, and the remaining concrete is sound. At locations where the broken face cannot be

concealed, grind smooth or saw cut entirely through the concrete.

3.1.7 Structural Steel

Dismantle structural steel at field connections and in a manner that will prevent bending or damage. Salvage for recycle structural steel, steel joists, girders, angles, plates, columns and shapes. Do not use flame-cutting torches. Transport steel joists and girders as whole units and not dismantled. Transport structural steel shapes to a designated area as directed by the Contracting Officer, stacked according to size, type of member and length, and stored off the ground, protected from the weather.

3.1.8 Miscellaneous Metal

Salvage shop-fabricated items such as access doors and frames, steel gratings, metal ladders, wire mesh partitions, metal railings, metal windows and similar items as whole units. Salvage light-gage and cold-formed metal framing, such as steel studs, steel trusses, metal gutters, roofing and siding, metal toilet partitions, toilet accessories and similar items. Scrap metal shall become the Contractor's property. Recycle scrap metal as part of demolition and deconstruction operations. Provide separate containers to collect scrap metal and transport to a scrap metal collection or recycling facility, in accordance with the Waste Management Plan.

3.1.9 Carpentry

Salvage for recycle lumber, millwork items, and finished boards, and sort by type and size. Chip or shred and recycle salvaged wood unfit for reuse, except stained, painted, or treated wood. Remove windows, doors, frames, and cabinets, and similar items as whole units, complete with trim and accessories.

3.1.10 Carpet

Remove existing carpet for reclamation in accordance with manufacturer recommendations and as follows. Remove used carpet in large pieces, roll tightly, and pack neatly in a container. Remove adhesive according to recommendations of the Carpet and Rug Institute (CRI). Adhesive removal solvents shall comply with CRI 104/CRI 105. Recycle removed carpet cushion.

3.1.11 Acoustic Ceiling Tile

Remove, neatly stack, and recycle acoustic ceiling tiles. Recycling may be available with manufacturer. Otherwise, priority shall be given to a local recycling organization. Recycling is not required if the tiles contain or may have been exposed to asbestos material.

3.1.12 Airfield Lighting

Remove existing airfield lighting as indicated and terminate in a manner satisfactory to the Contracting Officer. Remove edge lights, associated transformers and high-mast light poles as indicated and deliver to a location on the station in accordance with instructions of the Contracting Officer.

3.1.13 Air Conditioning Equipment

Remove air conditioning, refrigeration, and other equipment containing refrigerants without releasing chlorofluorocarbon refrigerants to the atmosphere in accordance with the Clean Air Act Amendment of 1990. Recover all refrigerants prior to removing air conditioning, refrigeration, and other equipment containing refrigerants and dispose of in accordance with the paragraph entitled "Disposal of Ozone Depleting Substance (ODS)."

3.1.14 Cylinders and Canisters

Remove all fire suppression system cylinders and canisters and dispose of in accordance with the paragraph entitled "Disposal of Ozone Depleting Substance (ODS)."

3.1.15 Locksets on Swinging Doors

Remove all locksets from all swinging doors indicated to be removed and disposed of. Deliver the locksets and related items to a designated location for receipt by the Contracting Officer after removal.

3.1.16 Mechanical Equipment and Fixtures

Disconnect mechanical hardware at the nearest connection to existing services to remain, unless otherwise noted. Disconnect mechanical equipment and fixtures at fittings. Remove service valves attached to the unit. Salvage each item of equipment and fixtures as a whole unit; listed, indexed, tagged, and stored. Salvage each unit with its normal operating auxiliary equipment. Transport salvaged equipment and fixtures, including motors and machines, to a designated storage area as directed by the Contracting Officer. Do not remove equipment until approved. Do not offer low-efficiency equipment for reuse; provide to recycling service for disassembly and recycling of parts.

3.1.16.1 Preparation for Storage

Remove water, dirt, dust, and foreign matter from units; tanks, piping and fixtures shall be drained; interiors, if previously used to store flammable, explosive, or other dangerous liquids, shall be steam cleaned. Seal openings with caps, plates, or plugs. Secure motors attached by flexible connections to the unit. Change lubricating systems with the proper oil or grease.

3.1.16.2 Piping

Disconnect piping at unions, flanges and valves, and fittings as required to reduce the pipe into straight lengths for practical storage. Store salvaged piping according to size and type. If the piping that remains can become pressurized due to upstream valve failure, end caps, blind flanges, or other types of plugs or fittings with a pressure gage and bleed valve shall be attached to the open end of the pipe to ensure positive leak control. Carefully dismantle piping that previously contained gas, gasoline, oil, or other dangerous fluids, with precautions taken to prevent injury to persons and property. Store piping outdoors until all fumes and residues are removed. Box prefabricated supports, hangers, plates, valves, and specialty items according to size and type. Wrap sprinkler heads individually in plastic bags before boxing. Classify piping not designated for salvage, or not reusable, as scrap metal.

3.1.16.3 Ducts

Classify removed duct work as scrap metal.

3.1.16.4 Fixtures, Motors and Machines

Remove and salvage fixtures, motors and machines associated with plumbing, heating, air conditioning, refrigeration, and other mechanical system installations. Salvage, box and store auxiliary units and accessories with the main motor and machines. Tag salvaged items for identification, storage, and protection from damage. Classify non-porcelain broken, damaged, or otherwise unserviceable units and not caused to be broken, damaged, or otherwise unserviceable as debris to be disposed of by the Contractor.

3.1.17 Electrical Equipment and Fixtures

Salvage motors, motor controllers, and operating and control equipment that are attached to the driven equipment. Salvage wiring systems and components. Box loose items and tag for identification. Disconnect primary, secondary, control, communication, and signal circuits at the point of attachment to their distribution system.

3.1.17.1 Fixtures

Remove and salvage electrical fixtures. Salvage unprotected glassware from the fixture and salvage separately. Salvage incandescent, mercury-vapor, and fluorescent lamps and fluorescent ballasts manufactured prior to 1978, boxed and tagged for identification, and protected from breakage.

3.1.17.2 Electrical Devices

Remove and salvage switches, switchgear, transformers, conductors including wire and nonmetallic sheathed and flexible armored cable, regulators, meters, instruments, plates, circuit breakers, panelboards, outlet boxes, and similar items. Box and tag these items for identification according to type and size.

3.1.17.3 Wiring Ducts or Troughs

Remove and salvage wiring ducts or troughs. Dismantle plug-in ducts and wiring troughs into unit lengths. Remove plug-in or disconnecting devices from the busway and store separately.

3.1.17.4 Conduit and Miscellaneous Items

Salvage conduit except where embedded in concrete or masonry. Consider corroded, bent, or damaged conduit as scrap metal. Sort straight and undamaged lengths of conduit according to size and type. Classify supports, knobs, tubes, cleats, and straps as debris to be removed and disposed.

3.1.18 Elevators and Hoists

Remove elevators, hoists, and similar conveying equipment and salvage as whole units, to the most practical extent. Remove and prepare items for salvage without damage to any of the various parts. Salvage and store

rails for structural steel with the equipment as an integral part of the unit.

3.1.19 Items With Unique/Regulated Disposal Requirements

Remove and dispose of items with unique or regulated disposal requirements in the manner dictated by law or in the most environmentally responsible manner.

3.2 CONCURRENT EARTH-MOVING OPERATIONS

Do not begin excavation, filling, and other earth-moving operations that are sequential to demolition or deconstruction work in areas occupied by structures to be demolished or deconstructed until all demolition and deconstruction in the area has been completed and debris removed. Fill holes, open basements and other hazardous openings.

3.3 DISPOSITION OF MATERIAL

3.3.1 Title to Materials

Except for salvaged items specified in related Sections, and for materials or equipment scheduled for salvage, all materials and equipment removed and not reused or salvaged, shall become the property of the Contractor and shall be removed from Government property. Title to materials resulting from demolition and deconstruction, and materials and equipment to be removed, is vested in the Contractor upon approval by the Contracting Officer of the Contractor's demolition, deconstruction, and removal procedures, and authorization by the Contracting Officer to begin demolition and deconstruction. The Government will not be responsible for the condition or loss of, or damage to, such property after contract award. Showing for sale or selling materials and equipment on site is prohibited.

3.3.2 Reuse of Materials and Equipment

Remove and store materials and equipment indicated to be reused or relocated to prevent damage, and reinstall as the work progresses. Coordinate the re-use of materials and equipment with the re-use requirements in accordance with Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL. Capture re-use of materials in the diversion calculations for the project.

3.3.3 Salvaged Materials and Equipment

Remove materials and equipment that are indicated to be removed by the Contractor and that are to remain the property of the Government, and deliver to a storage site, as directed.

- a. Salvage items and material to the maximum extent possible.
- b. Store all materials salvaged for the Contractor as approved by the Contracting Officer and remove from Government property before completion of the contract. Coordinate the salvaged materials with tracking requirements in accordance with Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL. Capture salvaged materials in the diversion calculations for the project.
- c. Remove salvaged items to remain the property of the Government in a

manner to prevent damage, and packed or crated to protect the items from damage while in storage or during shipment. Items damaged during removal or storage must be repaired or replaced to match existing items. Properly identify the contents of containers. Deliver items reserved as property of the Government to the areas designated.

- d. Remove items reserved as property of the using service prior to commencement of work under this contract.
- e. Remove historical items in a manner to prevent damage. Deliver the following historical items to the Government for disposition: Corner stones, contents of corner stones, and document boxes wherever located on the site.

3.3.4 Disposal of Ozone Depleting Substance (ODS)

Class I and Class II ODS are defined in Section, 602(a) and (b), of The Clean Air Act. Prevent discharge of Class I and Class II ODS to the atmosphere. Place recovered ODS in cylinders meeting AHRI Guideline K suitable for the type ODS (filled to no more than 80 percent capacity) and provide appropriate labeling. Recovered ODS shall be removed from Government property and disposed of in accordance with 40 CFR 82. Products, equipment and appliances containing ODS in a sealed, self-contained system (e.g., residential refrigerators and window air conditioners) shall be disposed of in accordance with 40 CFR 82. Submit Receipts or bills of lading, as specified. Submit a shipping receipt or bill of lading for all containers of ozone depleting substance (ODS) shipped to the Defense Depot, Richmond, Virginia.

3.3.4.1 Special Instructions

No more than one type of ODS is permitted in each container. A warning/hazardous label shall be applied to the containers in accordance with Department of Transportation regulations. All cylinders including but not limited to fire extinguishers, spheres, or canisters containing an ODS shall have a tag with the following information:

- a. Activity name and unit identification code
- b. Activity point of contact and phone number
- c. Type of ODS and pounds of ODS contained
- d. Date of shipment
- e. National stock number (for information, call (804) 279-4525).

3.3.4.2 Fire Suppression Containers

Deactivate fire suppression system cylinders and canisters with electrical charges or initiators prior to shipment. Also, safety caps must be used to cover exposed actuation mechanisms and discharge ports on these special cylinders.

3.3.5 Transportation Guidance

Ship all ODS containers in accordance with MIL-STD-129, DLA 4145.25 (also referenced one of the following: Army Regulation 700-68, Naval Supply Instruction 4440.128C, Marine Corps Order 10330.2C, and Air Force

Regulation 67-12), 49 CFR 173.301, and DOD 4000.25-1-M.

3.3.6 Unsalvageable and Non-Recyclable Material

Dispose of unsalvageable and non-recyclable combustible material off the site.

3.4 CLEANUP

Remove debris and rubbish from basement and similar excavations. Remove and transport the debris in a manner that prevents spillage on streets or adjacent areas. Apply local regulations regarding hauling and disposal.

3.5 DISPOSAL OF REMOVED MATERIALS

3.5.1 Regulation of Removed Materials

Dispose of debris, rubbish, scrap, and other nonsalvageable materials resulting from removal operations with all applicable federal, state and local regulations as contractually specified in the Waste Management Plan. Storage of removed materials on the project site is prohibited.

3.5.2 Burning on Government Property

Burning of materials removed from demolished and deconstructed structures will not be permitted on Government property.

3.5.3 Removal to Spoil Areas on Government Property

Transport noncombustible materials removed from demolition and deconstruction structures to designated spoil areas on Government property.

3.5.4 Removal from Government Property

Transport waste materials removed from demolished and deconstructed structures, except waste soil, from Government property for legal disposal. Dispose of waste soil as directed.

3.6 REUSE OF SALVAGED ITEMS

Recondition salvaged materials and equipment designated for reuse before installation. Replace items damaged during removal and salvage operations or restore them as necessary to usable condition.

-- End of Section --

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SECTION 02 82 00

ASBESTOS REMEDIATION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP Z9.2 (2018) Fundamentals Governing the Design and Operation of Local Exhaust Ventilation Systems

ASTM INTERNATIONAL (ASTM)

ASTM D4397 (2016) Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications

ASTM E1368 (2014) Visual Inspection of Asbestos Abatement Projects

COMPRESSED GAS ASSOCIATION (CGA)

CGA G-7 (2014) Compressed Air for Human Respiration; 6th Edition

GEORGIA STATE LEGISLATURE

GAC 391-3-1 Air Quality Control

GAC 391-3-14 Asbestos Removal and Encapsulation

INTERNATIONAL SAFETY EQUIPMENT ASSOCIATION (ISEA)

ANSI/ISEA Z87.1 (2020) Occupational and Educational Personal Eye and Face Protection Devices

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 701 (2019) Standard Methods of Fire Tests for Flame Propagation of Textiles and Films

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

NIOSH NMAM (2016; 5th Ed) NIOSH Manual of Analytical Methods

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2024) Safety -- Safety and Occupational Health (SOH) Requirements

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 340/1-90/018 (1990) Asbestos/NESHAP Regulated Asbestos
Containing Materials Guidance

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.147 The Control of Hazardous Energy (Lock
Out/Tag Out)

29 CFR 1926 Safety and Health Regulations for
Construction

29 CFR 1926.51 Sanitation

29 CFR 1926.59 Hazard Communication

29 CFR 1926.103 Respiratory Protection

29 CFR 1926.200 Accident Prevention Signs and Tags

29 CFR 1926.1101 Asbestos

40 CFR 61-SUBPART A General Provisions

40 CFR 61-SUBPART M National Emission Standard for Asbestos

40 CFR 763 Asbestos

42 CFR 84 Approval of Respiratory Protective Devices

49 CFR 107 Hazardous Materials Program Procedures

49 CFR 171 General Information, Regulations, and
Definitions

49 CFR 172 Hazardous Materials Table, Special
Provisions, Hazardous Materials
Communications, Emergency Response
Information, and Training Requirements

49 CFR 173 Shippers - General Requirements for
Shipments and Packagings

UNDERWRITERS LABORATORIES (UL)

UL 586 (2009; Reprint Dec 2017) UL Standard for
Safety High-Efficiency Particulate, Air
Filter Units

1.2 DEFINITIONS

1.2.1 ACM

Asbestos Containing Materials.

1.2.2 Amended Water

Water containing a wetting agent or surfactant with a maximum surface tension of 0.00042 psi.

1.2.3 Area Sampling

Sampling of asbestos fiber concentrations which approximates the concentrations of asbestos in the theoretical breathing zone but is not actually collected in the breathing zone of an employee.

1.2.4 Asbestos

The term asbestos includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, and actinolite asbestos and any of these minerals that has been chemically treated or altered. Materials are considered to contain asbestos if the asbestos content of the material is determined to be at least one percent.

1.2.5 Asbestos Control Area

That area where asbestos removal operations are performed which is isolated by physical boundaries which assist in the prevention of the uncontrolled release of asbestos dust, fibers, or debris.

1.2.6 Asbestos Fibers

Those fibers having an aspect ratio of at least 3:1 and longer than 5 micrometers as determined by National Institute for Occupational Safety and Health (NIOSH) Method 7400.

1.2.7 Asbestos Permissible Exposure Limit

0.1 f/cc of air as an 8-hour time weighted average (TWA) measured in the breathing zone as defined by 29 CFR 1926.1101 or other Federal legislation having legal jurisdiction for the protection of workers health.

1.2.8 Authorized Person

Any person authorized by the Contractor and required by work duties to be present in the regulated areas.

1.2.9 Background

The ambient airborne asbestos concentration in an uncontaminated area as measured prior to any asbestos hazard abatement efforts. Background concentrations for other (contaminated) areas are measured in similar but asbestos free locations.

1.2.10 Competent Person (CP)

A person meeting the requirements for CP as specified in 29 CFR 1926.1101 including a person capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, and is specifically trained in a training course which meet the criteria of EPA's Model Accreditation Plan (40 CFR 763) for project designer or supervisor, or its equivalent. The CP must have a current State of Georgia asbestos contractors or supervisors license.

1.2.11 Contractor

The Contractor is that individual, or entity under contract to perform the herein listed work.

1.2.12 Disposal Bag

A 6 mil thick, leak-tight plastic bag, pre-labeled in accordance with 29 CFR 1926.1101, used for transporting asbestos waste from containment to disposal site.

1.2.13 Disturbance

Activities that disrupt the matrix of ACM, crumble or pulverize ACM, or generate visible debris from ACM. Disturbance includes cutting away small amounts of ACM, no greater than the amount which can be contained in one standard sized glovebag or waste bag, not larger than 60 inches in length and width in order to access a building component.

1.2.14 Encapsulation

The abatement of an asbestos hazard through the appropriate use of chemical encapsulants.

1.2.15 Encapsulants

Specific materials in various forms used to chemically or physically entrap asbestos fibers in various configurations to prevent these fibers from becoming airborne. There are four types of encapsulants as follows which must comply with performance requirements as specified herein.

- a. Removal Encapsulant (can be used as a wetting agent)
- b. Bridging Encapsulant (used to provide a tough, durable surface coating to asbestos containing material)
- c. Penetrating Encapsulant (used to penetrate the asbestos containing material encapsulating all asbestos fibers and preventing fiber release due to routine mechanical damage)
- d. Lock-Down Encapsulant (used to seal off or "lock-down" minute asbestos fibers left on surfaces from which asbestos containing material has been removed).

1.2.16 Friable Asbestos Material

A term defined in 40 CFR 61-SUBPART M and EPA 340/1-90/018 meaning any material which contains more than 1 percent asbestos, as determined using the method specified in 40 CFR 763, Polarized Light Microscopy (PLM), that when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

1.2.17 Glovebag Technique

Those asbestos removal and control techniques put forth in 29 CFR 1926.1101.

1.2.18 Government Consultant (GC)

That qualified person employed directly by the Government to monitor, sample, inspect the work or in some other way advise the Contracting Officer. The GC is normally a private consultant, but can be an employee of the Government.

1.2.19 High Efficiency Particulate Air (HEPA) Filter Equipment

HEPA filtered vacuum and exhaust ventilation equipment with a filter system capable of collecting and retaining asbestos fibers. Filters must retain 99.97 percent of particles 0.3 microns or larger as indicated in UL 586.

1.2.20 Model Accreditation Plan (MAP)

USEPA training accreditation requirements for persons who work with asbestos as specified in 40 CFR 763.

1.2.21 Negative Pressure Enclosure (NPE)

That engineering control technique described as a negative pressure enclosure in 29 CFR 1926.1101.

1.2.22 National Emission Standards for Hazardous Air Pollutants

The USEPA NESHAP regulation for asbestos is at 40 CFR 61-SUBPART M.

1.2.23 Nonfriable Asbestos Material

Material that contains asbestos in which the fibers have been immobilized by a bonding agent, coating, binder, or other material so that the asbestos is well bound and will not normally release asbestos fibers during any appropriate use, handling, storage or transportation. It is understood that asbestos fibers may be released under other conditions such as demolition, removal, or mishap.

1.2.24 Permissible Exposure Limits (PELs)

1.2.24.1 PEL-TWA

Concentration of asbestos not in excess of 0.1 f/cc of air (f/cc) as an 8-hour TWA.

1.2.24.2 PEL-Excursion Limit

An airborne concentration of asbestos not in excess of 1.0 f/cc of air as averaged over a sampling period of 30 minutes.

1.2.25 Personal Sampling

Air sampling which is performed to determine asbestos fiber concentrations within the breathing zone of a specific employee, as performed in accordance with 29 CFR 1926.1101.

1.2.26 Private Qualified Person (PQP)

That qualified person hired by the Contractor to perform the herein listed tasks.

1.2.27 Qualified Person (QP)

A Registered Architect, Professional Engineer, Certified Industrial Hygienist, consultant or other qualified person who has successfully completed training and is therefore accredited under a legitimate State Model Accreditation Plan as described in 40 CFR 763 as a Building Inspector, Contractor/Supervisor Abatement Worker, and Asbestos Project Designer; and has successfully completed the National Institute of Occupational Safety and Health (NIOSH) 582 course "Sampling and Evaluating Airborne Asbestos Dust" or equivalent. The QP must be qualified to perform visual inspections as indicated in ASTM E1368. The QP must be appropriately licensed in the State of Georgia.

1.2.28 TEM

Refers to Transmission Electron Microscopy.

1.2.29 TWA

The TWA is an 8-hour TWA airborne concentration of asbestos fibers.

1.2.30 Transite

A generic name for asbestos cement wallboard and pipe.

1.2.31 Wetting Agent

A chemical added to water to reduce the water's surface tension thereby increasing the water's ability to soak into the material to which it is applied. An equivalent wetting agent must have a surface tension of at most 0.00042 psi.

1.2.32 Worker

Individual (not designated as the CP or a supervisor) who performs asbestos work and has completed asbestos worker training required by 29 CFR 1926.1101, to include EPA Model Accreditation Plan (MAP) "Worker" training; accreditation, if required by the OSHA Class of work to be performed or by the state where the work is to be performed. The worker must be appropriately licensed in the State of Georgia.

1.3 REQUIREMENTS

1.3.1 Description of Work

The Project will include the demolition of Building 1030, a 9,851 square foot building known as the Military Working Dog (MWD) Kennel building, as well as two corrugated metal sheds and a separate dog kennel area. The new Military Working Dog Kennel facilities include a 11,183 square foot MWD Kennel with 500 square feet of Unheated Storage Facilities. The new MWD Kennel will include kennel administration offices, veterinary exam and surgical suite, TA-50 locker area, latrines with showers, tack room, food preparation and storage areas, indoor and outdoor kennels, and building utility support areas. Fire detection and suppression, energy management control, unclassified and classified communications networks, intrusion detection, surveillance, and access control systems will be provided.

Supporting facilities include all related site-work and utilities

(electrical, water, gas, sanitary sewer, and information systems distribution), lighting, parking, curb and gutter, sidewalks, storm drainage, landscaping, antiterrorism/force protection measures (AT/FP), obedience course with apparatuses, exercise and break areas, mobility equipment storage, and other site improvements.

Review the report titled, "Report of Pre-Demolition Asbestos Survey and Lead-Based Paint Screen, Military Working Dog Kennel, Hunter Army Airfield, Savannah, Georgia" by Geo-Hydro Engineers, dated May 20, 2020, hereinafter referred to as "HAZMAT Survey," which is included in Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS as an Attachment. The HAZMAT Survey details the suspect materials and homogeneous areas that were sampled for asbestos including a summary of the locations, amount, type, and NESHAP category of asbestos containing material (ACM) identified during this survey.

Note that the interior of the two corrugated metals sheds present at the site and the area below the metal roof of the MWD Kennel building must be surveyed for suspect asbestos containing material prior to demolition.

If removal and/or relocation of non-sampled suspect materials or utilities is required, these materials/lines should be assumed to contain asbestos as well unless and until sampling proves otherwise.

The work covered by this section includes the handling and control of asbestos containing materials and describes some of the resultant procedures and equipment required to protect workers, the environment and occupants of the building or area, or both, from contact with airborne asbestos fibers. The work also includes the disposal of any asbestos containing materials generated by the work. More specific operational procedures must be outlined in the Asbestos Hazard Abatement Plan called for elsewhere in this specification. As previously noted, the asbestos work includes the removal of the following ACM which is governed by 40 CFR 763. The ACM to be removed is listed on the Asbestos Analysis Table of the HAZMAT Survey and includes:

- a. Black mastic behind the drywall above the drop ceiling of the large patient room of the veterinary office in the MWD Kennel building. Geo-Hydro estimated there to be approximately 600 square feet of black mastic within this room; however it is possible that more of this mastic is hidden behind other areas of drywall within the building.
- b. Note that the interior of the two corrugated metals sheds present at the site and the area below the metal roof of the MWD Kennel building must be surveyed for suspect asbestos containing material prior to demolition. Such materials should be assumed to be asbestos-containing or tested prior to demolition activities.

All quantities are estimates. Contractor shall verify quantities and locations prior to bid. In addition, Contractors shall remove additional presumed ACM.

Under normal conditions non-friable or chemically bound materials containing asbestos would not be considered hazardous; however, this material may release airborne asbestos fibers during demolition and removal and therefore must be handled in accordance with the removal and disposal procedures as specified herein. Provide techniques as outlined in this specification. The work area will be evacuated during the

asbestos abatement work. A CP must supervise asbestos removal work as specified herein.

1.3.2 Unexpected Discovery of Asbestos

Notify the Contracting Officer if any previously untested building components suspected to contain asbestos are impacted by the work.

1.3.3 Medical Requirements

Provide medical requirements including but not limited to medical surveillance and medical record keeping as listed in 29 CFR 1926.1101.

1.3.3.1 Medical Examinations

Before exposure to airborne asbestos fibers, provide workers with a comprehensive medical examination as required by 29 CFR 1926.1101 or other pertinent State or local directives. This requirement must have been satisfied within the 12 months prior to the start of work on this contract. The same medical examination must be given on an annual basis to employees engaged in an occupation involving asbestos and within 30 calendar days before or after the termination of employment in such occupation. Specifically identify x-ray films of asbestos workers to the consulting radiologist and mark medical record jackets with the word "ASBESTOS."

1.3.3.2 Medical Records

Maintain complete and accurate records of employees' medical examinations, medical records, and exposure data for a period of 50 years after termination of employment and make records of the required medical examinations and exposure data available for inspection and copying to: The Assistant Secretary of Labor for Occupational Safety and Health (OSHA), or authorized representatives of them, and an employee's physician upon the request of the employee or former employee.

1.3.4 Employee Training

Submit certificates, prior to the start of work but after the main abatement submittal, signed by each employee indicating that the employee has received training in the proper handling of materials and wastes that contain asbestos in accordance with 40 CFR 763; understands the health implications and risks involved, including the illnesses possible from exposure to airborne asbestos fibers; understands the use and limits of the respiratory equipment to be used; and understands the results of monitoring of airborne quantities of asbestos as related to health and respiratory equipment as indicated in 29 CFR 1926.1101 on an initial and annual basis. Organize certificates by individual worker, not grouped by type of certification. Post appropriate evidence of compliance with the training requirements of 40 CFR 763. Train personnel involved in the asbestos control work in accordance with United States Environmental Protection Agency (USEPA) Asbestos Hazard Emergency Response Act (AHERA) training criteria or State training criteria whichever is more stringent. Document the training by providing: dates of training, training entity, course outline, names of instructors, and qualifications of instructors upon request by the Contracting Officer. Furnish each employee with respirator training and fit testing administered by the PQP as required by 29 CFR 1926.1101 and 29 CFR 1926.103. Fully cover engineering and other hazard control techniques and procedures. Asbestos workers must have a

current State of Georgia asbestos worker's license.

1.3.5 Permits, Licenses, and Notifications

Prior to the start of work, obtain necessary permits and licenses in conjunction with asbestos removal, encapsulation, hauling, and disposition, and furnish notification of such actions required by Federal, State, regional, and local authorities. Notify the United States Environmental Protection Agency (USEPA) Region IV, Georgia Environmental Protection Division, Lead-Based Paint and Asbestos Program, the Contracting Officer and other appropriate Government agencies in writing 20 working days prior to commencement of asbestos work in accordance with 40 CFR 61-SUBPART M, GAC 391-3-14, and other applicable laws, ordinances, criteria, rules, and regulations. Submit copies of all Notifications to the Contracting Officer. The Georgia Environmental Protection Division, Lead-Based Paint and Asbestos Program written notification must be submitted on the Asbestos Abatement or Demolition Project Notification Forms available at <https://epd.georgia.gov/asbestos-forms>.

1.3.6 Environment, Safety and Health Compliance

In addition to detailed requirements of this specification, comply with those applicable laws, ordinances, criteria, rules, and regulations of Federal, State, regional, and local authorities regarding handling, storing, transporting, and disposing of asbestos waste materials. Comply with the applicable requirements of the current issue of EM 385-1-1, 29 CFR 1926.1101, 40 CFR 61-SUBPART A, 40 CFR 61-SUBPART M, 40 CFR 763, and GAC 391-3-14 Asbestos Removal and Encapsulation. Where the requirements of this specification, applicable laws, rules, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirement as defined by the Government apply. The following laws, ordinances, criteria, rules and regulations regarding removal, handling, storing, transporting and disposing of asbestos materials apply:

- a. 29 CFR 1926.1101.
- b. 29 CFR 1926.103
- c. GAC 391-3-14 Asbestos Removal and Encapsulation.
- d. GAC 391-3-1 Air Quality Control

1.3.7 Respiratory Protection Program

Establish and implement a respirator program as required by 29 CFR 1926.1101, and 29 CFR 1926.103. Submit a written description of the program to the Contracting Officer. Submit a written program manual or operating procedure including methods of compliance with regulatory statutes.

1.3.7.1 Respirator Program Records

Submit records of the respirator program as required by 29 CFR 1926.103, and 29 CFR 1926.1101.

1.3.7.2 Respirator Fit Testing

The Contractor's PQP must conduct a qualitative or quantitative fit test conforming to 29 CFR 1926.103 for each worker required to wear a

respirator, and any authorized visitors who enter a regulated area where respirators are required to be worn. A respirator fit test must be performed prior to initially wearing a respirator and every 12 months thereafter. If physical changes develop that will affect the fit, a new fit test must be performed. Functional fit checks must be performed each time a respirator is put on and in accordance with the manufacturer's recommendation.

1.3.7.3 Respirator Selection and Use Requirements

Provide respirators, and ensure that they are used as required by 29 CFR 1926.1101 and in accordance with CGA G-7 and the manufacturer's recommendations. Respirators must be approved by the National Institute for Occupational Safety and Health NIOSH, under the provisions of 42 CFR 84, for use in environments containing airborne asbestos fibers. For air-purifying respirators, the particulate filter must be HEPA / (N-, R-, P-100). The initial respirator selection and the decisions regarding the upgrading or downgrading of respirator type must be made by the Contractor's Designated IH based on the measured or anticipated airborne asbestos fiber concentrations to be encountered.

1.3.8 Asbestos Hazard Control Supervisor

The Contractor must be represented on site by a supervisor, trained using the model Contractor accreditation plan as indicated in the Federal statutes for all portions of the herein listed work.

1.3.9 Hazard Communication

Adhere to all parts of 29 CFR 1926.59 and provide the Contracting Officer with a copy of the Safety Data Sheets (SDS) for all materials brought to the site.

1.3.10 Asbestos Hazard Abatement Plan

Submit a detailed plan of the safety precautions such as lockout, tagout, tryout, fall protection, and confined space entry procedures and equipment and work procedures to be used in the removal of materials containing asbestos. The plan, not to be combined with other hazard abatement plans, must be prepared, signed, and sealed by the PQP. Provide a Table of Contents for each abatement submittal, which follows the sequence of requirements in the contract. The plan must include but not be limited to the precise personal protective equipment to be used including, but not limited to, respiratory protection, type of whole-body protection, the location of asbestos control areas including clean and dirty areas, buffer zones, showers, storage areas, change rooms, removal methods, interface of trades involved in the construction, sequencing of asbestos related work, disposal plan, type of wetting agent and asbestos sealer to be used, locations of local exhaust equipment, planned air monitoring strategies, and a detailed description of the method to be employed in order to control environmental pollution. The plan must also include (both fire and medical emergency) response plans and an Activity Hazard Analyses (AHAs) in accordance with EM 385-1-1. The Asbestos Hazard Abatement Plan must be approved in writing prior to starting any asbestos work. The Contractor, Asbestos Hazard Control Supervisor, CP, and PQP must meet with the Contracting Officer prior to beginning work, to discuss in detail the Asbestos Hazard Abatement Plan, including work procedures and safety precautions. Once approved by the Contracting Officer, the plan will be enforced as if an addition to the specification. Any changes required in

the specification as a result of the plan must be identified specifically in the plan to allow for free discussion and approval by the Contracting Officer prior to starting work.

1.3.11 Testing Laboratory

Submit the name, address, and telephone number of each testing laboratory selected for the analysis, and reporting of airborne concentrations of asbestos fibers along with evidence that each laboratory selected holds the appropriate State license and permits and certification that each laboratory is American Industrial Hygiene Association (AIHA) accredited and that persons counting the samples have been judged proficient by current inclusion on the AIHA Asbestos Analysis Registry (AAR) and successful participation of the laboratory in the Proficiency Analytical Testing (PAT) Program. Where analysis to determine asbestos content in bulk materials or transmission electron microscopy is required, submit evidence that the laboratory is accredited by the National Institute of Science and Technology (NIST) under National Voluntary Laboratory Accreditation Program (NVLAP) for asbestos analysis. The testing laboratory firm must be independent of the asbestos contractor and must have no employee or employer relationship which could constitute a conflict of interest.

1.3.12 Landfill Approval

Submit written evidence that the landfill is approved for asbestos disposal by the U.S. Environmental Protection Agency, Region IV, Air Enforcement Section, and local regulatory agencies. Within three working days after delivery, submit detailed delivery tickets, prepared, signed, and dated by an agent of the landfill, certifying the amount of asbestos materials delivered to the landfill. Submit a copy of the waste shipment records within one day of the shipment leaving the project site.

1.3.13 Transporter Certification

Submit written evidence that the transporter is approved to transport asbestos waste in accordance with the DOT requirements of 49 CFR 171, 49 CFR 172 and 49 CFR 173 as well as registration requirements of 49 CFR 107 and all other State and local regulatory agency requirements.

1.3.14 Medical Certification

Provide a written certification for each worker and supervisor, signed by a licensed physician indicating that the worker and supervisor has met or exceeded all of the medical prerequisites listed herein and in 29 CFR 1926.1101 and 29 CFR 1926.103 as prescribed by law. Submit certificates prior to the start of work but after the main abatement submittal.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Amended Water; G

Safety Data Sheets (SDS) for All Materials; G

Respirators; G

Local Exhaust Equipment; G

Vacuums; G

SD-06 Test Reports

Air Sampling Results; G

Pressure Differential Recordings for Local Exhaust System; G

Clearance Sampling; G

Asbestos Disposal Quantity Report; G

SD-07 Certificates

Employee Training; G

Notifications; G

Respiratory Protection Program; G

Asbestos Hazard Abatement Plan; G

Testing Laboratory; G

Landfill Approval; G

Delivery Tickets; G

Waste Shipment Records; G

Transporter Certification; G

Medical Certification; G

Private Qualified Person (PQP) Documentation; G

Designated Competent Person; G

Worker's License; G

Contractor's License; G

Federal, State or Local Citations on Previous Projects; G

Equipment Used to Contain Airborne Asbestos Fibers; G

Water Filtration Equipment; G

Vacuums; G

Ventilation Systems; G

SD-11 Closeout Submittals

Permits and Licenses; G

Notifications; G

Respirator Program Records; G

Rental Equipment; G

1.5 QUALITY ASSURANCE

1.5.1 Private Qualified Person (PQP) Documentation

Submit the name, address, and telephone number of the PQP selected to prepare the Asbestos Hazard Abatement Plan, direct monitoring and training, and documented evidence that the PQP has successfully completed training in and is accredited and where required is certified as, a Building Inspector, Contractor/Supervisor Abatement Worker, and Asbestos Project Designer as described by 40 CFR 763 and has successfully completed the National Institute of Occupational Safety and Health (NIOSH) 582 course "Sampling and Evaluating Airborne Asbestos Dust" or equivalent. The PQP must be appropriately licensed in the State of Georgia as a Project Monitor. The PQP and the asbestos contractor must not have an employee/employer relationship or financial relationship which could constitute a conflict of interest. The PQP must be a first tier subcontractor.

1.5.2 Designated Competent Person Documentation

The Designated CP must be experienced in the administration and supervision of asbestos abatement projects including exposure assessment and monitoring, work practices, abatement methods, protective measures for personnel, setting up and inspecting asbestos abatement work areas, evaluating the integrity of containment barriers, placement and operation of local exhaust systems, ACM generated waste containment and disposal procedures, decontamination units installation and maintenance requirements, site safety and health requirements, and notification of other employees onsite. The Designated CP must be on-site at all times when asbestos abatement activities are underway. Submit training certification and a current State of Georgia Asbestos Contractor's and Supervisor's License. Submit evidence that the Designated CP has a minimum of 5 years of on-the-job asbestos abatement experience relevant to OSHA designated CP requirements. The Designated CP must be a first tier subcontractor.

1.5.3 Worker's License

Submit documentation that workers meet the requirements of 29 CFR 1926.1101, 40 CFR 61-SUBPART M and have a current State of Georgia Asbestos Workers License.

1.5.4 Contractor's License

Submit a copy of the asbestos contractor's license issued by the State of Georgia. Submit the following certification along with the license: "I certify that the personnel I am responsible for during the course of this project fully understand the contents of 29 CFR 1926.1101, 40 CFR 61-SUBPART M, EM 385-1-1, and the Federal, State and local

requirements for those asbestos abatement activities that they will be involved in." This certification statement must be signed by the Company's President or Chief Executive Officer.

1.5.5 Air Sampling Results

Complete fiber counting and provide results to the PQP for review within 16 hours of the "time off" of the sample pump. Notify the Contracting Officer immediately of any airborne levels of asbestos fibers in excess of the acceptable limits. Submit sampling results to the Contracting Officer and the affected Contractor employees where required by law within three working days, signed by the testing laboratory employee performing air sampling, the employee that analyzed the sample, and the PQP. Notify the Contractor and the Contracting Officer immediately of any variance in the pressure differential which could cause adjacent unsealed areas to have asbestos fiber concentrations in excess of 0.01 f/cc or background whichever is higher. In no circumstance must levels exceed 0.1 f/cc.

1.5.6 Pressure Differential Recordings for Local Exhaust System

Provide a local exhaust system that creates a negative pressure of at least 0.02 inches of water relative to the pressure external to the enclosure and operate it continuously, 24-hours a day, until the temporary enclosure of the asbestos control area is removed. Submit pressure differential recordings for each work day to the PQP for review and to the Contracting Officer within 24-hours from the end of each work day.

1.5.7 Federal, State or Local Citations on Previous Projects

Submit a statement, signed by an officer of the company, containing a record of any citations issued by Federal, State or local regulatory agencies relating to asbestos activities within the last 5 years (including projects, dates, and resolutions); a list of penalties incurred through non-compliance with asbestos project specifications, including liquidated damages, overruns in scheduled time limitations and resolutions; and situations in which an asbestos-related contract has been terminated (including projects, dates, and reasons for terminations). If there are none, a negative declaration signed by an officer of the company must be provided.

1.5.8 Preconstruction Conference

Conduct a safety preconstruction conference to discuss the details of the Asbestos Hazard Abatement Plan, Accident Prevention Plan (APP) including the AHAs required in specification Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS. The safety preconstruction conference must include the Contractor and their Designated CP, Designated IH and Project Supervisor and the Contracting Officer. Deficiencies in the APP will be discussed. Onsite work must not begin until the APP has been accepted.

1.6 SECURITY

If more than one regulated area is established, a log book must be provided for each regulated area. A log book must be kept documenting entry into and out of the regulated area. Entry into regulated areas must only be by personnel authorized by the Contractor and the Contracting Officer. Personnel authorized to enter regulated areas must be trained, medically evaluated, and wear the required personal protective equipment.

1.7 EQUIPMENT

1.7.1 Rental Equipment

Provide a copy of the written notification to the rental company concerning the intended use of the equipment and the possibility of asbestos contamination of the equipment.

PART 2 PRODUCTS

2.1 DISPOSAL CONTAINERS

Leak-tight (defined as solids, liquids, or dust that cannot escape or spill out) disposal containers must be provided for ACM wastes as required by 29 CFR 1926.1101. Disposal containers can be in the form of:

- a. Disposal Bags
- b. Fiberboard Drums
- c. Cardboard Boxes

2.2 SHEET PLASTIC

Sheet plastic must be polyethylene of 6 mil minimum thickness and must be provided in the largest sheet size necessary to minimize seams. Film must be clear and conform to ASTM D4397, except as specified below

2.2.1 Flame Resistant

Where a potential for fire exists, flame-resistant sheets must be provided. Film must be frosted and must conform to the requirements of NFPA 701.

2.2.2 Reinforced

Reinforced sheets must be provided where high skin strength is required, such as where it constitutes the only barrier between the regulated area and the outdoor environment. The sheet stock must consist of translucent, nylon-reinforced or woven-polyethylene thread laminated between 2 layers of polyethylene film. Film must meet flame resistant standards of NFPA 701.

2.3 MASTIC REMOVING SOLVENT

Mastic removing solvent must be nonflammable and must not contain methylene chloride, glycol ether, or halogenated hydrocarbons. Solvents used onsite must have a flash point greater than 140 degrees F.

2.4 LEAK-TIGHT WRAPPING

Two layers of 6 mil minimum thick polyethylene sheet stock must be used for the containment of removed asbestos-containing components or materials such as large tanks, boilers, insulated pipe segments and other materials. Upon placement of the ACM component or material, each layer must be individually leak-tight sealed with duct tape.

2.5 VIEWING INSPECTION WINDOW

Where feasible, a minimum of one clear, 1/8 inch thick, acrylic sheet, 18

by 24 inches, must be installed as a viewing inspection window at eye level on a wall in each containment enclosure. The windows must be sealed leak-tight with industrial grade duct tape.

2.6 WETTING AGENTS

Removal encapsulant (a penetrating encapsulant) must be provided when conducting removal abatement activities that require a longer removal time or are subject to rapid evaporation of amended water. The removal encapsulant must be capable of wetting the ACM and retarding fiber release during disturbance of the ACM greater than or equal to that provided by amended water. Performance requirements for penetrating encapsulants are specified in paragraph ENCAPSULANTS above.

PART 3 EXECUTION

3.1 EQUIPMENT

Provide the Contracting Officer or the Contracting Officer's Representative, with at least two complete sets of personal protective equipment as required for entry to and inspection of the asbestos control area. Provide equivalent training to the Contracting Officer or a designated representative as provided to Contractor employees in the use of the required personal protective equipment. Provide manufacturer's certificate of compliance for all equipment used to contain airborne asbestos fibers.

3.1.1 Air Monitoring Equipment

The Contractor's PQP must approve air monitoring equipment. The equipment must include, but must not be limited to:

- a. High-volume sampling pumps that can be calibrated and operated at a constant airflow up to 16 liters per minute.
- b. Low-volume, battery powered, body-attachable, portable personal pumps that can be calibrated to a constant airflow up to approximately 3.5 liters per minute, and a self-contained rechargeable power pack capable of sustaining the calibrated flow rate for a minimum of 10 hours. The pumps must also be equipped with an automatic flow control unit which must maintain a constant flow, even as filter resistance increases due to accumulation of fiber and debris on the filter surface.
- c. Single use standard 25 mm diameter cassette, open face, 0.8 micron pore size, mixed cellulose ester membrane filters and cassettes with 50 mm electrically conductive extension cowl, and shrink bands for personal air sampling.
- d. Single use standard 25 mm diameter cassette, open face, 0.45 micron pore size, mixed cellulose ester membrane filters and cassettes with 50 mm electrically conductive cowl, and shrink bands when conducting environmental area sampling using NIOSH NMAM Methods 7400 and 7402, (and the transmission electric microscopy method specified at 40 CFR 763 if required).
- e. A flow calibrator capable of calibration to within plus or minus 2 percent of reading over a temperature range of minus 4 to plus 140 degrees F and traceable to a NIST primary standard.

3.1.2 Respirators

Select respirators from those approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services.

3.1.2.1 Respirators for Handling Asbestos

Provide personnel engaged in pre-cleaning, cleanup, handling, removal of asbestos materials with respiratory protection as indicated in 29 CFR 1926.1101 and 29 CFR 1926.103. Breathing air must comply with CGA G-7.

3.1.3 Exterior Whole Body Protection

3.1.3.1 Outer Protective Clothing

Provide personnel exposed to asbestos above the PEL, working without a negative exposure assessment, or conducting Class I asbestos work with disposable "non-breathable," whole body outer protective clothing, head coverings, gloves, and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber gloves for comfort, but must not be used alone. Make sleeves secure at the wrists, make foot coverings secure at the ankles, and make clothing secure at the neck by the use of tape.

3.1.3.2 Personal Decontamination Unit

Provide a temporary, negative pressure unit with a separate decontamination locker room and clean locker room with a shower that complies with 29 CFR 1926.51(f)(4)(ii) through (V) in between for personnel required to wear whole body protective clothing. Provide two separate lockers for each asbestos worker, one in each locker room. Keep street clothing and street shoes in the clean locker. HEPA vacuum and remove asbestos contaminated disposable protective clothing while still wearing respirators at the boundary of the asbestos work area and seal in impermeable bags or containers for disposal. Do not wear work clothing between home and work. Locate showers between the decontamination locker room and the clean locker room and require that all employees shower before changing into street clothes. Collect used shower water and filter with approved water filtration equipment to remove asbestos contamination. Wastewater filters must be installed in series with the first stage pore size 20 microns and the second stage pore size of 5 microns. Dispose of filters and residue as asbestos waste. Discharge clean water to the sanitary system. Dispose of asbestos contaminated work clothing as asbestos contaminated waste. Keep the floor of the decontamination unit's clean room dry and clean at all times. Proper housekeeping and hygiene requirements must be maintained. Provide soap and towels for showering, washing and drying. Cloth towels provided must be disposed of as ACM waste or must be laundered in accordance with 29 CFR 1926.1101. Physically attach the decontamination units to the asbestos control area. Construct both a personnel decontamination unit and an equipment decontamination unit onto and integral with each asbestos control area.

3.1.3.3 Eye Protection

Provide eye protection that complies with ANSI/ISEA Z87.1 when operations

present a potential eye injury hazard. Provide goggles to personnel engaged in asbestos abatement operations when the use of a full face respirator is not required.

3.1.4 Regulated Areas

All Class I, II, and III asbestos work must be conducted within regulated areas. The regulated area must be demarcated to minimize the number of persons within the area and to protect persons outside the area from exposure to airborne asbestos. Control access to regulated areas, ensure that only authorized personnel enter, and verify that Contractor required medical surveillance, training and respiratory protection program requirements are met prior to allowing entrance.

3.1.5 Load-out Unit

Provide a temporary load-out unit that is adjacent and connected to the regulated area. Attach the load-out unit in a leak-tight manner to each regulated area.

3.1.6 Warning Signs and Labels

Provide warning signs at all approaches to asbestos control areas. Locate signs at such a distance that personnel may read the sign and take the necessary protective steps required before entering the area. Provide labels and affix to all asbestos materials, scrap, waste, debris, and other products contaminated with asbestos. Containers with preprinted warning labels conforming to the requirements are acceptable.

3.1.6.1 Warning Sign

Provide vertical format conforming to 29 CFR 1926.200, and 29 CFR 1926.1101 minimum 20 by 14 inches displaying the following legend in the lower panel:

<u>Legend</u>	<u>Notation</u>
DANGER	one inch Sans Serif Gothic or Block
ASBESTOS	one inch Sans Serif Gothic or Block
MAY CAUSE CANCER	one inch Sans Serif Gothic or Block
CAUSES DAMAGE TO LUNGS	1/4 inch Sans Serif Gothic or Block
AUTHORIZED PERSONNEL ONLY	1/4 inch Sans Serif Gothic or Block
WEAR RESPIRATORY PROTECTION AND PROTECTIVE CLOTHING IN THIS AREA	1/4 inch Sans Serif Gothic or Block

Spacing between lines must be at least equal to the height of the upper of

any two lines.

3.1.6.2 Warning Labels

Provide labels conforming to 29 CFR 1926.1101 of sufficient size to be clearly legible, displaying the following legend:

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST AVOID CREATING DUST

3.1.7 Local Exhaust System

When required, provide a local exhaust system in the asbestos control area in accordance with ASSP Z9.2 and 29 CFR 1926.1101 that will provide at least four air changes per hour inside of the negative pressure enclosure. Local exhaust equipment must be operated 24-hours per day, until the asbestos control area is removed and must be leak proof to the filter and equipped with HEPA filters. Maintain a minimum pressure differential in the control area of minus 0.02 inch of water column relative to adjacent, unsealed areas. Provide continuous 24-hour per day monitoring of the pressure differential with a pressure differential automatic recording instrument. The building ventilation system must not be used as the local exhaust system for the asbestos control area. Filters on exhaust equipment must conform to ASSP Z9.2 and UL 586. Terminate the local exhaust system out of doors and remote from any public access or ventilation system intakes.

3.1.8 Tools

Vacuums must be leak proof to the filter and equipped with HEPA filters. Filters on vacuums must conform to ASSP Z9.2 and UL 586. Do not use power tools to remove asbestos containing materials unless the tool is equipped with effective, integral HEPA filtered exhaust ventilation systems. Remove all residual asbestos from reusable tools prior to storage or reuse. Reusable tools must be thoroughly decontaminated prior to being removed from the regulated areas.

3.1.9 Rental Equipment

If rental equipment is to be used, furnish written notification to the rental agency concerning the intended use of the equipment and the possibility of asbestos contamination of the equipment.

3.1.10 Single Stage Decontamination Area

A decontamination area (equipment room/area) must be provided for Class I work involving less than 25 feet or 10 square feet of TSI or surfacing ACM, and for Class II and Class III asbestos work operations where exposures exceed the PELs or where there is no negative exposure assessment. The equipment room or area must be adjacent to the regulated area for the decontamination of employees, material, and their equipment

which could be contaminated with asbestos. The area must be covered by an impermeable drop cloth on the floor or horizontal working surface. The area must be of sufficient size to accommodate cleaning of equipment and removing personal protective equipment without spreading contamination beyond the area.

3.1.11 Decontamination Area Exit Procedures

Ensure that the following procedures are followed:

- a. Before leaving the regulated area, remove all gross contamination and debris from work clothing using a HEPA vacuum.
- b. Employees must remove their protective clothing in the equipment room and deposit the clothing in labeled impermeable bags or containers for disposal or laundering.
- c. Employees must not remove their respirators until showering.
- d. If required, employees must shower prior to entering the clean room. If a shower has not been located between the equipment room and the clean room or the work is performed outdoors, ensure that employees engaged in Class I asbestos jobs: a) Remove asbestos contamination from their work suits in the equipment room or decontamination area using a HEPA vacuum before proceeding to a shower that is not adjacent to the work area; or b) Remove their contaminated work suits in the equipment room, without cleaning worksuits, and proceed to a shower that is not adjacent to the work area.

3.2 WORK PROCEDURE

Perform asbestos related work in accordance with 29 CFR 1926.1101, 40 CFR 61-SUBPART M, and as specified herein. Use wet removal procedures as listed in the asbestos hazard abatement plan and negative pressure enclosure techniques. Wear and utilize protective clothing and equipment as specified herein. No eating, smoking, drinking, chewing gum, tobacco, or applying cosmetics is permitted in the asbestos work or control areas. Personnel of other trades not engaged in the removal of asbestos containing material must not be exposed at any time to airborne concentrations of asbestos unless all the personnel protection and training provisions of this specification are complied with by the trade personnel. Seal all roof top penetrations, except plumbing vents, prior to asbestos roofing work. Shut down the building heating, ventilating, and air conditioning system, cap the openings to the system, and provide temporary heating, ventilation, and air conditioning prior to the commencement of asbestos work. Power to the regulated area must be locked-out and tagged in accordance with 29 CFR 1910.147. Disconnect electrical service when wet removal is performed and provide temporary electrical service with verifiable ground fault circuit interrupter (GFCI) protection prior to the use of any water. All electrical work must be performed by a licensed electrician. Stop abatement work in the regulated area immediately when the airborne total fiber concentration: (1) equals or exceeds 0.01 f/cc, or the pre-abatement concentration, whichever is greater, outside the regulated area; or (2) equals or exceeds 1.0 f/cc inside the regulated area. Correct the condition to the satisfaction of the Contracting Officer, including visual inspection and air sampling. Work must resume only upon notification by the Contracting Officer. Corrective actions must be documented. If an asbestos fiber release or spill occurs outside of the asbestos control area, stop work immediately,

correct the condition to the satisfaction of the Contracting Officer including clearance sampling, prior to resumption of work.

3.2.1 Building Ventilation System and Critical Barriers

Building ventilation system supply and return air ducts in a regulated area must be isolated by airtight seals to prevent the spread of contamination throughout the system. The airtight seals must consist of 2 layers of polyethylene. Edges to wall, ceiling and floor surfaces must be sealed with industrial grade duct tape.

- a. A CP must supervise the work.
- b. For indoor work, critical barriers must be placed over all openings to the regulated area.
- c. Impermeable dropcloths must be placed on surfaces beneath all removal activity.

3.2.2 Protection of Existing Work to Remain

Perform work without damage or contamination of adjacent work. Where such work is damaged or contaminated as verified by the Contracting Officer using visual inspection or sample analysis, it must be restored to its original condition or decontaminated by the Contractor at no expense to the Government as deemed appropriate by the Contracting Officer. This includes inadvertent spill of dirt, dust, or debris in which it is reasonable to conclude that asbestos may exist. When these spills occur, stop work immediately. Then clean up the spill. When satisfactory visual inspection and air sampling results are obtained from the PQP work may proceed at the discretion of the Contracting Officer.

3.2.3 Furnishings

Furniture and equipment will be removed from the area of work by the Government before asbestos work begins.

3.2.4 Precleaning

Wet wipe and HEPA vacuum all surfaces potentially contaminated with asbestos prior to establishment of an enclosure.

3.2.5 Asbestos Control Area Requirements

3.2.5.1 Regulated Area for Class II Removal

Removal of the black mastic is a Class II removal activity. Establish designated limits for the asbestos regulated work area with the use of red barrier tape; install critical barriers, splash guards and signs, and maintain all other requirements for asbestos control area except local exhaust. Place impermeable dropcloths on surfaces beneath removal activity extending out 3 feet in all directions. A detached decontamination system may be used. Conduct area monitoring of airborne fibers during the work shift at the designated limits of the asbestos work area and conduct personal samples of each worker engaged in the work. If workers the airborne fiber concentration of the workers or designated limits at any time exceeds background or 0.01 f/cc, whichever is greater, stop work immediately and correct the situation.

3.2.6 Removal Procedures

Wet asbestos material with a fine spray of amended water during removal, cutting, or other handling so as to reduce the emission of airborne fibers. Remove material and immediately place in 6 mil plastic disposal bags. Remove asbestos containing material in a gradual manner, with continuous application of the amended water or wetting agent in such a manner that no asbestos material is disturbed prior to being adequately wetted. Where unusual circumstances prohibit the use of 6 mil plastic bags, submit an alternate proposal for containment of asbestos fibers to the Contracting Officer for approval. For example, in the case where both piping and insulation are to be removed, the Contractor may elect to wet the insulation, wrap the pipes and insulation in plastic and remove the pipe by sections. Containerize asbestos containing material while wet. Do not allow asbestos material to accumulate or become dry. Lower and otherwise handle asbestos containing material as indicated in 40 CFR 61-SUBPART M.

3.2.6.1 Sealing Contaminated Items Designated for Disposal

Remove contaminated architectural, mechanical, and electrical appurtenances such as venetian blinds, full-height partitions, carpeting, duct work, pipes and fittings, radiators, light fixtures, conduit, panels, and other contaminated items designated for removal by completely coating the items with an asbestos lock-down encapsulant at the demolition site before removing the items from the asbestos control area. These items need not be vacuumed. The asbestos lock-down encapsulant must be tinted a contrasting color and spray-applied by airless method. Thoroughness of sealing operation must be visually gauged by the extent of colored coating on exposed surfaces. Lock-down encapsulants must comply with the performance requirements specified herein.

3.2.7 Methods of Compliance

3.2.7.1 Mandated Practices

The specific abatement techniques and items identified must be detailed in the Contractor's AHAP. Use the following engineering controls and work practices in all operations, regardless of the levels of exposure:

- a. Vacuum cleaners equipped with HEPA filters.
- b. Wet methods or wetting agents except where it can be demonstrated that the use of wet methods is unfeasible due to the creation of electrical hazards, equipment malfunction, and in roofing.
- c. Prompt clean-up and disposal.
- d. Inspection and repair of polyethylene.
- e. Cleaning of equipment and surfaces of containers prior to removing them from the equipment room or area.

3.2.7.2 Control Methods

Use the following control methods:

- a. Local exhaust ventilation equipped with HEPA filter;

- b. Enclosure or isolation of processes producing asbestos dust;
- c. Where the feasible engineering and work practice controls are not sufficient to reduce employee exposure to or below the PELs, use them to reduce employee exposure to the lowest levels attainable and must supplement them by the use of respiratory protection.

3.2.7.3 Unacceptable Practices

The following work practices must not be used:

- a. High-speed abrasive disc saws that are not equipped with point of cut ventilator or enclosures with HEPA filtered exhaust air.
- b. Compressed air used to remove asbestos containing materials, unless the compressed air is used in conjunction with an enclosed ventilation system designed to capture the dust cloud created by the compressed air.
- c. Dry sweeping, shoveling, or other dry clean up.
- d. Employee rotation as a means of reducing employee exposure to asbestos.

3.2.8 Class II Work Procedures

In addition to the requirements of paragraphs MANDATED PRACTICES and CONTROL METHODS, the following engineering controls and work practices must be used:

- a. A CP must supervise the work.
- b. For indoor work, critical barriers must be placed over all openings to the regulated area.
- c. Impermeable dropcloths must be placed on surfaces beneath all removal activity.

3.2.9 Specific Control Methods for Class II Work

3.2.9.1 Sealants and Mastic

Establish designated limits for the asbestos regulated work area with the use of red barrier tape, critical barriers and signs, and maintain all other requirements for asbestos control area except local exhaust. Spread 6-mil plastic sheeting on the ground around the perimeter of the work area extending out in all directions. Using adequately wet methods, carefully remove the ACM sealants and mastics using a scraper or knife blade. As it is removed place the material into a disposal bag. Make every effort to keep the asbestos material from falling to the ground or work area floor below. Dry sweeping is prohibited. Use vacuums equipped with HEPA filter and disposable dust bag. Once the material is in the disposal bag, apply additional water as needed to achieve "adequately wet" conditions for NESHAP compliance. Place bagged asbestos waste under negative pressure with the use of a HEPA vacuum, goose neck and duck tape to seal the bag, wash to remove any visible contamination and place into a second 6-mil minimum thickness disposal bag. Containerize asbestos containing waste while wet. Lower and otherwise handle asbestos containing materials as indicated in 40 CFR 61-SUBPART M. Conduct area monitoring of airborne fibers during the work shift at the designated limits of the asbestos work

area and conduct personal samples of each worker engaged in the work. If the airborne fiber concentration of the workers or at designated limits at any time exceeds background or 0.01 f/cc, whichever is greater, stop work immediately and correct the situation.

3.2.9.2 Roofing Materials

Establish designated limits for the asbestos regulated work area with the use of red barrier tape, critical barriers, signs, and maintain all other requirements for asbestos control area except local exhaust. When removing roofing materials which contain ACM as described in 29 CFR 1926.1101(g)(8)(ii), use the following practices. Roofing material must be removed in an intact state. Wet methods must be used to remove roofing materials that are not intact, or that will be rendered not intact during removal, unless such wet methods are not feasible or will create safety hazards. When removing built-up roofs, with asbestos-containing roofing felts and an aggregate surface, using a power roof cutter, all dust resulting from the cutting operations must be collected by a HEPA dust collector, or must be HEPA vacuumed by vacuuming along the cut line. Asbestos-containing roofing material must not be dropped or thrown to the ground, but must be lowered to the ground via covered, dust-tight chute, crane, hoist or other method approved by the Contracting Officer. Any ACM that is not intact must be lowered to the ground as soon as practicable, but not later than the end of the work shift. While the material remains on the roof it must be kept wet or placed in an impermeable waste bag or wrapped in plastic sheeting. Intact ACM must be lowered to the ground as soon as practicable, but not later than the end of the work shift. Unwrapped material must be transferred to a closed receptacle. Critical barriers must be placed over roof level heating and ventilation air intakes. Conduct area monitoring of airborne fibers during the work shift at the designated limits of the asbestos work area and conduct personal samples of each worker engaged in the work. If the airborne fiber concentration of the workers or designated limits at any time exceeds background or 0.01 f/cc, whichever is greater, stop work immediately and correct the situation.

3.2.10 Air Sampling

Perform sampling of airborne concentrations of asbestos fibers in accordance with 29 CFR 1926.1101, the Contractor's air monitoring plan and as specified herein. Sampling performed in accordance with 29 CFR 1926.1101 must be performed by the PQP. Sampling performed for environmental and quality control reasons must be performed by the PQP. Unless otherwise specified, use NIOSH Method 7400 for sampling and analysis. Monitoring may be duplicated by the Government at the discretion of the Contracting Officer. If the air sampling results obtained by the Government differ from those results obtained by the Contractor, the Government will determine which results predominate. Results of breathing zone samples must be posted at the job site and made available to the Contracting Officer. Submit all documentation regarding initial exposure assessments, negative exposure assessments, and air-monitoring results.

3.2.10.1 Sampling Prior to Asbestos Work

Provide area air sampling and establish the baseline one day prior to the masking and sealing operations for each removal site. Establish the background by performing area sampling in similar but uncontaminated sites in the building.

3.2.10.2 Sampling During Asbestos Work

The PQP must provide personal and area sampling as indicated in 29 CFR 1926.1101 and governing environmental regulations. Breathing zone samples must be taken for at least 25 percent of the workers in each shift, or a minimum of two, whichever is greater. Air sample fiber counting must be completed and results provided within 24-hours (breathing zone samples), and 48 hours (environmental/clearance monitoring) after completion of a sampling period. In addition, provided the same type of work is being performed, provide area sampling at least once every work shift close to the work inside the enclosure, outside the clean room entrance to the enclosure, and at the exhaust opening of the local exhaust system. If sampling outside the enclosure shows airborne levels have exceeded background or 0.01 f/cc, whichever is greater, stop all work, correct the condition(s) causing the increase, and notify the Contracting Officer immediately. Where alternate methods are used, perform personal and area air sampling at locations and frequencies that will accurately characterize the evolving airborne asbestos levels. The written results must be signed by testing laboratory analyst, testing laboratory principal and the Contractor's PQP. The air sampling results must be documented on a Contractor's daily air monitoring log.

The PQP must provide personal sampling as indicated in 29 CFR 1926.1101. Breathing zone samples must be taken for at least 25 percent of the workers in each shift, or a minimum of two, whichever is greater. Breathing zone samples must be taken for at least 25 percent of the workers in each shift, or a minimum of two, whichever is greater. Air sample fiber counting must be completed and results provided within 24-hours (breathing zone samples), and 48 hours (environmental/clearance monitoring) after completion of a sampling period. At the same time the GC will provide area sampling close to the work inside the enclosure, outside the clean room entrance to the enclosure, and at the exhaust opening of the local exhaust system. In addition, provided the same type of work is being performed, the GC will provide area sampling once every work shift close to the work inside the enclosure, outside the clean room entrance to the enclosure, and at the exhaust opening of the local exhaust system. If sampling outside the enclosure shows airborne levels have exceeded background or 0.01 f/cc, whichever is greater, stop all work, correct the condition(s) causing the increase, and notify the Contracting Officer immediately. Where alternate methods are used, perform personal and area air sampling at locations and frequencies that will accurately characterize the evolving airborne asbestos levels. The written results must be signed by testing laboratory analyst, testing laboratory principal and the Contractor's PQP. The air sampling results must be documented on a Contractor's daily air monitoring log.

3.2.10.3 Final Clearance Requirements, NIOSH PCM Method

For PCM sampling and analysis using NIOSH NMAM Method 7400, the fiber concentration inside the abated regulated area, for each airborne sample, must be less than 0.01 f/cc. The abatement inside the regulated area is considered complete when every PCM final clearance sample is below the clearance limit. If any sample result is greater than 0.01 total f/cc, the asbestos fiber concentration (asbestos f/cc) must be confirmed from that same filter using NIOSH NMAM Method 7402 (TEM) at Contractor's expense. If any confirmation sample result is greater than 0.01 asbestos f/cc, abatement is incomplete and cleaning must be repeated at the Contractor's expense. Upon completion of any required recleaning,

resampling with results to meet the above clearance criteria must be done at the Contractor's expense.

3.2.10.4 Final Clearance Requirements, EPA TEM Method

For EPA TEM sampling and analysis, using the EPA Method specified in 40 CFR 763, abatement inside the regulated area is considered complete when the arithmetic mean asbestos concentration of the five inside samples is less than or equal to 70 structures per square millimeter (70 S/mm). When the arithmetic mean is greater than 70 S/mm, the three blank samples must be analyzed. If the three blank samples are greater than 70 S/mm, resampling must be done. If less than 70 S/mm, the five outside samples must be analyzed and a Z-test analysis performed. When the Z-test results are less than 1.65, the decontamination must be considered complete. If the Z-test results are more than 1.65, the abatement is incomplete and cleaning must be repeated. Upon completion of any required recleaning, resampling with results to meet the above clearance criteria must be done at the Contractor's expense.

3.2.10.5 Sampling After Final Clean-Up (Clearance Sampling)

Provide area sampling of asbestos fibers and establish an airborne asbestos concentration of less than 0.01 f/cc after final clean-up but before removal of the enclosure or the asbestos work control area. After final cleanup and the asbestos control area is dry but prior to clearance sampling, the PQP must perform a visual inspection in accordance with ASTM E1368 to ensure that the asbestos control and work area is free of any accumulations of dirt, dust, or debris. Prepare a written report signed and dated by the PQP documenting that the asbestos control area is free of dust, dirt, and debris and all waste has been removed. The asbestos fiber counts from these samples must be less than 0.01 f/cc or be not greater than the background, whichever is greater. Should any of the final samples indicate a higher value take appropriate actions to re-clean the area and repeat the sampling and TEM analysis at the Contractor's expense.

3.2.10.6 Air Clearance Failure

If clearance sampling results fail to meet the final clearance requirements, pay all costs associated with the required recleaning, resampling, and analysis, until final clearance requirements are met.

3.2.11 Site Inspection

While performing asbestos engineering control work, the Contractor must be subject to on-site inspection by the Contracting Officer who may be assisted by or represented by safety or industrial hygiene personnel. If the work is found to be in violation of this specification, the Contracting Officer or his representative will issue a stop work order to be in effect immediately and until the violation is resolved. All related costs including standby time required to resolve the violation must be at the Contractor's expense.

3.3 CLEAN-UP AND DISPOSAL

3.3.1 Housekeeping

Essential parts of asbestos dust control are housekeeping and clean-up procedures. Maintain surfaces of the asbestos control area free of

accumulations of asbestos fibers. Give meticulous attention to restricting the spread of dust and debris; keep waste from being distributed over the general area. Use HEPA filtered vacuum cleaners. DO NOT BLOW DOWN THE SPACE WITH COMPRESSED AIR. When asbestos removal is complete, all asbestos waste is removed from the work-site, and final clean-up is completed, the Contracting Officer will attest that the area is safe before the signs can be removed. After final clean-up and acceptable airborne concentrations are attained but before the HEPA unit is turned off and the enclosure removed, remove all pre-filters on the building HVAC system and provide new pre-filters. Dispose of filters as asbestos contaminated materials. Reestablish HVAC mechanical, and electrical systems in proper working order. The Contracting Officer will visually inspect all surfaces within the enclosure for residual material or accumulated dust or debris. The Contractor must re-clean all areas showing dust or residual materials. If re-cleaning is required, air sample and establish an acceptable asbestos airborne concentration after re-cleaning. The Contracting Officer must agree that the area is safe in writing before unrestricted entry will be permitted. The Government must have the option to perform monitoring to determine if the areas are safe before entry is permitted.

3.3.2 Title to Materials

All waste materials, except as specified otherwise, become the property of the Contractor and must be disposed of as specified in applicable local, State, and Federal regulations and herein.

3.3.3 Disposal of Asbestos

3.3.3.1 Procedure for Disposal

Coordinate all waste disposal manifests with the Contracting Officer. Collect asbestos waste, contaminated waste water filters, asbestos contaminated water, scrap, debris, bags, containers, equipment, and asbestos contaminated clothing which may produce airborne concentrations of asbestos fibers and place in sealed fiber-proof, waterproof, non-returnable containers (e.g. double plastic bags 6 mils thick, cartons, drums or cans). Wastes within the containers must be adequately wet in accordance with 40 CFR 61-SUBPART M. Affix a warning and Department of Transportation (DOT) label to each container including the bags or use at least 6 mils thick bags with the approved warnings and DOT labeling preprinted on the bag. Clearly indicate on the outside of each container the name of the waste generator and the location at which the waste was generated. Prevent contamination of the transport vehicle (especially if the transport vehicle is a rented truck likely to be used in the future for non-asbestos purposes). These precautions include lining the vehicle cargo area with plastic sheeting (similar to work area enclosure) and thorough cleaning of the cargo area after transport and unloading of asbestos debris is complete. Dispose of waste asbestos material at an Environmental Protection Agency (EPA) or State-approved asbestos landfill off Government property. For temporary storage, store sealed impermeable bags in asbestos waste drums or skids. An area for interim storage of asbestos waste-containing drums or skids will be assigned by the Contracting Officer or his authorized representative. Comply with 40 CFR 61-SUBPART M, State, regional, and local standards for hauling and disposal. Sealed plastic bags may be dumped from drums into the burial site unless the bags have been broken or damaged. Damaged bags must remain in the drum and the entire contaminated drum must be buried. Uncontaminated drums may be recycled. Workers unloading the sealed drums

must wear appropriate respirators and personal protective equipment when handling asbestos materials at the disposal site.

3.3.3.2 Asbestos Disposal Quantity Report

Direct the PQP to record and report, to the Contracting Officer, the amount of asbestos containing material removed and released for disposal. Deliver the report for the previous day at the beginning of each day shift with amounts of material removed during the previous day reported in linear feet or square feet as described initially in this specification and in cubic feet for the amount of asbestos containing material released for disposal.

-- End of Section --

SECTION 02 83 00

LEAD REMEDIATION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP Z9.2 (2018) Fundamentals Governing the Design
and Operation of Local Exhaust Ventilation
Systems

GEORGIA STATE LEGISLATURE

GAC 391-3-24 Lead-Based Paint Hazard Management

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 701 (2019) Standard Methods of Fire Tests for
Flame Propagation of Textiles and Films

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2024) Safety -- Safety and Occupational
Health (SOH) Requirements

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)

HUD 6780 (1995; Errata Aug 1996; Rev Ch. 7 - 1997)
Guidelines for the Evaluation and Control
of Lead-Based Paint Hazards in Housing

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1926.21 Safety Training and Education

29 CFR 1926.33 Access to Employee Exposure and Medical
Records

29 CFR 1926.55 Gases, Vapors, Fumes, Dusts, and Mists

29 CFR 1926.59 Hazard Communication

29 CFR 1926.62 Lead

29 CFR 1926.65 Hazardous Waste Operations and Emergency
Response

29 CFR 1926.103 Respiratory Protection

40 CFR 260 Hazardous Waste Management System: General

40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 268	Land Disposal Restrictions
40 CFR 745	Lead-Based Paint Poisoning Prevention in Certain Residential Structures
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
49 CFR 178	Specifications for Packagings

UNDERWRITERS LABORATORIES (UL)

UL 586	(2009; Reprint Dec 2017) UL Standard for Safety High-Efficiency Particulate, Air Filter Units

1.2 DEFINITIONS

1.2.1 Abatement

Measures defined in 40 CFR 745, Section 223, designed to permanently eliminate lead-based paint hazards.

1.2.2 Action Level

Employee exposure, without regard to use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter (ug/m3) of air averaged over an 8-hour period.

1.2.3 Area Sampling

Sampling of lead concentrations within the lead control area and inside the physical boundaries which is representative of the airborne lead concentrations but is not collected in the breathing zone of personnel (approximately 5 to 6 feet above the floor).

1.2.4 Certified Industrial Hygienist (CIH)

As used in this section refers to a person retained by the Contractor who

is certified as an industrial hygienist and who is trained in the recognition and control of lead, cadmium and chromium hazards in accordance with current federal, State, and local regulations. CIH must be certified for comprehensive practice by the American Board of Industrial Hygiene. The CIH must be independent of the Contractor and must have no employee or employer relationship which could constitute a conflict of interest.

1.2.5 Competent Person (CP)

As used in this section, refers to a person employed by the Contractor who is trained in the recognition and control of lead hazards in accordance with current federal, State, and local regulations and has the authority to take prompt corrective actions to control the lead hazard. The Contractor may provide more than one CP as required to supervise and monitor the work. The CP must be a CIH certified by the American Board of Industrial Hygiene or a Certified Safety Professional (CSP) certified by the Board of Certified Safety Professionals.

1.2.6 Contaminated Room

Refers to a room for removal of contaminated personal protective equipment (PPE).

1.2.7 Decontamination Shower Facility

That facility that encompasses a clean clothing storage room, and a contaminated clothing storage and disposal rooms, with a shower facility in between.

1.2.8 Deleading

Activities conducted by a person who offers to eliminate lead-based paint or lead-based paint hazards or to plan such activities in commercial buildings, bridges or other structures.

1.2.9 Eight-Hour Time Weighted Average (TWA)

Airborne concentration of lead to which an employee is exposed, averaged over an 8-hour workday as indicated in 29 CFR 1926.62.

1.2.10 High Efficiency Particulate Air (HEPA) Filter Equipment

HEPA filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining lead contaminated particulate. A high efficiency particulate filter demonstrates at least 99.97 percent efficiency against 0.3 micron or larger size particles.

1.2.11 Lead

Metallic lead, inorganic lead compounds, and organic lead soaps. Excludes other forms of organic lead compounds.

1.2.12 Lead-Based Paint (LBP)

Paint or other surface coating that contains lead in excess of 1.0 milligrams per centimeter squared or 0.5 percent by weight.

1.2.13 Lead-Based Paint Activities

Lead-based paint activities include; a lead-based paint inspection, a risk assessment, or abatement of lead-based paint hazards.

1.2.14 Lead-Based Paint Hazards

Any condition that causes exposure to lead from lead-contaminated dust, lead-contaminated soil, lead-based paint that is deteriorated or present in accessible surfaces, friction surfaces, or impact surfaces that would result in adverse human health effects.

1.2.15 Lead Control Area

A system of control methods to prevent the spread of lead dust, paint chips or debris to adjacent areas that may include temporary containment, floor or ground cover protection, physical boundaries, and warning signs to prevent unauthorized entry of personnel. HEPA filtered local exhaust equipment may be used as engineering controls to further reduce personnel exposures or building/outdoor environmental contamination.

1.2.16 Lead Permissible Exposure Limit (PEL)

Fifty ug/m3 of air as an 8-hour time weighted average as determined by 29 CFR 1926.62. If an employee is exposed for more than 8-hours in a work day, determine the PEL by the following formula:

$$\text{PEL (ug/m3 of air)} = 400/\text{No. hrs worked per day}$$

1.2.17 Material Containing Lead/Paint with Lead (MCL/PWL)

Any material, including paint, which contains lead as determined by the testing laboratory using a valid test method. The requirements of this section does not apply if no detectable levels of lead are found using a quantitative method for analyzing paint or MCL using laboratory instruments with specified limits of detection (usually 0.01 percent).

1.2.18 Personal Sampling

Sampling of airborne lead, cadmium, and chromium concentrations within the breathing zone of an employee to determine the 8-hour time weighted average concentration in accordance with 29 CFR 1926.62, 29 CFR 1926.55. Samples must be representative of the employees' work tasks. Breathing zone must be considered an area within a hemisphere, forward of the shoulders, with a radius of 6 to 9 inches and centered at the nose or mouth of an employee.

1.2.19 Physical Boundary

Area physically roped or partitioned off around lead, cadmium, and chromium control area to limit unauthorized entry of personnel.

1.3 DESCRIPTION

Review the report titled, "Report of Pre-Demolition Asbestos Survey and Lead-Based Paint Screen, Military Working Dog Kennel, Hunter Army Airfield, Savannah, Georgia" by Geo-Hydro Engineers, dated May 20, 2020, hereinafter referred to as "HAZMAT Survey," which is included in Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS as an Attachment. The HAZMAT

Survey details the locations, substrate, paint colors/conditions, and concentrations of materials that may be impacted.

Note that the interior of the two corrugated metals sheds present at the site and the area below the metal roof of the MWD Kennel building must be surveyed for lead paint prior to demolition.

Construction activities impacting PWL or material containing lead which are covered by this specification include the demolition or removal of material containing greater than 0.5 percent lead by weight located in the white paint on an interior metal window in the veterinarian office patient room of Building 1030, the Military Working Dog Kennel and as indicated on the drawings. Low levels of lead (<0.03 percent) was also identified in the exterior peach paint on the wall and the interior green/blue paint on cinder block in Building 1030. As a result of the lead-based paint (>0.5 percent lead), a Lead Management Plan will be required for work in the veterinarian office patient room. Additionally, all construction and demolition debris with lead containing paint must go to a subtitle D landfill; however, any metal to be salvaged may go to a metal recycling facility as long as the facility is made aware that the metal contains lead paint. The work covered by this section includes work tasks and the precautions specified in this section for the protection of the environment during and after the performance of the hazard abatement activities.

Preference is to demolish buildings with lead paint remaining intact on substrate materials, which avoids the hazards of removing PWL coatings. Any loose PWL chips must be collected and containerized for subsequent waste characterization testing. Contractor shall verify quantities and locations prior to bid.

1.3.1 Protection of Existing Areas To Remain

Project work including, but not limited to, lead hazard abatement work, storage, transportation, and disposal must be performed without damaging or contaminating adjacent work and areas. Where such work or areas are damaged or contaminated, restore work and areas to the original condition.

1.3.2 Coordination with Other Work

Coordinate with work being performed in adjacent areas to ensure there are no exposure issues. Explain coordination procedures in the Lead Compliance Plan and describe how the Contractor will prevent lead exposure to other contractors and Government personnel performing work unrelated to lead activities.

1.3.3 Sampling and Analysis

Submit a log of the analytical results from sampling conducted during the abatement. Keep the log of results current with project activities and brief the results to the Contracting Officer as analytical results are reported.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Hazardous Waste Management Plan; G
Competent Person Qualifications; G
Training Certification; G
Occupational and Environmental Assessment Data Report; G
Medical Examinations; G
Lead Waste Management Plan; G
Licenses, Permits and Notifications; G
Lead Compliance Plan; G
Written Evidence of TSD Approval; G

SD-03 Product Data

Respirators; G
Vacuum Filters; G
Negative Air Pressure System; G
Materials and Equipment; G
Expendable Supplies; G
Local Exhaust Equipment; G

SD-06 Test Reports

Sampling and Analysis; G
Occupational and Environmental Assessment Data Report; G

SD-07 Certificates

Testing Laboratory; G
Notification of the Commencement of LBP Hazard Abatement; G
Clearance Certification; G

SD-11 Closeout Submittals

Hazardous Waste Manifest; G
Turn-In Documents or Weight Tickets; G

1.5 QUALITY ASSURANCE

1.5.1 Qualifications

1.5.1.1 Competent Person (CP)

Submit name, address, and telephone number of the CP selected to perform responsibilities specified in paragraph COMPETENT PERSON (CP) RESPONSIBILITIES. Provide documented construction project-related experience with implementation of OSHA's Lead in Construction standard (29 CFR 1926.62), which shows ability to assess occupational and environmental exposure to lead; experience with the use of respirators, PPE and other exposure reduction methods to protect employee health. Demonstrate a minimum of 3 years experience implementing OSHA's Lead in Construction standard (29 CFR 1926.62). Submit proper documentation that the CP is trained and certified in accordance with federal, State, and local laws.

1.5.1.2 Training Certification

Submit a certificate for each worker and supervisor, signed and dated by the accredited training provider, stating that the employee has received the required lead training specified in 29 CFR 1926.62.

1.5.1.3 Testing Laboratory

Submit the name, address, and telephone number of the testing laboratory selected to perform the air analysis, testing, and reporting of airborne concentrations of lead. Use a laboratory participating in the EPA National Lead Laboratory Accreditation Program (NLLAP) by being accredited by either the American Association for Laboratory Accreditation (A2LA) or the American Industrial Hygiene Association (AIHA) and that is successfully participating in the Environmental Lead Proficiency Analytical Testing (ELPAT) program to perform sample analysis. Laboratories selected to perform blood lead analysis must be OSHA approved.

1.5.2 Requirements

1.5.2.1 Competent Person (CP) Responsibilities

- a. Verify training meets all federal, State, and local requirements.
- b. Review and approve Lead Compliance Plan for conformance to the applicable referenced standards.
- c. Continuously inspect LBP/PWL or MCL work for conformance with the approved plan.
- d. Perform (or oversee performance of) air sampling. Recommend upgrades or downgrades (whichever is appropriate based on exposure) on the use of PPE (respirators included) and engineering controls.
- e. Ensure work is performed in strict accordance with specifications at all times.
- f. Control work to prevent hazardous exposure to human beings and to the environment at all times.
- g. Supervise final cleaning of the lead control area, take clearance wipe

samples if necessary; review clearance sample results and make recommendations for further cleaning.

- h. Certify the conditions of the work as called for elsewhere in this specification.
- i. The CP must be certified pursuant to 40 CFR 745, Section 226 and is responsible for development and implementation of the abatement report and supervise lead hazard abatement work activities.

1.5.2.2 Lead Compliance Plan

Submit a detailed job-specific plan of the work procedures to be used in the disturbance of lead, LBP/PWL or MCL. Include in the plan a sketch showing the location, size, and details of lead control areas, critical barriers, physical boundaries, location and details of decontamination facilities, viewing ports, and mechanical ventilation system, if required.

Include a description of equipment and materials, work practices, controls and job responsibilities for each activity from which lead is emitted. Include in the plan, eating, drinking, smoking, hygiene facilities and sanitary procedures, interface of trades, sequencing of lead related work, collected waste water and dust containing lead and debris, air sampling, respirators, personal protective equipment, and a detailed description of the method of containment of the operation to ensure that lead is not released outside of the lead control area. Include site preparation, cleanup and clearance procedures. Include occupational and environmental sampling, training and strategy, sampling and analysis strategy and methodology, frequency of sampling, duration of sampling, and qualifications of sampling personnel in the air sampling portion of the plan. Include a description of arrangements made among contractors on multicontractor worksites to inform affected employees and to clarify responsibilities to control exposures.

The Lead Compliance Plan shall include exposure monitoring for lead during demolition that impacts PWL/MCL, in compliance with OSHA's 29 CFR 1926.62, especially if there is a reasonable possibility that employees may be exposed to lead at or above the OSHA action level of 30 ug/m³. Prior to disturbing PWL using any trigger task listed in paragraph 1.3 of this section, make an initial written determination as to whether portions of the paint coating(s) require pre-removal and of expected employee exposures, based on intended means and methods of disturbing PWL. Whether PWL is required to be removed prior to demolition depends on the construction methods and exposure controls, which must be described in the written Lead Compliance Program.

The plan must be developed and signed by a lead CP.

1.5.2.3 Occupational and Environmental Assessment Data Report

In order to reduce the full implementation of 29 CFR 1926.62, the Contractor must provide documentation. Submit a report that supports the determination to reduce full implementation of the requirements of 29 CFR 1926.62, and supporting the Lead Compliance Plan.

- a. The initial monitoring must represent each job classification, or if working conditions are similar to previous jobs by the same employer, provide previously collected exposure data that can be used to estimate worker exposures per 29 CFR 1926.62. The data must represent the worker's regular daily exposure to lead for stated work.

- b. Submit worker exposure data gathered during the task based trigger operations of 29 CFR 1926.62 with a complete process description. This includes manual demolition, manual scraping, manual sanding, heat gun, power tool cleaning, rivet busting, cleanup of dry expendable abrasives, abrasive blast enclosure removal, abrasive blasting, welding, cutting and torch burning where lead containing coatings are present.
- c. The initial assessment must determine the requirement for further monitoring and the need to fully implement the control and protective requirements including the lead compliance plan per 29 CFR 1926.62.

1.5.2.4 Medical Examinations

If Lead Compliance Plan anticipates worker lead exposure above the action level on any one day, submit pre-work blood lead levels and post-work blood lead levels for all workers performing lead activities during the execution of the work. Initial medical surveillance as required by 29 CFR 1926.62 must be made available to all employees exposed to lead at any time (one day) above the action level. Full medical surveillance must be made available to all employees on an annual basis who are or may be exposed to lead in excess of the action level for more than 30 days a year or as required by 29 CFR 1926.62. Adequate records must show that employees meet the medical surveillance requirements of 29 CFR 1926.33, 29 CFR 1926.62 and 29 CFR 1926.103. Provide medical surveillance to all personnel exposed to lead as indicated in 29 CFR 1926.62. Maintain complete and accurate medical records of employees for the duration of employment plus 30 years.

1.5.2.5 Training

Train each employee performing work that disturbs lead who performs LBP/MCL/PWL disposal, and air sampling operations prior to the time of initial job assignment and annually thereafter, in accordance with 29 CFR 1926.21, 29 CFR 1926.62 and State and local regulations where appropriate.

1.5.2.6 Respiratory Protection Program

- a. Provide each employee required to wear a respirator a respirator fit test at the time of initial fitting and at least annually thereafter as required by 29 CFR 1926.62.
- b. Establish and implement a respiratory protection program as required by 29 CFR 1926.103, 29 CFR 1926.62, and 29 CFR 1926.55.

1.5.2.7 Hazard Communication Program

Establish and implement a Hazard Communication Program as required by 29 CFR 1926.59.

1.5.2.8 Lead Waste Management

The Lead Waste Management Plan must comply with applicable requirements of federal, State, and local hazardous waste regulations and address:

- a. Identification and classification of wastes associated with the work.

- b. Estimated quantities of wastes to be generated and disposed of.
- c. Names and qualifications of each contractor that will be transporting, storing, treating, and disposing of the wastes. Include the facility location and a 24-hour point of contact. Furnish two copies of USEPA hazardous waste manifests and USEPA Identification numbers.
- d. Names and qualifications (experience and training) of personnel who will be working on-site with hazardous wastes.
- e. List of waste handling equipment to be used in performing the work, to include cleaning, volume reduction, and transport equipment.
- f. Spill prevention, containment, and cleanup contingency measures including a health and safety plan to be implemented in accordance with 29 CFR 1926.65.
- g. Work plan and schedule for waste containment, removal and disposal. Proper containment of the waste includes using acceptable waste containers (e.g., 55-gallon drums) as well as proper marking/labeling of the containers. Clean up and containerize wastes daily.
- h. Include any process that may alter or treat waste rendering a hazardous waste non hazardous.
- i. Unit cost for hazardous waste disposal according to this plan.

1.5.2.9 Environmental, Safety and Health Compliance

In addition to the detailed requirements of this specification, comply with laws, ordinances, rules, and regulations of federal, State, and local authorities regarding lead. Comply with the applicable requirements of the current issue of 29 CFR 1926.62 and EM 385-1-1. Submit matters regarding interpretation of standards to the Contracting Officer for resolution before starting work. Where specification requirements and the referenced documents vary, the most stringent requirements apply. The following local and State laws, ordinances, criteria, rules and regulations regarding removing, handling, storing, transporting, and disposing of lead contaminated materials apply:

- a. Georgia Administrative Code (GAC) - GAC 391-3-24 Lead-Based Paint Hazard Management

1.5.3 Pressure Differential Recordings for Local Exhaust System

If removal methods require a negative pressure containment, provide a local exhaust system that creates a negative pressure of at least 0.02 inches of water relative to the pressure external to the enclosure and operate it continuously, 24-hours a day, until the temporary enclosure of the lead control area is removed. Submit pressure differential recordings for each work day to the PQP for review and to the Contracting Officer within 24-hours from the end of each work day.

1.5.4 Licenses, Permits and Notifications

If removal methods require, certify and submit in writing to the Regional Office of the EPA and the Contracting Officer at least 10 days prior to the commencement of work that certifications, licenses, permits and notifications have been obtained. All associated fees or costs incurred

in obtaining the licenses, permits and notifications are included in the contract price.

1.5.5 Pre-Construction Conference

Along with the CP, meet with the Contracting Officer to discuss in detail the Lead Waste Management Plan and the Lead Compliance Plan, including procedures and precautions for the work.

1.6 EQUIPMENT

1.6.1 Respirators

Furnish appropriate respirators approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services, for use in atmospheres containing lead dust, fume and mist. Respirators must comply with the requirements of 29 CFR 1926.62.

1.6.2 Special Protective Clothing

Personnel exposed to lead contaminated dust must wear proper disposable protective whole body clothing, head covering, gloves, eye, and foot coverings as required by 29 CFR 1926.62. Furnish proper disposable plastic or rubber gloves to protect hands. Reduce the level of protection only after obtaining approval from the CP.

1.6.3 Rental Equipment Notification

If rental equipment is to be used during PWL or MCL handling and disposal, notify the rental agency in writing concerning the intended use of the equipment.

1.6.4 Vacuum Filters

UL 586 labeled HEPA filters.

1.6.5 Equipment for Government Personnel

Furnish the Contracting Officer with two complete sets of PPE daily, as required herein, for entry into and inspection of the lead removal work within the lead controlled area. Personal protective equipment must include disposable whole body covering, including appropriate foot, head, eye, and hand protection. PPE remains the property of the Contractor. The Government will provide respiratory protection for the Contracting Officer.

1.6.6 Abrasive Removal Equipment

The use of powered machine for vibrating, sanding, grinding, or abrasive blasting is prohibited unless equipped with local exhaust ventilation systems equipped with high efficiency particulate air (HEPA) filters.

1.6.7 Negative Air Pressure System

1.6.7.1 Minimum Requirements

If required by OSHA lead regulation and if Lead Compliance Plan indicates the necessity, do not proceed with work in the area until containment is set up and HEPA filtration systems are in place. The negative air

pressure system must meet the requirements of ASSP Z9.2 including approved HEPA filters in accordance with UL 586. Negative air pressure equipment must be equipped with new HEPA filters, and be sufficient to maintain a minimum pressure differential of minus 0.02 inch of water column relative to adjacent, unsealed areas. Negative air pressure system minimum requirements are listed as follows:

- a. The unit must be capable of delivering its rated volume of air with a clean first stage filter, an intermediate filter and a primary HEPA filter in place.
- b. The HEPA filter must be certified as being capable of trapping and retaining mono-disperse particles as small as 0.3 micrometers at a minimum efficiency of 99.97 percent.
- c. The unit must be capable of continuing to deliver no less than 70 percent of rated capacity when the HEPA filter is 70 percent full or measures 2.5 inches of water static pressure differential on a magnehelic gauge.
- d. Equip the unit with a manometer-type negative pressure differential monitor with minor scale division of 0.02 inch of water and accuracy within plus or minus 1.0 percent. The manometer must be calibrated daily as recommended by the manufacturer.
- e. Equip the unit with a means for the operator to easily interpret the readings in terms of the volumetric flow rate of air per minute moving through the machine at any given moment.
- f. Equip the unit with an electronic mechanism that automatically shuts the machine off in the event of a filter breach or absence of a filter.
- g. Equip the unit with an audible horn that sounds an alarm when the machine has shut itself off.
- h. Equip the unit with an automatic safety mechanism that prevents a worker from improperly inserting the main HEPA filter.

1.6.7.2 Auxiliary Generator

Provide an auxiliary generator with capacity to power a minimum of 50 percent of the negative air machines at any time during the work. When power fails, the generator controls must automatically start the generator and switch the negative air pressure system machines to generator power. The generator must not present a carbon monoxide hazard to workers.

1.6.8 Vacuum Systems

Vacuum systems must be suitably sized for the project, and filters must be capable of trapping and retaining all mono-disperse particles as small as 0.3 micrometers (mean aerodynamic diameter) at a minimum efficiency of 99.97 percent. Properly dispose of used filters that are being replaced.

1.7 PROJECT/SITE CONDITIONS

1.7.1 Protection of Existing Work to Remain

Perform work without damage or contamination of adjacent areas. Where existing work is damaged or contaminated, restore work to its original

condition or better as determined by the Contracting Officer.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Keep materials and equipment needed to complete the project available and on the site. Submit a description of the materials and equipment required; including Safety Data Sheets (SDSs) for material brought onsite to perform the work.

2.1.1 Expendable Supplies

Submit a description of the expendable supplies required.

2.1.1.1 Polyethylene Bags

Disposable bags must be polyethylene plastic and be a minimum of 6 mils thick (4 mils thick if double bags are used) or any other thick plastic material shown to demonstrate at least equivalent performance; and capable of being made leak-tight. Leak-tight means that solids, liquids or dust cannot escape or spill out.

2.1.1.2 Polyethylene Leak-tight Wrapping

Wrapping used to wrap lead contaminated debris must be polyethylene plastic that is a minimum of 6 mils thick or any other thick plastic material shown to demonstrate at least equivalent performance.

2.1.1.3 Polyethylene Sheeting

Sheeting must be polyethylene plastic with a minimum thickness of 6 mil, or any other thick plastic material shown to demonstrate at least equivalent performance; and be provided in the largest sheet size reasonably accommodated by the project to minimize the number of seams. Where the project location constitutes an out of the ordinary potential for fire, or where unusual fire hazards cannot be eliminated, provide flame-resistant polyethylene sheets which conform to the requirements of NFPA 701.

2.1.1.4 Tape and Adhesive Spray

Tape and adhesive must be capable of sealing joints between polyethylene sheets and for attachment of polyethylene sheets to adjacent surfaces. After dry application, tape or adhesive must retain adhesion when exposed to wet conditions, including amended water. Tape must be minimum 2 inches wide, industrial strength.

2.1.1.5 Containers

When used, containers must be leak-tight and be labeled in accordance with EPA, DOT and OSHA standards.

2.1.1.6 Chemical Paint Strippers

Chemical paint strippers must not contain methylene chloride and be formulated to prevent stain, discoloration, or raising of the substrate materials.

2.1.1.7 Chemical Paint Stripper Neutralizer

Neutralizers for paint strippers must be compatible with the substrate and suitable for use with the chemical stripper that has been applied to the surface.

2.1.1.8 Detergents and Cleaners

Detergents or cleaning agents must not contain trisodium phosphate and have demonstrated effectiveness in lead control work using cleaning techniques specified by HUD 6780 guidelines.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Protection

3.1.1.1 Notification

- a. Notify the Contracting Officer 20 days prior to the start of any lead work.
- b. Notification of the Commencement of LBP Hazard Abatement

Submit a copy of the notification of the commencement of LBP hazard abatement to the Contracting Officer.

3.1.1.2 Lead Control Area

- a. Physical Boundary - Provide physical boundaries around the control area by roping off the area designated in the work plan or providing curtains, portable partitions or other enclosures to ensure that lead will not escape outside of the lead control area. Prohibit the general public from accessing the lead, cadmium, chromium control areas.
- b. Warning Signs - When lead exposure is reasonably anticipated to exceed the Action Level for lead, provide warning signs at approaches to lead control areas. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the area. Signs must comply with the requirements of 29 CFR 1926.62.

3.1.1.3 Furnishings

The Government will remove furniture and equipment from the work area before lead work begins.

3.1.1.4 Heating, Ventilating and Air Conditioning (HVAC) Systems

Shut down, lock out, and isolate HVAC systems that supply, exhaust, or pass through the lead control areas. Seal intake and exhaust vents in the lead control area with 6 mil plastic sheet and tape. Seal seams in HVAC components that pass through the lead control area.

3.1.1.5 Local Exhaust System

Provide a local exhaust system in the lead control area in accordance with ASSP Z9.2 and 29 CFR 1926.62 that will provide at least 4 air changes per

hour inside of the negative pressure enclosure. Local exhaust equipment must be operated 24-hours per day, until the lead control area is removed and must be leak proof to the filter and equipped with HEPA filters. Maintain a minimum pressure differential in the lead control area of minus 0.02 inch of water column relative to adjacent, unsealed areas. Provide continuous 24-hour per day monitoring of the pressure differential with a pressure differential automatic recording instrument. The building ventilation system must not be used as the local exhaust system for the lead control area. Filters on exhaust equipment must conform to ASSP Z9.2 and UL 586. Terminate the local exhaust system out of doors and remote from any public access or ventilation system intakes.

3.1.1.6 Negative Air Pressure System Containment

- a. When required, operate the negative air pressure systems to provide at least 4 air changes per hour inside the containment. Operate the local exhaust unit equipment continuously until the containment is removed. Smoke test the negative air pressure system for leaks at the beginning of each shift. The certified supervisor is responsible to continuously monitor and keep a pressure differential log with an automatic manometric recording instrument. Notify the Contracting Officer immediately if the pressure differential falls below the prescribed minimum. Submit the continuously monitored pressure differential log, as specified. Do not use the building ventilation system as the local exhaust system. Terminate the local exhaust system out of doors unless the Contracting Officer allows an alternate arrangement. All filters must be new at the beginning of the project and be periodically changed as necessary to maintain specified pressure differential and disposed of as lead contaminated waste.
- b. Discontinuing Negative Air Pressure System. Operate the negative air pressure system continuously during abatement activities unless otherwise authorized by the Contracting Officer. At the completion of the project, units must be run until full cleanup has been completed and final clearance testing requirements have been met. Dismantling of the negative air pressure systems must conform to written decontamination procedures and be approved by the Contracting Officer be as presented in the Lead Compliance Plan. Seal the HEPA filter machine intakes with polyethylene to prevent environmental contamination.

3.1.1.7 Decontamination Shower Facility

When required, provide clean and contaminated change rooms and shower facilities in accordance with this specification and 29 CFR 1926.62.

3.1.1.8 Eye Wash Station

Provide suitable facilities within the work area for quick drenching or flushing of the eyes where eyes may be exposed to injurious corrosive materials.

3.1.1.9 Mechanical Ventilation System

- a. Use adequate ventilation to control personnel exposure to lead in accordance with 29 CFR 1926.62. To the extent feasible, use local exhaust ventilation or other collection systems, approved by the CP. Evaluate and maintain local exhaust ventilation systems in accordance with 29 CFR 1926.62.

- b. Vent local exhaust outside the building and away from building ventilation intakes or ensure system is connected to HEPA filters.
- c. Use locally exhausted, power actuated tools or manual hand tools.

3.1.1.10 Personnel Protection

Personnel must wear and use protective clothing and equipment as specified herein. Eating, smoking, or drinking or application of cosmetics is not permitted in the lead control area. No one will be permitted in the lead control area unless they have been appropriately trained and provided with protective equipment.

3.2 ERECTION

3.2.1 Lead Control Area Requirements

Establish a lead control area by completely establishing barriers and physical boundaries around the area or structure where PWL or MCL removal operations will be performed.

If required to control lead dust, establish full containment - Contain removal operations by the use of critical barriers and HEPA filtered exhaust system with decontamination facilities and with HEPA filtered exhaust if required by the CP. For containment areas larger than 1,000 square feet install a minimum of two 18 inch square viewing ports. Locate ports to provide a view of the required work from the exterior of the enclosed contaminated area. Glaze ports with laminated safety glass.

3.3 APPLICATION

3.3.1 Lead Work

Perform lead work in accordance with approved Lead Compliance Plan. Use procedures and equipment required to limit occupational exposure and environmental contamination with lead when the work is performed in accordance with 29 CFR 1926.62 and as specified herein. Dispose of all PWL or MCL and associated waste in compliance with federal, State, and local requirements.

3.3.2 Paint with Lead or Material Containing Lead Removal

Manual or power sanding or grinding of lead surfaces or materials is not permitted unless tools are equipped with HEPA attachments or wet methods. The dry sanding or grinding of surfaces that contain lead is prohibited. Provide methodology for removing lead in the Lead Compliance Plan; however, preference is to leave good-condition PWL in place on substrate materials during building demolition. Select lead removal processes to minimize contamination of work areas outside the control area with lead contaminated dust or other lead contaminated debris or waste and to ensure that unprotected personnel are not exposed to hazardous concentrations of lead. Describe this removal process in the Lead Compliance Plan.

Provide methodology for LBP/PWL removal and processes to minimize contamination of work areas outside the control area with lead contaminated dust or other lead contaminated debris/waste and to ensure that unprotected personnel are not exposed to hazardous concentrations of lead. Describe this LBP/PWL removal/control process in the Lead

Compliance Plan.

3.3.2.1 Paint with Lead or Material Containing Lead - Indoor Removal

Perform manual or mechanical removal in the lead control areas using enclosures, barriers or containments and powered locally exhausted tools equipped with HEPA filters. Collect residue and debris for disposal in accordance with federal, State, and local requirements.

3.3.2.2 Paint with Lead or Material Containing Lead - Outdoor Removal

Perform outdoor removal as indicated in federal, State, and local regulations and in the Lead Compliance Plan. The worksite preparation (barriers or containments) must be job dependent and presented in the Lead Compliance Plan.

3.3.3 Personnel Exiting Procedures

Whenever personnel exit the lead controlled area, they must perform the following procedures and must not leave the work place wearing any clothing or equipment worn in the control area:

- a. Vacuum all clothing before entering the contaminated change room.
- b. Remove protective clothing in the contaminated change room, and place them in an approved impermeable disposal bag.
- c. Shower if exposure exceeds an occupational exposure limits or if necessary for thorough decontamination.
- d. Wash hands and face at the site, don appropriate disposable or uncontaminated reusable clothing, move to an appropriate shower facility, shower.
- e. Change to clean clothes prior to leaving the clean clothes storage area.

3.4 FIELD QUALITY CONTROL

3.4.1 Tests

3.4.1.1 Air Sampling

Conduct sampling for lead in accordance with 29 CFR 1926.62 and as specified herein. Air sampling must be directed or performed by the CP.

- a. The CP must be on the job site directing the air and wipe sampling and inspecting the PWL or MCL removal work to ensure that the requirements of the contract have been satisfied during the entire PWL or MCL operation.
- b. Collect personal air samples on employees who are anticipated to have the greatest risk of exposure as determined by the CP. In addition, collect air samples on at least twenty-five percent of the work crew or a minimum of two employees, whichever is greater, during each work shift.
- c. Submit results of air samples, signed by the CP, within 72-hours after the air samples are taken.

- d. Conduct area air sampling daily, on each shift in which lead and lead-based paint removal operations are performed, in areas immediately adjacent to the lead, cadmium and chromium control area. Conduct sufficient area monitoring to ensure unprotected personnel are not exposed to lead at or above 30 ug/m³ of air. If 30 ug/m³ a concentration of lead of air is reached or exceeded, stop work, correct the conditions(s) causing the increased levels. Notify the Contracting Officer immediately. Determine if condition(s) require any further change in work methods. Resume removal work only after the CP and the Contracting Officer give approval.

3.4.1.2 Testing of Material Containing Lead, Cadmium, Chromium Residue

Test residue in accordance with 40 CFR 261 for hazardous waste.

3.5 CLEANING AND DISPOSAL

3.5.1 Cleanup

Maintain surfaces of the lead control area free of accumulations of dust and debris. Restrict the spread of dust and debris; keep waste from being distributed over the work area. Do not dry sweep or use pressurized air to clean up the area. At the end of each shift and when the lead operation has been completed, clean the controlled area of all visible contamination by vacuuming with a HEPA filtered vacuum cleaner, wet mopping the area and wet wiping the area as indicated by the Lead Compliance Plan. Reclean areas showing dust or debris. After visible dust and debris is removed, wet wipe and HEPA vacuum all surfaces in the controlled area. If adjacent areas become contaminated at any time during the work, clean, visually inspect, and then wipe sample all contaminated areas. The CP must then certify in writing that the area has been cleaned of lead contamination before clearance testing.

3.5.1.1 Clearance Certification

The CP must certify in writing that air samples collected outside the lead control area during paint removal operations are less than 30 ug/m³ of air of lead; the respiratory protection used for the employees was adequate if required; the work procedures were performed in accordance with 29 CFR 1926.62; and that there were no visible accumulations of material and dust containing lead left in the work site. Do not remove the lead control area or roped off boundary and warning signs prior to the Contracting Officer's acknowledgement of receipt of the CP certification.

Clear the lead control area of all visible dust and debris.

3.5.2 Disposal

Prior to commencing work and removal of any waste from the Installation, the Contractor must submit a Hazardous Waste Management Plan (HWMP) to the Contracting Officer for review and approval.

- a. Dispose of material, whether hazardous or non-hazardous in accordance with Section 01 57 19 and Section 01 74 19, the HWMP, Waste Management Plan, all laws and provisions, and all Federal, State or local regulations. Verify with the installation HWPM that waste is properly characterized. The result of each waste characterization (TCLP for RCRA materials) will dictate disposal requirements. If TCLP sampling of waste shows the waste exceeds the regulatory limit for lead, the

waste will be a hazardous waste. The hazardous waste will need to be collected and disposed in accordance with the HWMP approved by the HWPM.

- b. Contractor is responsible for segregation of waste. Collect lead contaminated waste, scrap, debris, bags, containers, equipment, and lead contaminated clothing that may produce airborne concentrations of lead particles. Label the containers in accordance with 29 CFR 1926.62, 40 CFR 261, 40 CFR 262 and corresponding state regulations.
- c. Dispose of lead contaminated material classified as hazardous waste at an EPA or State approved hazardous waste treatment, storage, or disposal facility off Government property.
- d. Accumulate waste materials in U.S. Department of Transportation (49 CFR 178) approved 55 gallon drums or appropriately sized container for smaller volumes. Properly label each drum to identify the type of hazardous material (49 CFR 172). For hazardous waste, the collection container requires marking/labeling in accordance with 40 CFR 262 and corresponding state regulations during the accumulation/collection timeframe. The Contracting Officer or an authorized representative will assign an area for accumulation of waste containers. Coordinate authorized accumulation volumes and time limits with the host installation environmental function.
- e. Handle, store, transport, and dispose lead or lead contaminated waste in accordance with 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, and 40 CFR 265. Comply with land disposal restriction notification requirements as required by 40 CFR 268.
- f. All lead waste generation, management, and disposal will be coordinated with the host installation environmental function.

3.5.2.1 Disposal Documentation

Coordinate all disposal or off-site shipments of lead waste with the host installation environmental function. Submit written evidence of TSD approval to demonstrate the hazardous waste TSD is approved for lead disposal by the EPA, State or local regulatory agencies. Submit one copy of the completed hazardous waste manifest, signed and dated by the initial transporter in accordance with 40 CFR 262. Provide a certificate that the waste was accepted by the disposal facility. Provide turn-in documents or weight tickets for non-hazardous waste disposal.

3.5.2.2 Payment for Hazardous Waste

Payment for disposal of hazardous and non-hazardous waste will not be made until a signed copy of the manifest from the treatment or disposal facility is received and approved by the Contracting Officer. The manifest must detail and certify the amount of lead containing materials or non-hazardous waste delivered to the treatment or disposal facility.

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SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 117	(2010; R 2015) Specifications for Tolerances for Concrete Construction and Materials and Commentary
ACI 121R	(2008) Guide for Concrete Construction Quality Systems in Conformance with ISO 9001
ACI 301	(2016) Specifications for Structural Concrete
ACI 302.1R	(2015) Guide for Concrete Floor and Slab Construction
ACI 304.2R	(2017) Guide to Placing Concrete by Pumping Methods
ACI 304R	(2000; R 2009) Guide for Measuring, Mixing, Transporting, and Placing Concrete
ACI 305.1	(2014) Specification for Hot Weather Concreting
ACI 305R	(2020) Guide to Hot Weather Concreting
ACI 306R	(2016) Guide to Cold Weather Concreting
ACI 308.1	(2023) External Curing of Cast-In-Place Concrete - Specification
ACI SP-2	(2019; 11th Edition) ACI Manual of Concrete Inspection
ACI SP-15	(2020) Field Reference Manual: Standard Specifications for Structural Concrete ACI 301-20 with Selected ACI References

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4	(1995; R 2004) Basic Hardboard

AMERICAN WELDING SOCIETY (AWS)

AWS D1.4/D1.4M (2011) Structural Welding Code -
Reinforcing Steel

ASTM INTERNATIONAL (ASTM)

ASTM A53/A53M (2018) Standard Specification for Pipe,
Steel, Black and Hot-Dipped, Zinc-Coated,
Welded and Seamless

ASTM A184/A184M (2019) Standard Specification for Welded
Deformed Steel Bar Mats for Concrete
Reinforcement

ASTM A615/A615M (2020) Standard Specification for Deformed
and Plain Carbon-Steel Bars for Concrete
Reinforcement

ASTM A706/A706M (2016) Standard Specification for
Low-Alloy Steel Deformed and Plain Bars
for Concrete Reinforcement

ASTM A934/A934M (2016) Standard Specification for
Epoxy-Coated Prefabricated Steel
Reinforcing Bars

ASTM A1044/A1044M (2016a) Standard Specification for Steel
Stud Assemblies for Shear Reinforcement of
Concrete

ASTM A1064/A1064M (2017) Standard Specification for
Carbon-Steel Wire and Welded Wire
Reinforcement, Plain and Deformed, for
Concrete

ASTM C31/C31M (2021a) Standard Practice for Making and
Curing Concrete Test Specimens in the Field

ASTM C33/C33M (2018) Standard Specification for Concrete
Aggregates

ASTM C39/C39M (2021) Standard Test Method for
Compressive Strength of Cylindrical
Concrete Specimens

ASTM C42/C42M (2020) Standard Test Method for Obtaining
and Testing Drilled Cores and Sawed Beams
of Concrete

ASTM C78/C78M (2021) Standard Test Method for Flexural
Strength of Concrete (Using Simple Beam
with Third-Point Loading)

ASTM C94/C94M (2020) Standard Specification for
Ready-Mixed Concrete

ASTM C136/C136M (2019) Standard Test Method for Sieve
Analysis of Fine and Coarse Aggregates

ASTM C143/C143M	(2020) Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150/C150M	(2021) Standard Specification for Portland Cement
ASTM C172/C172M	(2017) Standard Practice for Sampling Freshly Mixed Concrete
ASTM C173/C173M	(2016) Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C231/C231M	(2017a) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260/C260M	(2010a; R 2016) Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C311/C311M	(2018) Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
ASTM C330/C330M	(2017a) Standard Specification for Lightweight Aggregates for Structural Concrete
ASTM C494/C494M	(2019) Standard Specification for Chemical Admixtures for Concrete
ASTM C595/C595M	(2021) Standard Specification for Blended Hydraulic Cements
ASTM C618	(2019) Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM C989/C989M	(2018a) Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM C1017/C1017M	(2013; E 2015) Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1077	(2017) Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1107/C1107M	(2020) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C1218/C1218M	(2020c) Standard Test Method for Water-Soluble Chloride in Mortar and

Concrete

ASTM C1260	(2021) Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1293	(2008; R 2015) Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction
ASTM C1567	(2021) Standard Test Method for Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
ASTM C1602/C1602M	(2018) Standard Specification for Mixing Water Used in Production of Hydraulic Cement Concrete
ASTM D1752	(2018) Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D2835	(1989; R 2017) Standard Specification for Lubricant for Installation of Preformed Compression Seals in Concrete Pavements
ASTM D5759	(2012; R 2020) Characterization of Coal Fly Ash and Clean Coal Combustion Fly Ash for Potential Uses
ASTM D6690	(2015) Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
ASTM E96/E96M	(2016) Standard Test Methods for Water Vapor Transmission of Materials
ASTM E329	(2021) Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
ASTM E1155	(2020) Standard Test Method for Determining Floor Flatness and Floor Levelness Numbers
ASTM E1643	(2018a) Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs
ASTM E1745	(2017) Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

CRSI 10MSP	(2018) Manual of Standard Practice

CRSI RB4.1 (2016) Supports for Reinforcement Used in Concrete

FOREST STEWARDSHIP COUNCIL (FSC)

FSC STD 01 001 (2015) Principles and Criteria for Forest Stewardship

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST PS 1 (2009) DOC Voluntary Product Standard PS 1-07, Structural Plywood

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 104 (1980) Method of Calculation of the Fineness Modulus of Aggregate

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED NC (2009) Leadership in Energy and Environmental Design(tm) New Construction Rating System

1.2 DEFINITIONS

- a. "Cementitious material" as used herein must include all Portland cement and pozzolan.
- b. "Exposed to public view" means situated so that it can be seen from eye level from a public location after completion of the building. A public location is accessible to persons not responsible for operation or maintenance of the building.
- c. "Chemical admixtures" are materials in the form of powder or fluids that are added to the concrete to give it certain characteristics not obtainable with plain concrete mixes.
- d. "Design strength" (f'_c) is the specified compressive strength of concrete at time(s) specified in this section to meet structural design criteria.
- f. "Mixture proportioning" is the process of designing concrete mixture proportions to enable it to meet the strength, service life and constructability requirements of the project while minimizing the initial and life-cycle cost.
- g. "Mixture proportions" are the masses or volumes of individual ingredients used to make a unit measure (cubic meter or cubic yard) of concrete.
- h. "Pozzolan" is a siliceous or siliceous and aluminous material, which in itself possesses little or no cementitious value but will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds possessing cementitious properties.
- i. "Workability (or consistence)" is the ability of a fresh (plastic)

concrete mix to fill the form/mould properly with the desired work (vibration) and without reducing the concrete's quality. Workability depends on water content, chemical admixtures, aggregate (shape and size distribution), cementitious content and age (level of hydration).

1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Concrete Curing Plan

Quality Control Plan; G, RO

Quality Control Personnel Certifications; G, RO

Quality Control Organizational Chart

Laboratory Accreditation; G, RO

SD-02 Shop Drawings

Formwork

Reinforcing Steel; G, RO

SD-03 Product Data

Joint Sealants; (LEED NC)

Joint Filler; (LEED NC)

Formwork Materials

Cementitious Materials; (LEED NC)

Vapor Barrier

Concrete Curing Materials

Reinforcement; (LEED NC)

Liquid Chemical Floor Hardeners and Sealers

Admixtures

Local/Regional Materials; (LEED NC)

Biodegradable Form Release Agent

Pumping Concrete

Finishing Plan

Nonshrink Grout

SD-05 Design Data

Concrete Mix Design; G, RO

SD-06 Test Reports

Concrete Mix Design; G AE

Fly Ash

Pozzolan

Slag Cement

Aggregates

Tolerance Report

Compressive Strength Tests; G AE

Chloride Ion Concentration

Air Content

Slump Tests

Water

SD-07 Certificates

Reinforcing Bars

Welder Qualifications

VOC Content for Form Release Agents, Curing Compounds, and
Concrete Penetrating Sealers

Safety Data Sheets

Forest Stewardship Council (FSC) Certification

Field Testing Technician and Testing Agency

SD-08 Manufacturer's Instructions

Liquid Chemical Floor Hardeners and Sealers

Joint Sealants; (LEED NC)

Curing Compound

1.4 MODIFICATION OF REFERENCES

Accomplish work in accordance with ACI publications except as modified herein. Consider the advisory or recommended provisions to be mandatory. Interpret reference to the "Building Official," the "Structural Engineer,"

and the "Architect/Engineer" to mean the Contracting Officer.

1.5 DELIVERY, STORAGE, AND HANDLING

Follow ACI 301, ACI 304R and ASTM A934/A934M requirements and recommendations. Do not deliver concrete until vapor retarder, vapor barrier, forms, reinforcement, embedded items, and chamfer strips are in place and ready for concrete placement. Do not store concrete curing compounds or sealers with materials that have a high capacity to adsorb volatile organic compound (VOC) emissions. Do not store concrete curing compounds or sealers in occupied spaces.

1.5.1 Reinforcement

Store reinforcement of different sizes and shapes in separate piles or racks raised above the ground to avoid excessive rusting. Protect from contaminants such as grease, oil, and dirt. Ensure bar sizes can be accurately identified after bundles are broken and tags removed.

1.6 QUALITY ASSURANCE

1.6.1 Design Data

1.6.1.1 Concrete Mix Design

Sixty days minimum prior to concrete placement, submit a mix design for each strength and type of concrete. Submit a complete list of materials including type; brand; source and amount of cement, supplementary cementitious materials, and admixtures; and applicable reference specifications. Submit mill test and all other test for cement, supplementary cementitious materials, aggregates, and admixtures. Provide documentation of maximum nominal aggregate size, gradation analysis, percentage retained and passing sieve, and a graph of percentage retained versus sieve size. Provide mix proportion data using at least three different water-cementitious material ratios for each type of mixture, which produce a range of strength encompassing those required for each type of concrete required. If source material changes, resubmit mix proportion data using revised source material. Provide only materials that have been proven by trial mix studies to meet the requirements of this specification, unless otherwise approved in writing by the Contracting Officer. Indicate clearly in the submittal where each mix design is used when more than one mix design is submitted. Resubmit data on concrete components if the qualities or source of components changes. For previously approved concrete mix designs used within the past twelve months, the previous mix design may be re-submitted without further trial batch testing if accompanied by material test data conducted within the last six months. Obtain mix design approval from the contracting officer prior to concrete placement.

1.6.2 Shop Drawings

1.6.2.1 Reinforcing Steel

Indicate bending diagrams, assembly diagrams, splicing and laps of bars, shapes, dimensions, and details of bar reinforcing, accessories, and concrete cover. Do not scale dimensions from structural drawings to determine lengths of reinforcing bars. Reproductions of contract drawings are unacceptable.

1.6.3 Control Submittals

1.6.3.1 Concrete Curing Plan

Submit proposed materials, methods and duration for curing concrete elements in accordance with ACI 308.1.

1.6.3.2 Pumping Concrete

Submit proposed materials and methods for pumping concrete. Submittal must include mix designs, pumping equipment including type of pump and size and material for pipe, and maximum length and height concrete is to be pumped.

1.6.3.3 Finishing Plan

Submit proposed material and procedures to be used in obtaining the finish for the floors. Include qualification of person to be used for obtaining floor tolerance measurement, description of measuring equipment to be used, and a sketch showing lines and locations the measuring equipment will follow.

1.6.3.4 VOC Content for form release agents, curing compounds, and concrete penetrating sealers

Submit certification for the form release agent, curing compounds, and concrete penetrating sealers that indicate the VOC content of each product.

1.6.3.5 Safety Data Sheets

Submit Safety Data Sheets (SDS) for all materials that are regulated for hazardous health effects. SDS must be readily accessible during each work shift to employees when they are at the construction site.

1.6.4 Test Reports

1.6.4.1 Fly Ash and Pozzolan

Submit test results in accordance with ASTM C618 for fly ash and pozzolan. Submit test results performed within 6 months of submittal date.

1.6.4.2 Slag Cement

Submit test results in accordance with ASTM C989/C989M for slag cement. Submit test results performed within 6 months of submittal date.

1.6.4.3 Aggregates

Submit test results in accordance with ASTM C33/C33M, or ASTM C330/C330M for lightweight aggregate, and ASTM C1293 or ASTM C1567 as required in the paragraph titled ALKALI-AGGREGATE REACTION.

1.6.5 Quality Control Plan

Develop and submit for approval a concrete quality control program in accordance with the guidelines of ACI 121R and as specified herein. The plan must include approved laboratories. Provide direct oversight for the concrete qualification program inclusive of associated sampling and testing. All quality control reports must be provided to the Contracting

Officer, Quality Manager and Concrete Supplier. Maintain a copy of ACI SP-15 and CRSI 10MSP at project site.

1.6.6 Quality Control Personnel Certifications

The Contractor must submit for approval the responsibilities of the various quality control personnel, including the names and qualifications of the individuals in those positions and a quality control organizational chart defining the quality control hierarchy and the responsibility of the various positions. Quality control personnel must be employed by the Contractor.

Submit American Concrete Institute certification for the following:

- a. CQC personnel responsible for inspection of concrete operations.
- b. Lead Foreman or Journeyman of the Concrete Placing, Finishing, and Curing Crews.
- c. Field Testing Technicians: ACI Concrete Field Testing Technician, Grade I.

1.6.6.1 Quality Manager Qualifications

The quality manager must hold a current license as a professional engineer in a U.S. state or territory with experience on at least five similar projects. Evidence of extraordinary proven experience may be considered by the Contracting Officer as sufficient to act as the Quality Manager.

1.6.6.2 Field Testing Technician and Testing Agency

Submit data on qualifications of proposed testing agency and technicians for approval by the Contracting Officer prior to performing testing on concrete.

- a. Work on concrete under this contract must be performed by an ACI Concrete Field Testing Technician Grade 1 qualified in accordance with ACI SP-2 or equivalent. Equivalent certification programs must include requirements for written and performance examinations as stipulated in ACI SP-2.
- b. Testing agencies that perform testing services on reinforcing steel must meet the requirements of ASTM E329.
- c. Testing agencies that perform testing services on concrete materials must meet the requirements of ASTM C1077.

1.6.7 Laboratory Qualifications for Concrete Qualification Testing

The concrete testing laboratory must have the necessary equipment and experience to accomplish required testing. The laboratory must meet the requirements of ASTM C1077 and be Cement and Concrete Reference Laboratory (CCRL) inspected.

1.6.8 Laboratory Accreditation

Laboratory and testing facilities must be provided by and at the expense of the Contractor. The laboratories performing the tests must be accredited in accordance with ASTM C1077, including ASTM C78/C78M and

ASTM C1260. The accreditation must be current and must include the required test methods, as specified. Furthermore, the testing must comply with the following requirements:

- a. Aggregate Testing and Mix Proportioning: Aggregate testing and mixture proportioning studies must be performed by an accredited laboratory and under the direction of a registered professional engineer in a U.S. state or territory competent in concrete materials who is competent in concrete materials and must sign all reports and designs.
- b. Acceptance Testing: Furnish all materials, labor, and facilities required for molding, curing, testing, and protecting test specimens at the site and in the laboratory. Furnish and maintain boxes or other facilities suitable for storing and curing the specimens at the site while in the mold within the temperature range stipulated by ASTM C31/C31M.
- c. Contractor Quality Control: All sampling and testing must be performed by an approved, onsite, independent, accredited laboratory.

1.7 ENVIRONMENTAL REQUIREMENTS

Provide space ventilation according to material manufacturer recommendations, at a minimum, during and following installation of concrete curing compound and sealer. Maintain one of the following ventilation conditions during the curing period or for 72 hours after installation:

- a. Supply 100 percent outside air 24 hours a day.
- b. Supply airflow at a rate of 6 air changes per hour, when outside temperatures are between 55 degrees F and 84 degrees F and humidity is between 30 percent and 60 percent.
- c. Supply airflow at a rate of 1.5 air changes per hour, when outside air conditions are not within the range stipulated above.

1.7.1 Submittals for Environmental Performance

- a. Provide data indication the percentage of post-industrial pozzolan (fly ash, slag cement) cement substitution as a percentage of the full product composite by weight.
- b. Provide data indicating the percentage of post-industrial and post-consumer recycled content aggregate.
- c. Provide product data indicating the percentage of post-consumer recycled steel content in each type of steel reinforcement as a percentage of the full product composite by weight.
- d. Provide product data stating the location where all products were manufactured
- e. For projects using FSC certified formwork, provide chain-of-custody documentation for all certified wood products.
- f. For projects using reusable formwork, provide data showing how formwork is reused.

- g. Provide SDS product information data showing that form release agents meet any environmental performance goals such as using vegetable and soy based products.
- h. Provide SDS product information data showing that concrete adhesives meet any environmental performance goals including low emitting, low volatile organic compound products.

1.8 SUSTAINABLE DESIGN REQUIREMENTS

1.8.1 Local/Regional Materials

Use materials or products extracted, harvested, or recovered, as well as manufactured, within a 500 mile radius from the project site, if available from a minimum of three sources. See Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING for cumulative total local material requirements. Concrete materials may be locally available. Submit documentation indicating distance between manufacturing facility and the project site. Indicate distance of raw material origin from the project site. Indicate relative dollar value of local/regional materials to total dollar value of products included in project.

1.8.2 Forest Stewardship Council (FSC) Certification

Use FSC-certified wood where specified. Provide letter of certification signed by lumber supplier. Indicate compliance with FSC STD 01 001 and identify certifying organization.

1.9 QUALIFICATIONS FOR WELDING WORK

Welding procedures must be in accordance with AWS D1.4/D1.4M.

Verify that Welder qualifications are in accordance with AWS D1.4/D1.4M for welding of reinforcement or under an equivalent qualification test approved in advance. Welders are permitted to do only the type of welding for which each is specifically qualified.

PART 2 PRODUCTS

2.1 FORMWORK MATERIALS

- a. Form-facing material in contact with concrete must be lumber, plywood, tempered concrete-form-grade hardboard, metal, or plastic. Submit product information on proposed form-facing materials if different from that specified herein.
- b. Design formwork, shores, reshores, and backshores to support loads transmitted to them and to comply with applicable building code requirements.
- c. Design formwork to withstand pressure resulting from placement and vibration of concrete and to maintain specified tolerances.
- d. Provide temporary openings in formwork if needed to facilitate cleaning and inspection.
- e. Design formwork joints to inhibit leakage of mortar.

- f. Limit deflection of facing materials for concrete surfaces exposed to view to 1/240 of center-to-center spacing of facing supports.

2.1.1.1 Wood Forms

Use lumber as specified in Section 06 10 00 ROUGH CARPENTRY and as follows. Provide lumber that is square edged or tongue-and-groove boards, free of raised grain, knotholes, or other surface defects. Provide plywood that complies with NIST PS 1, B-B concrete form panels or better or AHA A135.4, hardboard for smooth form lining. Submit data verifying that composite wood products contain no urea formaldehyde resins. Virgin wood used must be FSC-certified.

2.1.1.1.1 Concrete Form Plywood (Standard Rough)

Provide plywood that conforms to NIST PS 1, B-B, concrete form, not less than 5/8-inch thick.

2.1.1.1.2 Overlaid Concrete Form Plywood (Standard Smooth)

Provide plywood that conforms to NIST PS 1, B-B, high density form overlay, not less than 5/8-inch thick.

2.1.2 Plastic Forms

Plastic lumber as specified in Section 06 10 00 ROUGH CARPENTRY. Provide plastic forms that contain a minimum of 100 percent post-consumer recycled content, or a minimum of 100 percent post-industrial recycled content.

2.1.3 Steel Forms

Provide steel form surfaces that do not contain irregularities, dents, or sags.

2.2 FORMWORK ACCESSORIES

- a. Use commercially manufactured formwork accessories, including ties and hangers.
- b. Form ties and accessories must not reduce the effective cover of the reinforcement.

2.2.1 Form Ties

- a. Use form ties with ends or end fasteners that can be removed without damage to concrete.
- b. Where indicated in Contract Documents, use form ties with integral water barrier plates or other acceptable positive water barriers in walls.
- c. The breakback distance for ferrous ties must be at least 2 in. for Surface Finish-2.0 or Surface Finish-3.0, as defined in ACI 301.
- e. Submit manufacturer's data sheet on form ties.

2.2.2 Biodegradable Form Release Agent

- a. Provide form release agent that is colorless, biodegradable, and

water-based, with a zero VOC content. A minimum of 85 percent of the total product must be biobased material.

- b. Provide product that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
- c. Provide form release agent that reduces formwork moisture absorption, and does not contain diesel fuel, petroleum-based lubricating oils, waxes, or kerosene. Submit documentation indicating type of biobased material in product and biobased content. Indicate relative dollar value of biobased content products to total dollar value of products included in project.
- d. Submit manufacturer's product data on formwork release agent for use on each form-facing material.

2.2.3 Chamfer Materials

Use lumber materials with dimensions of 3/4 x 3/4 in.

2.2.4 Construction and movement joints

- a. Submit details and locations of construction joints in accordance with the requirements herein.
- b. Make construction joints perpendicular to main reinforcement.
- c. Provide movement joints where indicated in Contract Documents or in accepted alternate locations.
- d. Submit location and detail of movement joints if different from those indicated in Contract Documents.
- e. Submit manufacturer's data sheet on expansion joint materials.
- f. Provide keyways where indicated in Contract Documents.

2.2.5 Other Embedded items

Use sleeves, inserts, anchors, and other embedded items of material and design indicated in Contract Documents.

2.3 CONCRETE MATERIALS

2.3.1 Cementitious Materials

2.3.1.1 Portland Cement

- a. Unless otherwise specified, provide cement that conforms to ASTM C150/C150M Type I/II or II.
- b. Use one brand and type of cement for formed concrete having exposed-to-view finished surfaces.
- c. Supplier must certify that no hazardous waste is used in the fuel mix or raw materials. Supplier must certify that the hazardous waste is neutralized by the manufacturing process and that no additional pollutants are discharged.

- d. Submit information along with evidence demonstrating compliance with referenced standards. Submittals must include types of cementitious materials, manufacturing locations, shipping locations, and certificates showing compliance.
- e. Cementitious materials must be stored and kept dry and free from contaminants.

2.3.1.2 Blended Cements

- a. Blended cements must conform to ASTM C595/C595M Type IL.

2.3.1.3 Fly Ash

- a. ASTM C618, Class F, except that the maximum allowable loss on ignition must not exceed 3 percent.
- b. If fly ash is used it shall range from 15 to 35 percent by weight of cementitious material, provided the fly ash does not reduce the amount of cement in the concrete mix below the minimum requirements of local building codes. Where the use of fly ash cannot meet the minimum level, it shall not be used. Report the chemical analysis of the fly ash in accordance with ASTM C311/C311M. Evaluate and classify fly ash in accordance with ASTM D5759.

2.3.1.4 Slag Cement

ASTM C989/C989M, Grade 100 or 120.

2.3.1.5 Other Supplementary Cementitious Materials

Natural pozzolan must be raw or calcined and conform to ASTM C618, Class N, including the optional requirement for uniformity.

2.3.2 Water

- a. Water or ice must comply with the requirements of ASTM C1602/C1602M.
- b. Minimize the amount of water in the mix. Improve workability by adjusting the grading of the aggregate and using admixture rather than by adding water.
- c. Water must be potable; free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances deleterious to concrete.
- d. Protect mixing water and ice from contamination during storage and delivery.
- e. Submit test report showing water complies with ASTM C1602/C1602M.

2.3.3 Aggregate

2.3.3.1 Normal-Weight Aggregate

- a. Aggregates must conform to ASTM C33/C33M.
- b. Aggregates used in concrete must be obtained from the same sources and

have the same size range as aggregates used in concrete represented by submitted field test records or used in trial mixtures.

- c. Provide sand that is at least 50 percent natural sand.
- d. Store and handle aggregate in a manner that will avoid segregation and prevents contamination by other materials or other sizes of aggregates. Store aggregates in locations that will permit them to drain freely. Do not use aggregates that contain frozen lumps.
- e. Submit types, pit or quarry locations, producers' names, aggregate supplier statement of compliance with ASTM C33/C33M, and ASTM C1293 expansion data not more than 18 months old.

2.3.4 Admixtures

- a. Chemical admixtures must conform to ASTM C494/C494M.
- b. Air-entraining admixtures must conform to ASTM C260/C260M.
- c. Chemical admixtures for use in producing flowing concrete must conform to ASTM C1017/C1017M.
- d. Do not use calcium chloride admixtures.
- e. Admixtures used in concrete must be the same as those used in the concrete represented by submitted field test records or used in trial mixtures.
- f. Protect stored admixtures against contamination, evaporation, or damage.
- g. To ensure uniform distribution of constituents, provide agitating equipment for admixtures used in the form of suspensions or unstable solutions. Protect liquid admixtures from freezing and from temperature changes that would adversely affect their characteristics.
- h. Submit types, brand names, producers' names, manufacturer's technical data sheets, and certificates showing compliance with standards required herein.

2.4 MISCELLANEOUS MATERIALS

2.4.1 Concrete Curing Materials

Provide concrete curing material in accordance with ACI 301 Section 5 and ACI 308.1 Section 2.

2.4.2 Nonshrink Grout

Nonshrink grout in accordance with ASTM C1107/C1107M.

2.4.3 Floor Finish Materials

2.4.3.1 Liquid Chemical Floor Hardeners and Sealers

- a. Hardener must be a colorless aqueous solution containing a blend of inorganic silicate or silicate material and proprietary components combined with a wetting agent; that penetrates, hardens, and densifies

concrete surfaces. Submit manufactures instructions for placement of liquid chemical floor hardener.

- b. Use concrete penetrating sealers with a low (maximum 100 grams/liter, less water and less exempt compounds) VOC content. Submit manufactures instructions for placement of sealers.

2.4.4 Expansion/Contraction Joint Filler

ASTM D1752 Type I or Type II. Material must be 1/2 inch thick, unless otherwise indicated.

2.4.5 Joint Sealants

2.4.5.1 Horizontal Surfaces, 3 Percent Slope, Maximum

ASTM D6690 or ASTM C920, Type M, Class 25, Use T.

2.4.5.2 Lubricant for Preformed Compression Seals

ASTM D2835.

2.4.6 Vapor Barrier

ASTM E1745 Class C polyethylene sheeting, minimum 15 mil thickness with a maximum permeance rating of 0.01 perms per ASTM E96/E96M.

Consider plastic vapor retarders and adhesives with a high recycled content, low toxicity low VOC (Volatile Organic Compounds) levels.

2.5 CONCRETE MIX DESIGN

2.5.1 Properties and Requirements

- a. Use materials and material combinations listed in this section and the contract documents.
- b. Cementitious material content must be adequate for concrete to satisfy the specified requirements for strength, w/cm, durability, and finishability described in this section and the contract documents.
- c. Selected target slump must meet the requirements this section, the contract documents, and must not exceed 9 in. Concrete must not show visible signs of segregation.
- d. The target slump must be enforced for the duration of the project. Determine the slump by ASTM C143/C143M. Slump tolerances must meet the requirements of ACI 117.
- e. The nominal maximum size of coarse aggregate for a mixture must not exceed three-fourths of the minimum clear spacing between reinforcement, one-fifth of the narrowest dimension between sides of forms, or one-third of the thickness of slabs or toppings.
- f. Concrete must be air entrained for members assigned to Exposure Class F1. The total air content must be in accordance with the requirements of the paragraph titled DURABILITY.
- g. Measure air content at the point of delivery in accordance with

ASTM C173/C173M or ASTM C231/C231M.

- h. Concrete for slabs to receive a hard-troweled finish must not contain an air-entraining admixture or have a total air content greater than 3 percent.
- i. Concrete properties and requirements for each portion of the structure are specified in the table below. Refer to the paragraph titled DURABILITY for more details on exposure categories and their requirements.

	Minimum $f'c$ psi	Exposure Categories^	Miscellaneous Requirements
Footings	5000 at 28 days	C0; F1	max slump 3 +/- 1 in. Nominal maximum aggregate size must be 1 1/2 in. maximum water/cement ratio 0.50
Slabs-on-ground	4000 at 28 days	C0; F0 F1	Nominal maximum aggregate size must be 3/4 in. Coarseness factor between 50 and 70 adjusted workability factor between 33 and 39 slump 4 in +/- 1/2 in. maximum water/cement ratio 0.42

2.5.2 Durability

2.5.2.1 Alkali-Aggregate Reaction

Do not use any aggregate susceptible to alkali-carbonate reaction (ACR). Use one of the three options below for qualifying concrete mixtures to reduce the potential of alkali-silica reaction (ASR):

- a. For each aggregate used in concrete, the expansion result determined in accordance with ASTM C1293 must not exceed 0.04 percent at one year.

2.5.2.2 Freezing and Thawing Resistance

- a. Concrete must be air entrained for members assigned to Exposure Class F1. The total air content must meet the requirements of the following table:

Nominal maximum aggregate size, in.	Exposure Class F1
3/4	5.0
1	4.5
1-1/2	4.5

*Tolerance on air content as delivered must be plus/minus 1.5 percent.

- b. Submit documentation verifying compliance with specified requirements.

2.5.2.3 Corrosion and Chloride Content

- a. Provide concrete meeting the requirements of the following table based on the exposure class assigned to members requiring protection against reinforcement corrosion in Contract Documents.
- b. Submit documentation verifying compliance with specified requirements.
- c. Water-soluble chloride ion content contributed from constituents including water, aggregates, cementitious materials, and admixtures must be determined for the concrete mixture by ASTM C1218/C1218M at age between 28 and 42 days.
- d. The maximum water-soluble chloride ion (Cl-) content in concrete, percent by mass of cement is as follows:

Exposure class	Maximum w/cm*	Minimum f'c, psi	Maximum water-soluble chloride ion (CL-) content in concrete, percent by mass of cement
Reinforced concrete			
C0	N/A	2500	1.00

*The maximum w/cm limits do not apply to lightweight concrete.

2.5.2.4 Concrete Temperature

The temperature of concrete as delivered must not exceed 95 degrees F.

2.5.3 Trial Mixtures

Trial mixtures must be in accordance to ACI 301.

2.5.4 Ready-Mix Concrete

Provide concrete that meets the requirements of ASTM C94/C94M.

Ready-mixed concrete manufacturer must provide duplicate delivery tickets with each load of concrete delivered. Provide delivery tickets with the following information in addition to that required by ASTM C94/C94M:

- a. Type and brand cement

- b. Cement and supplementary cementitious materials content in 94-pound bags per cubic yard of concrete
- c. Maximum size of aggregate
- d. Amount and brand name of admixtures
- e. Total water content expressed by water cementitious material ratio

2.6 REINFORCEMENT

- a. Bend reinforcement cold. Fabricate reinforcement in accordance with fabricating tolerances of ACI 117.
- b. Submit manufacturer's certified test report for reinforcement.
- c. Submit placing drawings showing fabrication dimensions and placement locations of reinforcement and reinforcement supports. Placing drawings must indicate locations of splices, lengths of lap splices, and details of mechanical and welded splices.
- d. Submit request with locations and details of splices not indicated in Contract Documents.
- e. Submit request to place column dowels without using templates.
- f. Field bending or straightening of reinforcing bars is not permitted.
- g. Submit request for field cutting, including location and type of bar to be cut and reason field cutting is required.

2.6.1 Reinforcing Bars

- a. Reinforcing bars must be deformed, except spirals, load-transfer dowels, and welded wire reinforcement, which may be plain.
- b. ASTM A615/A615M with the bars marked S, Grade 60; or
- c. Submit documentation indicating percentage of post-industrial and post-consumer recycled content per unit of product. Indicate relative dollar value of recycled content products to total dollar value of products included in project.
- d. Submit mill certificates for reinforcing bars.

2.6.1.1 Bar Mats

- a. Bar mats must conform to ASTM A184/A184M.

2.6.1.2 Headed Shear Stud Reinforcement

Headed studs and headed stud assemblies must conform to ASTM A1044/A1044M.

2.6.2 Mechanical Reinforcing Bar Connectors

- a. Provide 125 percent minimum yield strength of the reinforcement bar.
- b. Mechanical splices for galvanized reinforcing bars must be galvanized or coated with dielectric material.

- c. Mechanical splices used with epoxy-coated or dual-coated reinforcing bars must be coated with dielectric material.
- d. Submit data on mechanical splices demonstrating compliance with this paragraph.

2.6.3 Wire

- a. Provide wire reinforcement that contains a minimum of 100 percent recycled content. Provide flat sheets of welded wire reinforcement for slabs and toppings.
- b. Plain or deformed steel wire must conform to ASTM A1064/A1064M.

2.6.4 Reinforcing Bar Supports

- a. Provide reinforcement support types within structure as required by Contract Documents. Reinforcement supports must conform to CRSI RB4.1.
- b. Legs of supports in contact with formwork must be hot-dip galvanized, or plastic coated after fabrication, or stainless-steel bar supports.
- c. 10 percent post-consumer recycled content, or minimum 40 percent post-industrial recycled content.

2.6.5 Dowels for Load Transfer in Floors

Provide greased dowels for load transfer in floors of the type, design, weight, and dimensions indicated. Provide dowel bars that are plain-billet steel conforming to ASTM A615/A615M, Grade 40. Provide dowel pipe that is steel conforming to ASTM A53/A53M.

2.6.6 Welding

- a. Provide weldable reinforcing bars that conform to ASTM A706/A706M and ASTM A615/A615M and Supplement S1, Grade 60, except that the maximum carbon content must be 0.55 percent.
- b. Comply with AWS D1.4/D1.4M unless otherwise specified. Do not tack weld reinforcing bars.
- c. Welded assemblies of steel reinforcement produced under factory conditions, such as welded wire reinforcement, bar mats, and deformed bar anchors, are allowed.

PART 3 EXECUTION

3.1 EXAMINATION

- a. Do not begin installation until substrates have been properly constructed; verify that substrates are level.
- b. If substrate preparation is the responsibility of another installer, notify Contracting Officer of unsatisfactory preparation before processing.
- c. Check field dimensions before beginning installation. If dimensions vary too much from design dimensions for proper installation, notify

Contracting Officer and wait for instructions before beginning installation.

3.2 PREPARATION

Determine quantity of concrete needed and minimize the production of excess concrete. Designate locations or uses for potential excess concrete before the concrete is poured.

3.2.1 General

- a. Surfaces against which concrete is to be placed must be free of debris, loose material, standing water, snow, ice, and other deleterious substances before start of concrete placing.
- b. Remove standing water without washing over freshly deposited concrete. Divert flow of water through side drains provided for such purpose.

3.2.2 Subgrade Under Foundations and Footings

- a. When subgrade material is semi-porous and dry, sprinkle subgrade surface with water as required to eliminate suction at the time concrete is deposited, or seal subgrade surface by covering surface with specified vapor retarder.
- b. When subgrade material is porous, seal subgrade surface by covering surface with specified vapor retarder.

3.2.3 Subgrade Under Slabs on Ground

- a. Before construction of slabs on ground, have underground work on pipes and conduits completed and approved.
- b. Previously constructed subgrade or fill must be cleaned of foreign materials
- c. Finish surface of capillary water barrier under interior slabs on ground must not show deviation in excess of 1/4 inch when tested with a 10-foot straightedge parallel with and at right angles to building lines.
- d. Finished surface of subgrade or fill under exterior slabs on ground must not be more than 0.02-foot above or 0.10-foot below elevation indicated.

3.2.4 Edge Forms and Screed Strips for Slabs

- a. Set edge forms or bulkheads and intermediate screed strips for slabs to obtain indicated elevations and contours in finished slab surface and must be strong enough to support vibrating bridge screeds or roller pipe screeds if nature of specified slab finish requires use of such equipment.
- b. Align concrete surface to elevation of screed strips by use of strike-off templates or approved compacting-type screeds.

3.2.5 Reinforcement and Other Embedded Items

- a. Secure reinforcement, joint materials, and other embedded materials in

position, inspected, and approved before start of concrete placing.

- b. When concrete is placed, reinforcement must be free of materials deleterious to bond. Reinforcement with rust, mill scale, or a combination of both will be considered satisfactory, provided minimum nominal dimensions, nominal weight, and minimum average height of deformations of a hand-wire-brushed test specimen are not less than applicable ASTM specification requirements.

3.3 FORMS

- a. Provide forms, shoring, and scaffolding for concrete placement. Set forms mortar-tight and true to line and grade.
- b. Chamfer above grade exposed joints, edges, and external corners of concrete 0.75 inch. Place chamfer strips in corners of formwork to produce beveled edges on permanently exposed surfaces. Do not bevel reentrant corners or edges of formed joints of concrete.
- c. Provide formwork with clean-out openings to permit inspection and removal of debris.
- d. Inspect formwork and remove foreign material before concrete is placed.
- e. At construction joints, lap form-facing materials over the concrete of previous placement. Ensure formwork is placed against hardened concrete so offsets at construction joints conform to specified tolerances.
- f. Provide positive means of adjustment (such as wedges or jacks) of shores and struts. Do not make adjustments in formwork after concrete has reached initial setting. Brace formwork to resist lateral deflection and lateral instability.
- g. Fasten form wedges in place after final adjustment of forms and before concrete placement.
- h. Provide anchoring and bracing to control upward and lateral movement of formwork system.
- i. Construct formwork for openings to facilitate removal and to produce opening dimensions as specified and within tolerances.
- j. Provide runways for moving equipment. Support runways directly on formwork or structural members. Do not support runways on reinforcement. Loading applied by runways must not exceed capacity of formwork or structural members.
- k. Position and support expansion joint materials, waterstops, and other embedded items to prevent displacement. Fill voids in sleeves, inserts, and anchor slots temporarily with removable material to prevent concrete entry into voids.
- l. Clean surfaces of formwork and embedded materials of mortar, grout, and foreign materials before concrete placement.

3.3.1 Reuse

- a. Reuse forms providing the structural integrity of concrete and the

aesthetics of exposed concrete are not compromised.

- b. Wood forms must not be clogged with paste and must be capable of absorbing high water-cementitious material ratio paste.
- c. Remove leaked mortar from formwork joints before reuse.

3.3.2 Forms for Standard Rough Form Finish

Provide formwork in accordance with ACI 301 Section 5 with a surface finish, SF-1.0, for formed surfaces that are to be concealed by other construction.

3.3.3 Forms for Standard Smooth Form Finish

Provide formwork in accordance with ACI 301 Section 5 with a surface finish, SF-3.0, for formed surfaces that are exposed to view.

3.3.4 Form Ties

- a. After ends or end fasteners of form ties have been removed, repair tie holes in accordance with ACI 301 Section 5 requirements.

3.3.5 Tolerances for Form Construction

- a. Construct formwork so concrete surfaces conform to tolerances in ACI 117.
- b. Position and secure sleeves, inserts, anchors, and other embedded items such that embedded items are positioned within ACI 117 tolerances.
- c. To maintain specified elevation and thickness within tolerances, install formwork to compensate for deflection and anticipated settlement in formwork during concrete placement. Set formwork and intermediate screed strips for slabs to produce designated elevation, camber, and contour of finished surface before formwork removal. If specified finish requires use of vibrating screeds or roller pipe screeds, ensure that edge forms and screed strips are strong enough to support such equipment.

3.3.6 Removal of Forms and Supports

- a. If vertical formed surfaces require finishing, remove forms as soon as removal operations will not damage concrete.
- b. Remove top forms on sloping surfaces of concrete as soon as removal will not allow concrete to sag. Perform repairs and finishing operations required. If forms are removed before end of specified curing period, provide curing and protection.
- c. Do not damage concrete during removal of vertical formwork. Perform needed repair and finishing operations required on vertical surfaces. If forms are removed before end of specified curing period, provide curing and protection.
- d. Form-facing material and horizontal facing support members may be removed before in-place concrete reaches specified compressive strength if shores and other supports are designed to allow facing

removal without deflection of supported slab or member.

3.4 PLACING REINFORCEMENT AND MISCELLANEOUS MATERIALS

- a. Unless otherwise specified, placing reinforcement and miscellaneous materials must be in accordance to ACI 301. Provide bars, welded wire reinforcement, wire ties, supports, and other devices necessary to install and secure reinforcement.
- b. Reinforcement must not have rust, scale, oil, grease, clay, or foreign substances that would reduce the bond. Rusting of reinforcement is a basis of rejection if the effective cross-sectional area or the nominal weight per unit length has been reduced. Remove loose rust prior to placing steel. Tack welding is prohibited.
- c. Nonprestressed cast-in-place concrete members must have concrete cover for reinforcement given in the following table:

Concrete Exposure	Member	Reinforcement	Specified cover, in.
Cast against and permanently in contact with ground	All	All	3
In contact with ground	All	No. 6 through No. 18 bars	2
		No. 5 bar, W31 or D31 wire, and smaller	1-1/2
Exposed to weather	All	All	2 1/2

Concrete Exposure	Member	Reinforcement	Specified cover, in.
Not exposed to weather or in contact with ground	Slabs, joists, and walls	No. 14 and No. 18 bars	1-1/2
		No. 11 bar and smaller	3/4
	Beams, columns, pedestals, and tension ties	Primary reinforcement, stirrups, ties, spirals, and hoops	1-1/2

3.4.1 General

Provide details of reinforcement that are in accordance with the Contract Documents.

3.4.2 Vapor Barrier

- a. Install in accordance with ASTM E1643. Provide beneath the on-grade concrete floor slab. Use the greatest widths and lengths practicable to eliminate joints wherever possible. Lap joints a minimum of 12 inches and tape.
- b. Remove torn, punctured, or damaged vapor barrier material and provide with new vapor barrier prior to placing concrete. Concrete placement must not damage vapor barrier material. Place vapor barrier directly on underlying subgrade, base course, or capillary water barrier, unless it consists of crushed material or large granular material which could puncture the vapor barrier. In this case, a thin layer of approximately 1/2 inch of fine graded material should be rolled or compacted over the fill before installation of the vapor barrier to reduce the possibility of puncture. Control concrete placement so as to prevent damage to the vapor barrier.

3.4.3 Reinforcement Supports

Provide reinforcement support in accordance with CRSI RB4.1 and ACI 301 Section 3 requirements.

3.4.4 Splicing

As indicated in the Contract Documents. For splices not indicated follow ACI 301. Do not splice at points of maximum stress. Overlap welded wire reinforcement the spacing of the cross wires, plus 2 inches.

3.4.5 Setting Miscellaneous Material

Place and secure anchors and bolts, pipe sleeves, conduits, and other such items in position before concrete placement and support against displacement. Plumb anchor bolts and check location and elevation.

Temporarily fill voids in sleeves with readily removable material to prevent the entry of concrete.

3.4.6 Fabrication

Shop fabricate reinforcing bars to conform to shapes and dimensions indicated for reinforcement, and as follows:

- a. Provide fabrication tolerances that are in accordance with ACI 117.
- b. Provide hooks and bends that are in accordance with the Contract Documents.

Reinforcement must be bent cold to shapes as indicated. Bending must be done in the shop. Rebinding of a reinforcing bar that has been bent incorrectly is not be permitted. Bending must be in accordance with standard approved practice and by approved machine methods.

Deliver reinforcing bars bundled, tagged, and marked. Tags must be metal with bar size, length, mark, and other information pressed in by machine. Marks must correspond with those used on the placing drawings.

Do not use reinforcement that has any of the following defects:

- a. Bar lengths, depths, and bends beyond specified fabrication tolerances
- b. Bends or kinks not indicated on drawings or approved shop drawings
- c. Bars with reduced cross-section due to rusting or other cause

Replace defective reinforcement with new reinforcement having required shape, form, and cross-section area.

3.4.7 Placing Reinforcement

Place reinforcement in accordance with ACI 301.

For slabs on grade (over earth or over capillary water barrier) and for footing reinforcement, support bars or welded wire reinforcement on Precast concrete blocks, spaced at intervals required by size of reinforcement, to keep reinforcement the minimum height specified above the underside of slab or footing.

Provide reinforcement that is supported and secured together to prevent displacement by construction loads or by placing of wet concrete, and as follows:

- a. Provide supports for reinforcing bars that are sufficient in number and have sufficient strength to carry the reinforcement they support, and in accordance with ACI 301 and CRSI 10MSP. Do not use supports to support runways for concrete conveying equipment and similar construction loads.
- b. Equip supports on ground and similar surfaces with sand-plates.
- c. Support welded wire reinforcement as required for reinforcing bars.
- d. Secure reinforcements to supports by means of tie wire. Wire must be black, soft iron wire, not less than 16 gauge.

- e. Reinforcement must be accurately placed, securely tied at intersections, and held in position during placing of concrete by spacers, chairs, or other approved supports. Point wire-tie ends away from the form. Unless otherwise indicated, numbers, type, and spacing of supports must conform to the Contract Documents.
- f. Bending of reinforcing bars partially embedded in concrete is permitted only as specified in the Contract Documents.

3.4.8 Spacing of Reinforcing Bars

- a. Spacing must be as indicated in the Contract Documents.
- b. Reinforcing bars may be relocated to avoid interference with other reinforcement, or with conduit, pipe, or other embedded items. If any reinforcing bar is moved a distance exceeding one bar diameter or specified placing tolerance, resulting rearrangement of reinforcement is subject to preapproval by the Contracting Officer.

3.4.9 Concrete Protection for Reinforcement

Additional concrete protection must be in accordance with the Contract Documents.

3.4.10 Welding

Welding must be in accordance with AWS D1.4/D1.4M.

3.5 BATCHING, MEASURING, MIXING, AND TRANSPORTING CONCRETE

In accordance with ASTM C94/C94M, ACI 301, ACI 302.1R and ACI 304R, except as modified herein. Batching equipment must be such that the concrete ingredients are consistently measured within the following tolerances: 1 percent for cement and water, 2 percent for aggregate, and 3 percent for admixtures. Furnish mandatory batch ticket information for each load of ready mix concrete.

3.5.1 Measuring

Make measurements at intervals as specified in paragraphs SAMPLING and TESTING.

3.5.2 Mixing

- a. Mix concrete in accordance with ASTM C94/C94M, ACI 301 and ACI 304R.
- b. Machine mix concrete. Begin mixing within 30 minutes after the cement has been added to the aggregates. Place concrete within 90 minutes of either addition of mixing water to cement and aggregates or addition of cement to aggregates if the concrete temperature is less than 84 degrees F.
- c. Place concrete within 60 minutes if the concrete temperature is greater than 84 degrees F except as follows: If set retarding admixture is used and slump requirements can be met, limit for placing concrete may remain at 90 minutes. Additional water may be added, provided that both the specified maximum slump and submitted water-cementitious material ratio are not exceeded and the required

concrete strength is still met. When additional water is added, an additional 30 revolutions of the mixer at mixing speed is required.

- d. If the entrained air content falls below the specified limit, add a sufficient quantity of admixture, within the manufacturer's recommended dosage, to bring the entrained air content within the specified limits. Dissolve admixtures in the mixing water and mix in the drum to uniformly distribute the admixture throughout the batch. Do not reconstitute concrete that has begun to solidify.

3.5.3 Transporting

Transport concrete from the mixer to the forms as rapidly as practicable. Prevent segregation or loss of ingredients. Clean transporting equipment thoroughly before each batch. Do not use aluminum pipe or chutes. Remove concrete which has segregated in transporting and dispose of as directed.

3.6 PLACING CONCRETE

Place concrete in accordance with ACI 301 Section 5. Concrete shall be placed within 15 minutes of discharge into non-agitating equipment.

3.6.1 Footing Placement

Concrete for footings may be placed in excavations without forms upon inspection and approval by the Contracting Officer. Excavation width must be a minimum of 4 inches greater than indicated.

3.6.2 Pumping

ACI 304R and ACI 304.2R. Pumping must not result in separation or loss of materials nor cause interruptions sufficient to permit loss of plasticity between successive increments. Loss of slump in pumping equipment must not exceed 2 inches at discharge/placement. Do not convey concrete through pipe made of aluminum or aluminum alloy. Avoid rapid changes in pipe sizes. Limit maximum size of coarse aggregate to 33 percent of the diameter of the pipe. Limit maximum size of well-rounded aggregate to 40 percent of the pipe diameter. Take samples for testing at both the point of delivery to the pump and at the discharge end.

3.6.3 Cold Weather

Cold weather concrete must meet the requirements of ACI 301 unless otherwise specified. Do not allow concrete temperature to decrease below 50 degrees F. Obtain approval prior to placing concrete when the ambient temperature is below 40 degrees F or when concrete is likely to be subjected to freezing temperatures within 24 hours. Cover concrete and provide sufficient heat to maintain 50 degrees F minimum adjacent to both the formwork and the structure while curing. Limit the rate of cooling to 37 degrees F in any 1 hour and 50 degrees F per 24 hours after heat application.

3.6.4 Hot Weather

Hot weather concrete must meet the requirements of ACI 305.1 unless otherwise specified. Maintain required concrete temperature using Figure 4.2 in ACI 305R to prevent the evaporation rate from exceeding 0.2 pound of water per square foot of exposed concrete per hour. Cool ingredients before mixing or use other suitable means to control concrete temperature

and prevent rapid drying of newly placed concrete. Shade the fresh concrete as soon as possible after placing. Start curing when the surface of the fresh concrete is sufficiently hard to permit curing without damage. Provide water hoses, pipes, spraying equipment, and water hauling equipment, where job site is remote to water source, to maintain a moist concrete surface throughout the curing period. Provide burlap cover or other suitable, permeable material with fog spray or continuous wetting of the concrete when weather conditions prevent the use of impervious sheets. For vertical surfaces, protect forms from direct sunlight and add water to top of structure once concrete is set.

3.6.5 Bonding

Surfaces of set concrete at joints, must be roughened and cleaned of laitance, coatings, loose particles, and foreign matter. Roughen surfaces in a manner that exposes the aggregate uniformly and does not leave laitance, loosened particles of aggregate, nor damaged concrete at the surface.

Obtain bonding of fresh concrete that has set as follows:

- a. At joints between footings and walls or columns, between walls or columns and the beams or slabs they support, and elsewhere unless otherwise specified; roughened and cleaned surface of set concrete must be dampened, but not saturated, immediately prior to placing of fresh concrete.
- b. At joints in exposed-to-view work; at vertical joints in walls; at joints near midpoint of span in girders, beams, supported slabs, other structural members; in work designed to contain liquids; the roughened and cleaned surface of set concrete must be dampened but not saturated and covered with a cement grout coating.
- c. Provide cement grout that consists of equal parts of Portland cement and fine aggregate by weight with not more than 6 gallons of water per sack of cement. Apply cement grout with a stiff broom or brush to a minimum thickness of 1/16 inch. Deposit fresh concrete before cement grout has attained its initial set.

3.7 WASTE MANAGEMENT

Provide as specified in the Waste Management Plan and as follows.

3.7.1 Mixing Equipment

Before concrete pours, designate Contractor-owned site meeting environmental standards for cleaning out concrete mixing trucks. Minimize water used to wash equipment.

3.7.2 Reinforcing Steel

Collect reinforcing steel and place in designated area for recycling.

3.7.3 Other Waste

Identify concrete manufacturer's or supplier's policy for collection or return of construction waste, unused material, deconstruction waste, and/or packaging material. Return excess cement to supplier. Institute deconstruction and construction waste separation and recycling for use in

manufacturer's programs. When such a program is not available, seek local recyclers to reclaim the materials.

3.8 SURFACE FINISHES EXCEPT FLOOR, SLAB, AND PAVEMENT FINISHES

3.8.1 Defects

Repair surface defects in accordance with ACI 301 Section 5.

3.8.2 Not Against Forms (Top of Walls)

Surfaces not otherwise specified must be finished with wood floats to even surfaces. Finish must match adjacent finishes.

3.8.3 Formed Surfaces

3.8.3.1 Tolerances

Tolerances in accordance with ACI 117 and as indicated.

3.8.3.2 As-Cast Rough Form

Provide for surfaces not exposed to public view a surface finish SF-1.0. Patch holes and defects in accordance with ACI 301.

3.8.3.3 Standard Smooth Finish

Provide for surfaces exposed to public view a surface finish SF-3.0. Patch holes and defects in accordance with ACI 301.

3.9 FLOOR, SLAB, AND PAVEMENT FINISHES AND MISCELLANEOUS CONSTRUCTION

In accordance with ACI 301 and ACI 302.1R, unless otherwise specified. Slope floors uniformly to drains where drains are provided. Where straightedge measurements are specified, Contractor must provide straightedge.

3.9.1 Finish

Place, consolidate, and immediately strike off concrete to obtain proper contour, grade, and elevation before bleedwater appears. Permit concrete to attain a set sufficient for floating and supporting the weight of the finisher and equipment. If bleedwater is present prior to floating the surface, drag the excess water off or remove by absorption with porous materials. Do not use dry cement to absorb bleedwater. Grate tampers ("jitterbugs") shall not be used. Contractor shall coordinate concrete finish with floor finishes.

3.9.1.1 Floated

Use for exterior slabs where not otherwise specified. Finish concrete in accordance with ACI 301 Section 5 for a floated finish.

3.9.1.2 Steel Troweled

Use for floors intended as walking surfaces. Finish concrete in accordance with ACI 301 Section 5 for a steel troweled finish.

3.9.1.3 Broomed

Use on surfaces of exterior walks, platforms, patios, and ramps, unless otherwise indicated. Finish concrete in accordance with ACI 301 Section 5 for a broomed finish.

3.9.2 Flat Floor Finishes

ACI 302.1R. Construct in accordance with one of the methods recommended in Table 10.15.3a, "Slab-on-ground flatness/levelness construction guide" or Table 10.15.3b, "Suspended slab flatness/levelness construction guide" appropriate for the type of construction. ACI 117 for tolerance tested by ASTM E1155.

a. Specified Conventional Value:

Floor Flatness (Ff)	25	17	minimum
Floor Levelness (FL)	20	15	minimum

3.9.2.1 Measurement of Floor Tolerances

Test slab within 24 hours of the final troweling. Provide tests to Contracting Officer within 12 hours after collecting the data. Floor flatness inspector is required to provide a tolerance report which must include:

- a. Key plan showing location of data collected.
- b. Results required by ASTM E1155.

3.9.2.2 Remedies for Out of Tolerance Work

Contractor is required to repair and retest any floors not meeting specified tolerances. Prior to repair, Contractor must submit and receive approval for the proposed repair, including product data from any materials proposed. Repairs must not result in damage to structural integrity of the floor. For floors exposed to public view, repairs must prevent any uneven or unusual coloring of the surface.

3.9.3 Pits and Trenches

Place bottoms and walls monolithically or provide waterstops and keys.

3.9.4 Splash Blocks

Provide at outlets of downspouts emptying at grade. Splash blocks may be precast concrete, and must be 24 inches long, 12 inches wide and 4 inches thick, unless otherwise indicated, with smooth-finished countersunk dishes sloped to drain away from the building.

3.10 JOINTS

3.10.1 Construction Joints

Make and locate joints not indicated so as not to impair strength and appearance of the structure, as approved. Joints must be perpendicular to main reinforcement. Reinforcement must be continued and developed across construction joints. Locate construction joints as follows:

3.10.1.1 Maximum Allowable Construction Joint Spacing

- a. In walls at not more than 60 feet in any horizontal direction.
- b. In slabs on ground, so as to divide slab into areas not in excess of 1,200 square feet.

3.10.1.2 Construction Joints for Constructability Purposes

- a. In walls, at top of footing; at top of slabs on ground; or where required to conform to architectural details.

Provide keyways at least 1-1/2-inches deep in construction joints in walls and slabs and between walls and footings; approved bulkheads may be used for slabs.

3.10.2 Isolation Joints in Slabs on Ground

- a. Provide joints at points of contact between slabs on ground and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as indicated.
- b. Fill joints with premolded joint filler strips 1/2 inch thick, extending full slab depth. Install filler strips at proper level below finish floor elevation with a slightly tapered, dress-and-oiled wood strip temporarily secured to top of filler strip to form a groove not less than 3/4 inch in depth where joint is sealed with sealing compound and not less than 1/4 inch in depth where joint sealing is not required. Remove wood strip after concrete has set. Contractor must clean groove of foreign matter and loose particles after surface has dried.

3.10.3 Contraction Joints in Slabs on Ground

- a. Provide joints to form panels as indicated.
- b. Under and on exact line of each control joint, cut 50 percent of welded wire reinforcement before placing concrete.
- c. Sawcut contraction joints into slab on ground in accordance with ACI 301 Section 5.

3.10.4 Sealing Joints in Slabs on Ground

- a. Contraction and control joints which are to receive finish flooring material must be sealed with joint sealing compound after concrete curing period. Slightly underfill groove with joint sealing compound to prevent extrusion of compound. Remove excess material as soon after sealing as possible.
- b. Sealed groove must be left ready to receive filling material that is provided as part of finish floor covering work.

3.11 CURING AND PROTECTION

Curing and protection in accordance with ACI 301 Section 5, unless otherwise specified. Begin curing immediately following form removal. Avoid damage to concrete from vibration created by blasting, pile driving, movement of equipment in the vicinity, disturbance of formwork or

protruding reinforcement, and any other activity resulting in ground vibrations. Protect concrete from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks, and oil stains. Do not allow concrete to dry out from time of placement until the expiration of the specified curing period. Provide moist curing for all areas except storage building. Storage building to receive curing and sealing compound.

3.11.1 Curing Periods

ACI 301 Section 5. Begin curing immediately after placement. Protect concrete from premature drying, excessively hot temperatures, and mechanical injury; and maintain minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete. The materials and methods of curing are subject to approval by the Contracting Officer.

3.11.2 Curing Formed Surfaces

Accomplish curing of formed surfaces, including undersurfaces of girders, beams, supported slabs, and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed before end of curing period, accomplish final curing of formed surfaces by any of the curing methods specified above, as applicable.

3.11.3 Curing Unformed Surfaces

- a. Accomplish initial curing of unformed surfaces, such as monolithic slabs, floor topping, and other flat surfaces, by moist curing.

3.11.4 Temperature of Concrete During Curing

When temperature of atmosphere is 41 degrees F and below, maintain temperature of concrete at not less than 55 degrees F throughout concrete curing period or 45 degrees F when the curing period is measured by maturity. When necessary, make arrangements before start of concrete placing for heating, covering, insulation, or housing as required to maintain specified temperature and moisture conditions for concrete during curing period.

When the temperature of atmosphere is 80 degrees F and above or during other climatic conditions which cause too rapid drying of concrete, make arrangements before start of concrete placing for installation of wind breaks, of shading, and for fog spraying, wet sprinkling, or moisture-retaining covering of light color as required to protect concrete during curing period.

Changes in temperature of concrete must be uniform and not exceed 37 degrees F in any 1 hour nor 80 degrees F in any 24-hour period.

3.11.5 Protection from Mechanical Injury

During curing period, protect concrete from damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration and from damage caused by rain or running water.

3.11.6 Protection After Curing

Protect finished concrete surfaces from damage by construction operations.

3.12 FIELD QUALITY CONTROL

3.12.1 Aggregate Testing

3.12.1.1 Fine Aggregate

At least once during each shift when the concrete plant is operating, perform one sieve analysis and fineness modulus determination in accordance with ASTM C136/C136M and COE CRD-C 104 for the fine aggregate or for each fine aggregate if it is batched in more than one size or classification. The location at which samples are taken may be selected by the Contractor as the most advantageous for control. However, the Contractor is responsible for delivering fine aggregate to the mixer within specification limits. When the amount passing on any sieve is outside the specification limits, the fine aggregate shall be immediately resampled and retested. If there is another failure on any sieve, the fact shall be immediately reported to the Contracting Officer, concreting shall be stopped, and immediate steps taken to correct the grading.

3.12.1.2 Coarse Aggregate

At least once during each shift in which the concrete plant is operating, perform a sieve analysis in accordance with ASTM C136/C136M for each size of coarse aggregate. The location at which samples are taken may be selected by the Contractor as the most advantageous for production control. However, the Contractor shall be responsible for delivering the aggregate to the mixer within specification limits. A test record of samples of aggregate taken at the same locations shall show the results of the current test as well as the average results of the five most recent tests including the current test. The Contractor may adopt limits for control coarser than the specification limits for samples taken other than as delivered to the mixer to allow for degradation during handling. When the amount passing any sieve is outside the specification limits, the coarse aggregate shall be immediately resampled and retested. If the second sample fails on any sieve, that fact shall be reported to the Contracting Officer. Where two consecutive averages of 5 tests are outside specification limits, the operation shall be considered out of control and reported to the Contracting Officer. Concreting shall be stopped and immediate steps shall be taken to correct the grading.

3.12.2 Concrete Sampling

ASTM C172/C172M. Collect samples of fresh concrete to perform tests specified. ASTM C31/C31M for making test specimens.

3.12.3 Concrete Testing

3.12.3.1 Slump Tests

ASTM C143/C143M. Take concrete samples during concrete placement/discharge. The maximum slump may be increased as specified with the addition of an approved admixture provided that the water-cementitious material ratio is not exceeded. Perform tests at commencement of concrete placement, when test cylinders are made, and for each batch (minimum) or every 20 cubic yards (maximum) of concrete.

3.12.3.2 Temperature Tests

Test the concrete delivered and the concrete in the forms. Perform tests in hot or cold weather conditions (below 50 degrees F and above 80 degrees F) for each batch (minimum) or every 20 cubic yards (maximum) of concrete, until the specified temperature is obtained, and whenever test cylinders and slump tests are made.

3.12.3.3 Compressive Strength Tests

ASTM C39/C39M. Make five 6 inch by 12 inch test cylinders for each set of tests in accordance with ASTM C31/C31M, ASTM C172/C172M and applicable requirements of ACI 305R and ACI 306R. Take precautions to prevent evaporation and loss of water from the specimen. Test two cylinders at 7 days, two cylinders at 28 days, and hold one cylinder in reserve. Take samples for strength tests of each mix design of concrete placed each day not less than once a day, nor less than once for each 100 cubic yards of concrete for the first 500 cubic yards, then every 500 cubic yards thereafter, nor less than once for each 5400 square feet of surface area for slabs or walls. For the entire project, take no less than five sets of samples and perform strength tests for each mix design of concrete placed. Each strength test result must be the average of two cylinders from the same concrete sample tested at 28 days. Concrete compressive tests must meet the requirements of this section, the Contract Document, and ACI 301. Retest locations represented by erratic core strengths. Where retest does not meet concrete compressive strength requirements submit a mitigation or remediation plan for review and approval by the contracting officer. Repair core holes with nonshrink grout. Match color and finish of adjacent concrete.

3.12.3.4 Air Content

ASTM C173/C173M or ASTM C231/C231M for normal weight concrete. Test air-entrained concrete for air content at the same frequency as specified for slump tests.

3.12.3.5 Chloride Ion Concentration

Chloride ion concentration must meet the requirements of the paragraph titled CORROSION AND CHLORIDE CONTENT. Determine water soluble ion concentration in accordance with ASTM C1218/C1218M. Perform test once for each mix design.

3.12.3.6 Strength of Concrete Structure

The strength of the concrete structure will be considered to be deficient if any of the following conditions are identified:

- a. Failure to meet compressive strength tests as evaluated.
- b. Reinforcement not conforming to requirements specified.
- c. Concrete which differs from required dimensions or location in such a manner as to reduce strength.
- d. Concrete curing and protection of concrete against extremes of temperature during curing, not conforming to requirements specified.
- e. Concrete subjected to damaging mechanical disturbances, particularly

load stresses, heavy shock, and excessive vibration.

f. Poor workmanship likely to result in deficient strength.

Where the strength of the concrete structure is considered deficient submit a mitigation or remediation plan for review and approval by the contracting officer.

3.12.3.7 Non-Conforming Materials

Factors that indicate that there are non-conforming materials include (but not limited to) excessive compressive strength, inadequate compressive strength, excessive slump, excessive voids and honeycombing, concrete delivery records that indicate excessive time between mixing and placement, or excessive water was added to the mixture during delivery and placement. Any of these indicators alone are sufficient reason for the Contracting Officer to request additional sampling and testing.

Investigations into non-conforming materials must be conducted at the Contractor's expense. The Contractor must be responsible for the investigation and must make written recommendations to adequately mitigate or remediate the non-conforming material. The Contracting Officer may accept, accept with reduced payment, require mitigation, or require removal and replacement of non-conforming material at no additional cost to the Government.

3.12.3.8 Testing Concrete Structure for Strength

When there is evidence that strength of concrete structure in place does not meet specification requirements or there are non-conforming materials, make cores drilled from hardened concrete for compressive strength determination in accordance with ASTM C42/C42M, and as follows:

- a. Take at least three representative cores from each member or area of concrete-in-place that is considered potentially deficient. Location of cores will be determined by the Contracting Officer.
- b. Test cores after moisture conditioning in accordance with ASTM C42/C42M if concrete they represent is more than superficially wet under service.
- c. Air dry cores, (60 to 80 degrees F with relative humidity less than 60 percent) for 7 days before test and test dry if concrete they represent is dry under service conditions.
- d. Strength of cores from each member or area are considered satisfactory if their average is equal to or greater than 85 percent of the 28-day design compressive strength of the class of concrete.
- e. Core specimens will be taken and tested by the Government. If the results of core-boring tests indicate that the concrete as placed does not conform to the drawings and specification, the cost of such tests and restoration required must be borne by the Contractor.

Fill core holes solid with patching mortar and finished to match adjacent concrete surfaces.

Correct concrete work that is found inadequate by core tests in a manner approved by the Contracting Officer.

3.13 REPAIR, REHABILITATION AND REMOVAL

Before the Contracting Officer accepts the structure the Contractor must inspect the structure for cracks, damage and substandard concrete placements that may adversely affect the service life of the structure. A report documenting these defects must be prepared which includes recommendations for repair, removal or remediation must be submitted to the Contracting Officer for approval before any corrective work is accomplished.

3.13.1 Crack Repair

Prior to final acceptance, all cracks in excess of 0.02 inches wide must be documented and repaired. The proposed method and materials to repair the cracks must be submitted to the Contracting Officer for approval. The proposal must address the amount of movement expected in the crack due to temperature changes and loading.

3.13.2 Repair of Weak Surfaces

Weak surfaces are defined as mortar-rich, rain-damaged, uncured, or containing exposed voids or deleterious materials. Concrete surfaces with weak surfaces less than 1/4 inch thick must be diamond ground to remove the weak surface. Surfaces containing weak surfaces greater than 1/4 inch thick must be removed and replaced or mitigated in a manner acceptable to the Contracting Officer.

3.13.3 Failure of Quality Assurance Test Results

Proposed mitigation efforts by the Contractor must be approved by the Contracting Officer prior to proceeding.

-- End of Section --

SECTION 03 33 00

CAST-IN-PLACE ARCHITECTURAL CONCRETE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 211.1	(1991; R 2009) Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete
ACI 211.2	(1998; R 2004) Standard Practice for Selecting Proportions for Structural Lightweight Concrete
ACI 301	(2016) Specifications for Structural Concrete
ACI 318	(2014; Errata 1-2 2014; Errata 3-5 2015; Errata 6 2016; Errata 7-9 2017) Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary (ACI 318R-14)
ACI 347R	(2014; Errata 1 2017) Guide to Formwork for Concrete
ACI SP-66	(2004) ACI Detailing Manual

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel

1.2 SYSTEM DESCRIPTION

All materials, procedures, and requirements specified in Section 03 30 00 CAST-IN-PLACE CONCRETE shall fully apply to cast-in-place architectural concrete, except as otherwise specified.

1.2.1 Concrete Mix Design

Design the concrete mix in accordance with ACI 211.1 and ACI 211.2 including consideration of the finishes required.

1.2.2 Formwork Design

Design formwork conforming to ACI 301 and ACI 347R.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.

Submit the following in accordance with Section 01 33 00 SUBMITTAL

PROCEDURES:

SD-02 Shop Drawings

Detail Drawings; G RO.

SD-04 Samples

Materials

1.4 QUALITY ASSURANCE

1.4.1 Detail Drawings

Submit detail drawings conforming to ACI SP-66 and ACI 318. Detail drawings shall show location of cast-in-place concrete caps in the work, building elevations, formwork fabrication details, reinforcements, embedments, dimensions, concrete strength, interface with adjacent materials, and special placing instructions, in sufficient detail to cover fabrication, placement, stripping, and finishing.

Detail drawings must include each profile of the precast concrete cap with dimensions as indicated in the drawings. Drawings must indicate associated slopes, drip edges, and other elements called out in the drawings.

PART 2 PRODUCTS

2.1 MATERIALS

Submit samples of materials listed below, indicating sizes, shapes, finishes, color, and pertinent accessories.

2.1.1 Reinforcing Steel

Reinforcing steel shall be galvanized if clearance to an exterior face is 1 inch or less.

2.1.2 Tie Wire

Tie wire shall be soft monel or 18-8 stainless steel.

2.1.3 Plates, Angles, Anchors, and Embedments

Plates, angles, anchors, and embedments shall conform to ASTM A36/A36M, and shall be prime painted with inorganic zinc primer.

2.1.4 Formwork

Formwork for special effects shall be as approved.

2.1.5 Form Release Agents

Form release agents shall be manufacturer's standard, nonstaining, nonpetroleum based, compatible with surface sealer finish coating.

2.1.6 Surface Sealer

Surface sealer shall be methyl methacrylate polymer acrylic emulsion, clear color.

PART 3 EXECUTION

3.1 FORMWORK ERECTION

Erect formwork in accordance with the detail drawings to ensure that the finished concrete members conform accurately to the indicated dimensions, lines, elevations, and finishes. Deflection shall not exceed 1/360th of each component span or distance between adjacent supports. Deflections and tolerance shall not be cumulative. Install form lines as necessary to provide the required finish. Forms shall be coated with form release agents before reinforcement is placed. Formwork shall conform to ACI 301 and ACI 347R.

3.2 CONCRETE FINISHES

Concrete finishes shall conform to the approved finishes. Finishing shall be accomplished at the time of concrete placement or immediately after formwork removal, as follows:

- a. Smooth finish: (1) As cast using flat smooth nonporous forms. (2) As cast using fluted, sculptured, board finish or textured form liners.

3.3 JOINT SEALING

Joint sealing shall be as specified in Section 07 92 00 JOINT SEALANTS.

3.4 CLEANING

No sooner than 72 hours after joints are sealed, faces and other exposed surfaces of cast-in-place concrete shall be washed down, cleaned with soap and water applied with a soft bristle brush, then washed down again with clean water, or by other approved procedures. Discolorations which cannot be removed by these procedures, shall be considered defective work. Cleaning work shall be done when temperature and humidity conditions are such that surfaces dry rapidly. Care shall be taken during cleaning operations to protect adjacent surfaces from damage.

3.5 SURFACE SEALING

After cleaning, exterior exposed architectural concrete surfaces indicated shall be given one coat of surface sealer, spray applied unless otherwise approved. Adjacent surfaces shall be protected to prevent damage from the surface sealer.

3.6 PROTECTION OF WORK

Work shall be protected against damage from subsequent operations.

3.7 DEFECTIVE WORK

Defective work shall be repaired or replaced, as directed, using approved procedures.

-- End of Section --

SECTION 03 42 13.00 10

PLANT-PRECAST CONCRETE PRODUCTS FOR BELOW GRADE CONSTRUCTION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 211.1	(1991; R 2009) Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete
ACI 211.2	(1998; R 2004) Standard Practice for Selecting Proportions for Structural Lightweight Concrete
ACI 305R	(2020) Guide to Hot Weather Concreting
ACI 306.1	(1990; R 2002) Standard Specification for Cold Weather Concreting
ACI 318	(2014; Errata 1-2 2014; Errata 3-5 2015; Errata 6 2016; Errata 7-9 2017) Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary (ACI 318R-14)

AMERICAN CONCRETE PIPE ASSOCIATION (ACPA)

ACPA 01-102	(2000) Concrete Pipe Handbook
ACPA 01-110	(1984) Design Manual for Sulfide and Corrosion Prediction and Control
ACPA QPC	(202016) QCast Plant Certification Manual

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2020; Errata 1 2021) Structural Welding Code - Steel
AWS D1.4/D1.4M	(2011) Structural Welding Code - Reinforcing Steel

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A153/A153M	(2016a) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM A615/A615M	(2020) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A706/A706M	(2016) Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A767/A767M	(2016) Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
ASTM A775/A775M	(2017) Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A884/A884M	(2019) Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement
ASTM A1064/A1064M	(2017) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C31/C31M	(2021a) Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C39/C39M	(2021) Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C138/C138M	(2017a) Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C143/C143M	(2020) Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C171	(2020) Standard Specification for Sheet Materials for Curing Concrete
ASTM C173/C173M	(2016) Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C192/C192M	(2019) Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
ASTM C231/C231M	(2017a) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C309	(2019) Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C443	(2020) Standard Specification for Joints

for Concrete Pipe and Manholes, Using
Rubber Gaskets

ASTM C857	(2016) Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
ASTM C858	(2010; E 2012) Standard Specification for Underground Precast Concrete Utility Structures
ASTM C877	(2021) Standard Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections
ASTM C891	(2020) Standard Practice for Installation of Underground Precast Concrete Utility Structures
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM C923	(2008; R 2013; E 2016) Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
ASTM C990	(2009; R 2014) Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
ASTM C1064/C1064M	(2017) Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
ASTM C1107/C1107M	(2020) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C1116/C1116M	(2010a; R 2015) Standard Specification for Fiber-Reinforced Concrete
ASTM C1244	(2020) Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill
ASTM C1478	(2019) Standard Specification for Storm Drain Resilient Connectors Between Reinforced Concrete Storm Sewer Structures, Pipes and Laterals

CSA GROUP (CSA)

CSA A23.4	(2016; R 2021) Precast Concrete - Materials and Construction

NATIONAL PRECAST CONCRETE ASSOCIATION (NPCA)

NPCA QC Manual	(2017) Quality Control Manual for Precast

and Prestressed Concrete Plants

1.2 SUBMITTALS

All submittals are the responsibility of the precast concrete producer. Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Quality Control Procedures

SD-02 Shop Drawings

Standard Precast Units; G

Custom-Made Precast Units; G

Special Finishes

SD-03 Product Data

Standard Precast Units

Proprietary Precast Units

Embedded Items

Accessories

SD-05 Design Data

Design Calculations; G

Concrete Mix Proportions

SD-06 Test Reports

Test Reports

SD-07 Certificates

Quality Control Procedures

SD-11 Closeout Submittals

Recycled content for fly ash and pozzolan; S

Recycled content for Ground Iron Blast-Furnace Slag; S

Recycled content for Silica Fume; S

Recycled content for Synthetic Fiber Reinforcement; S

Recycled content for steel; S

1.3 QUALITY ASSURANCE

Demonstrate adherence to the standards set forth in NPCA QC Manual or ACPA QPC. Meet requirements written in the subparagraphs below.

1.3.1 NPCA and ACPA Plant Certification

The precast concrete producer must be certified by the National Precast Concrete Association's or the American Concrete Pipe Association's Plant Certification Program prior to and during production of the products for this project.

1.3.2 Qualifications, Quality Control and Inspection

1.3.2.1 Qualifications

Select a precast concrete producer that has been in the business of producing precast concrete units similar to those specified for a minimum of 3 years. The precast concrete producer must maintain a permanent quality control department or retain an independent testing agency on a continuing basis.

1.3.2.2 Quality Control Procedures

Submit quality control procedures established by the precast manufacturer in accordance with NPCA QC Manual and ACPA QPC. Show that the following QC tests are performed as required and in accordance with the ASTM standards indicated.

1.3.2.2.1 Slump

Perform a slump test for each 150 cu yd of concrete produced, or once a day, whichever comes first. Perform slump tests in accordance with ASTM C143/C143M.

1.3.2.2.2 Temperature

Measure the temperature of fresh concrete when slump or air content tests are made and when compressive test specimens are made in accordance with ASTM C1064/C1064M.

1.3.2.2.3 Compressive Strength

Make at least four compressive strength specimens for each 150 cubic yards of concrete of each mix in accordance with the following Standards: ASTM C31/C31M, ASTM C192/C192M, ASTM C39/C39M.

1.3.2.2.4 Air Content

Perform tests for air content on air-entrained, wet-cast concrete for each 150 cu yd of concrete, but not less often than once each day when air-entrained concrete is used. Determine the air content in accordance with either ASTM C231/C231M or ASTM C173/C173M for normal weight aggregates and ASTM C173/C173M for lightweight aggregates.

1.3.2.2.5 Unit Weight

Perform tests for unit weight a minimum of once per week to verify the yield of batch mixes. Perform unit weight tests for each 100 cu yd of

lightweight concrete in accordance with ASTM C138/C138M.

1.3.2.3 Inspection

The Contracting Officer may place an inspector in the plant when the units covered by this specification are being manufactured. The burden of payment for plant inspection will be clearly detailed in the specification. The precast concrete producer must give notice 14 days prior to the time the units will be available for plant inspection. Neither the exercise nor waiver of inspection at the plant will affect the Government's right to enforce contractual provisions after units are transported or erected.

1.3.2.4 Test Reports

Submit the following:

1.3.2.4.1 Material Certifications or Laboratory Test Reports

Include mill tests and all other test data, for Portland cement, blended cement, pozzolans, ground granulated blast furnace slag, silica fume, aggregate, admixtures, and curing compound proposed for use on this project.

1.3.2.4.2 Mix Test

Submit reports showing that the mix has been successfully tested to produce concrete with the properties specified and will be suitable for the job conditions. Such tests may include compressive strength, flexural strength, plastic or hardened air content, freeze thaw durability, abrasion and absorption. Clearly detail in the specifications special tests for precast concrete or cast-in items.

1.3.2.4.3 Self-Consolidating Concrete

Submit sufficient documentation, when the use of self-consolidating concrete (SCC) is proposed, showing a minimum of 30-days production track records demonstrating that SCC is appropriate for casting of the product.

1.3.2.4.4 In-Plant QA/QC Inspection Reports

Submit inspection reports upon the request of the Contracting Officer.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery

Deliver precast units to the site in accordance with the delivery schedule to avoid excessive build-up of units in storage at the site. Upon delivery to the job site, all precast concrete units will be inspected by the Contracting Officer for quality and final acceptance.

1.4.2 Storage

Store units off the ground or in a manner that minimizes potential damage.

1.4.3 Handling

Handle, transport, and store products in a manner to minimize damage.

Lifting devices or holes must be consistent with industry standards. Perform lifting with methods or devices intended for this purpose as indicated on shop drawings.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Furnish precast concrete units designed and fabricated by an experienced and acceptable precast concrete manufacturer who has been, for at least three years, regularly and continuously engaged in the manufacture of precast concrete work similar to that indicated on the drawings. Coordinate precast work with the work of other trades. Below grade structures must comply with ASTM C858.

2.1.1 Standard Precast Units

Design standard precast concrete units to withstand indicated design load conditions in accordance with applicable industry design standards ACI 318, ASTM C857. Design must also consider stresses induced during handling, shipping and installation as to avoid product cracking or other handling damage. Indicate design loads for precast concrete units on the shop drawings. Submit drawings for standard precast concrete units furnished by the precast concrete producer for approval by the Contracting Officer. These drawings must demonstrate that the applicable industry design standards have been met. Include installation and construction information on shop drawings. Include details of steel reinforcement size and placement as well as supporting design calculations, if appropriate. Produce precast concrete units in accordance with the approved drawings. Submit cut sheets, for standard precast concrete units, showing conformance to project drawings and requirements, and to applicable industry design standards listed in this specification.

2.1.2 Custom-Made Precast Units

Submit design calculations for custom-made precast units, prepared and sealed by a registered professional engineer, for approval prior to fabrication. Include in the calculations the analysis of units for lifting stresses and the sizing of lifting devices. Submit drawings furnished by the precast concrete producer for approval by the Contracting Officer. Show on these drawings complete design, installation, and construction information in such detail as to enable the Contracting Officer to determine the adequacy of the proposed units for the intended purpose. Include details of steel reinforcement size and placement as well as supporting design calculations, if appropriate. Produce precast concrete units in accordance with the approved drawings.

2.1.3 Proprietary Precast Units

Products manufactured under franchise arrangements must conform to all the requirements specified by the franchiser. Items not included in the franchise specification, but included in this specification, must conform to the requirements in this specification. Submit standard plans or informative literature, for proprietary precast concrete units. Make available supporting calculations and design details upon request. Provide sufficient information as to demonstrate that such products will perform the intended task.

2.1.1.4 Joints and Sealants

Provide joints and sealants between adjacent units of the type and configuration indicated on shop drawings meeting specified design and performance requirements.

2.1.1.5 Concrete Mix Design

2.1.1.5.1 Concrete Mix Proportions

Base selection of proportions for concrete on the methodology presented in ACI 211.1 for normal weight concrete and ACI 211.2 for lightweight concrete. Develop the concrete proportions using the same type and brand of cement, the same type and brand of pozzolan, the same type and gradation of aggregates, and the same type and brand of admixture that will be used in the manufacture of precast concrete units for the project. Do not use calcium chloride in precast concrete containing reinforcing steel or other embedded metal items. At a minimum of thirty days prior to precast concrete unit manufacturing, the precast concrete producer will submit a mix design and proportions for each strength and type of concrete that will be used. Furnish a complete list of materials, including quantity, type, brand and applicable data sheets for all mix design constituents as well as applicable reference specifications. The use of self-consolidating concrete is permitted, provided that mix design proportions and constituents meet the requirements of this specification.

2.1.1.5.2 Concrete Strength

Provide precast concrete units with a 28-day compressive strength (f'_c) of 4000 psi.

2.1.1.5.3 Water-to-Cement Ratio

Where exposed to freezing and thawing, furnish concrete containing entrained air and with a water-cementitious ratio of 0.45 or less. Where not exposed to freezing, but required to have a low permeability, furnish concrete with a water-cementitious ratio of 0.48 or less. Where exposed to deicer salts, brackish water, or seawater, furnish concrete with a water-cementitious ratio of 0.40 or less, for corrosion protection.

2.1.1.5.4 Air Content

The air content of concrete that will be exposed to freezing conditions must be within the limits given below.

NOMINAL MAXIMUM AGGREGATE SIZE	AIR CONTENT PERCENT	
	EXPOSURE CLASS F1	EXPOSURE CLASSES F2 and F3
3/8 inch	6.0	7.5
1/2 inch	5.5	7.0
3/4 inch	5.0	6.0

NOMINAL MAXIMUM AGGREGATE SIZE	AIR CONTENT PERCENT	
	EXPOSURE CLASS F1	EXPOSURE CLASSES F2 and F3
1.0 inch	4.5	6.0
1.5 inch	4.5	5.5
Note: For specified compressive strengths greater than 5000 psi, air content may be reduced 1 percent		

2.1.5.5 Corrosion Control for Sanitary Sewer Systems

Follow design recommendations outlined in Chapter 7 of ACPA 01-102 or the ACPA 01-110 when hydrogen sulfide is indicated as a potential problem.

2.2 MATERIALS

Except as otherwise specified in the following paragraphs, conform material to Section 03 30 00 CAST-IN-PLACE CONCRETE.

2.2.1 Material Sustainability Criteria

For products in this section, where applicable and to extent allowed by performance criteria, provide and document the following in accordance with Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING:

- a. Recycled content for fly ash and pozzolan.
- b. Recycled content for Ground Iron Blast-Furnace Slag.
- c. Recycled content for Silica Fume.
- d. Recycled content for Synthetic Fiber Reinforcement.
- e. Recycled content for steel, 75 percent minimum.

2.2.2 Pigments

Non-fading and lime-resistant.

2.2.3 Reinforcement

2.2.3.1 Reinforcing Bars

- a. Deformed Billet-steel: ASTM A615/A615M.
- b. Deformed Low-alloy steel: ASTM A706/A706M.

2.2.3.2 Reinforcing Wire

- a. Plain Wire: ASTM A1064/A1064M.
- b. Deformed Wire: ASTM A1064/A1064M.

2.2.3.3 Welded Wire Reinforcement

- a. Plain Wire: ASTM A1064/A1064M.
- b. Deformed Wire: ASTM A1064/A1064M.

2.2.3.4 Epoxy Coated Reinforcement

- a. Reinforcing Bars: ASTM A775/A775M.
- b. Wires and Welded Wire: ASTM A884/A884M.

2.2.3.5 Galvanized Reinforcement

Provide galvanized reinforcement conforming to ASTM A767/A767M.

2.2.4 Synthetic Fiber Reinforcement

Provide fiber reinforced concrete in accordance with ASTM C1116/C1116M Type III, synthetic fiber reinforced concrete, and as follows. Synthetic reinforcing fibers must be monofilament polypropylene fibers. Provide fibers that have a specific gravity of 0.9, a minimum tensile strength of 70 ksi, graded per manufacturer, and specifically manufactured to an optimum gradation for use as concrete secondary reinforcement.

2.2.5 Inserts and Embedded Metal

All items embedded in concrete must be of the type required for the intended task, and meet the following standards.

- a. Structural Steel Plates, Angles, etc.: ASTM A36/A36M.
- b. Hot-dipped Galvanized: ASTM A153/A153M.
- c. Proprietary Items: In accordance with manufacturers published literature.

2.2.6 Accessories

Submit proper installation instructions and relevant product data for items including, but not limited to, sealants, gaskets, connectors, steps, cable racks and other items installed before or after delivery.

- a. Rubber Gaskets for Circular Concrete Sewer Pipe and Culvert Pipe: ASTM C443.
- b. External Sealing Bands for Noncircular Sewer, Storm Drain and Culvert Pipe: ASTM C877.
- c. Preformed Flexible Joint Sealants for Concrete Pipe, Manholes, and Manufactured Box Sections: ASTM C990.
- d. Elastomeric Joint Sealants: ASTM C920.

2.2.7 Pipe Entry Connectors

Pipe entry connectors must conform to ASTM C923 or ASTM C1478.

2.2.8 Grout

Nonshrink Grout must conform to ASTM C1107/C1107M. Cementitious grout must be a mixture of Portland cement, sand, and water. Proportion one part cement to approximately 2.5 parts sand, with the amount of water based on placement method. Provide air entrainment for grout exposed to the weather.

PART 3 EXECUTION

3.1 FABRICATION AND PLACEMENT

Perform fabrication in accordance with NPCA QC Manual or ACPA QPC unless specified otherwise.

3.1.1 Forms

Use forms, for manufacturing precast concrete products, of the type and design consistent with industry standards and practices. They should be capable of consistently providing uniform products and dimensions. Construct forms so that the forces and vibrations to which the forms will be subjected can cause no product damage. Clean forms of concrete build-up after each use. Apply form release agents according to the manufacturers recommendations and do not allow to build up on the form casting surfaces.

3.1.2 Reinforcement

Follow applicable ASTM Standard or ACI 318 for placement and splicing. Fabricate cages of reinforcement either by tying the bars, wires or welded wire reinforcement into rigid assemblies or by welding, where permissible, in accordance with AWS D1.4/D1.4M. Position reinforcing as specified by the design and so that the concrete cover conforms to requirements. The tolerance on concrete cover must be one-third of that specified but not more than 1/2 inch. Provide concrete cover not less than 1/2 inch. Take positive means to assure that the reinforcement does not move significantly during the casting operations.

3.1.3 Embedded Items

Position embedded items at locations specified in the design documents. Perform welding in accordance with AWS D1.1/D1.1M when necessary. Hold rigidly in place inserts, plates, weldments, lifting devices and other items to be imbedded in precast concrete products so that they do not move significantly during casting operations. Submit product data sheets and proper installation instruction for anchors, lifting inserts and other devices. Clearly indicate the products dimensions and safe working load.

3.1.4 Synthetic Fiber Reinforced Concrete

Add fiber reinforcement to the concrete mix at the batch plant in accordance with the applicable sections of ASTM C1116/C1116M and the recommendations of the manufacturer. Use a minimum of 1.5 pounds of fibers per cubic yard of concrete.

3.2 CONCRETE

3.2.1 Concrete Mixing

Mixing operations must produce batch-to-batch uniformity of strength, consistency, and appearance.

3.2.2 Concrete Placing

Deposit concrete into forms as near to its final location as practical. Keep the free fall of the concrete to a minimum. Consolidate concrete in such a manner that segregation of the concrete is minimized and honeycombed areas are kept to a minimum. Use vibrators to consolidate concrete with frequencies and amplitudes sufficient to produce well consolidated concrete.

3.2.2.1 Cold Weather Concreting

Perform cold weather concreting in accordance with ACI 306.1.

- a. Provide adequate equipment for heating concrete materials and protecting concrete during freezing or near-freezing weather.
- b. All concrete materials, reinforcement, forms, fillers, and ground with which concrete is to come in contact must be free from frost.
- c. Do not use frozen materials or materials containing ice.
- d. In cold weather the temperature of concrete at the time of placing must not be below 45 degrees F. Discard concrete that freezes before its compressive strength reaches 500 psi.

3.2.2.2 Hot Weather Concreting

Follow recommendations for hot weather concreting in ACI 305R. During hot weather, give proper attention to constituents, production methods, handling, placing, protection, and curing to prevent excessive concrete temperatures or water evaporation that could impair required strength or serviceability of the member or structure. The temperature of concrete at the time of placing must not exceed 90 degrees F.

3.2.3 Concrete Curing

Commence curing immediately following the initial set and completion of surface finishing.

3.2.3.1 Curing by Moisture Retention

Prevent moisture evaporation from exposed surfaces until adequate strength for stripping is reached by one of the following methods:

- a. Cover with polyethylene sheets a minimum of 6 mils thick in accordance with ASTM C171.
- b. Cover with burlap or other absorptive material and keep continually moist.
- c. Use a membrane-curing compound, conforming to ASTM C309 and applied at a rate not less than 200 square ft/gallon, or in accordance with

manufacturers' recommendations.

3.2.3.2 Curing with Heat and Moisture

Do not subject concrete to steam or hot air until after the concrete has attained its initial set. Apply steam, if used, within a suitable enclosure, which permits free circulation of the steam in accordance with CSA A23.4. If hot air is used for curing, take precautions to prevent moisture loss from the concrete. The temperature of the concrete must not be permitted to exceed 150 degrees F. These requirements do not apply to products cured with steam under pressure in an autoclave.

3.2.4 Surface Finish

Finish unformed surfaces of wet-cast precast concrete products as specified. If no finishing procedure is specified, finish such surfaces using a strike-off to level the concrete with the top of the form.

3.2.4.1 Formed Non-Architectural Surfaces

Cast surfaces against approved forms following industry practices in cleaning forms, designing concrete mixes, placing and curing concrete. Normal color variations, form joint marks, small surface holes caused by air bubbles, and minor chips and spalls will be accepted but no major imperfections, honeycombs or other major defects will be permitted.

3.2.4.2 Unformed Surfaces

Finish unformed surfaces with a vibrating screed, or by hand with a float. Normal color variations, minor indentations, minor chips and spalls will be accepted. Major imperfections, honeycombs, or other major defects are not permitted.

3.2.4.3 Special Finishes

Troweled, broom or other finishes must be according to the requirements of project documents and performed in accordance with industry standards or supplier specifications. Submit finishes for approval when required by the project documents. The sample finishes must be approved prior to the start of production.

3.2.5 Stripping Products from Forms

Do not remove products from the forms until the concrete reaches the compressive strength for stripping required by the design. If no such requirement exists, products may be removed from the forms after the final set of concrete provided that stripping damage is minimal.

3.2.6 Patching and Repair

No repair is required to formed surfaces that are relatively free of air voids and honeycombed areas, unless the surfaces are required by the design to be finished.

3.2.6.1 Repairing Minor Defects

Defects that will not impair the functional use or expected life of a precast concrete product may be repaired by any method that does not impair the product.

3.2.6.2 Repairing Honeycombed Areas

When honeycombed areas are to be repaired, remove all loose material and cut back the areas into essentially horizontal or vertical planes to a depth at which coarse aggregate particles break under chipping rather than being dislodged. Use proprietary repair materials in accordance with the manufacturer's instructions. If a proprietary repair material is not used, saturate the area with water. Immediately prior to repair, the area should be damp, but free of excess water. Apply a cement-sand grout or an approved bonding agent to the chipped surfaces, followed immediately by consolidating an appropriate repair material into the cavity.

3.2.6.3 Repairing Major Defects

Evaluate, by qualified personnel, defects in precast concrete products which impair the functional use or the expected life of products to determine if repairs are feasible and, if so, to establish the repair procedure.

3.2.7 Shipping Products

Do not ship products until they are at least five days old, unless it can be shown that the concrete strength has reached at least 75 percent of the specified 28-day strength, or that damage will not result, impairing the performance of the product.

3.3 INSTALLATION

3.3.1 Site Access

It is the Contractor's responsibility to provide adequate access to the site to facilitate hauling, storage and proper handling of the precast concrete products.

3.3.2 General Requirements

- a. Install precast concrete products to the lines and grades shown in the contract documents or otherwise specified.
- b. Lift products by suitable lifting devices at points provided by the precast concrete producer.
- c. Install products in accordance with the precast concrete producer's instructions. In the absence of such instructions, install underground utility structures in accordance with ASTM C891. Install pipe and manhole sections in accordance with the procedures outlined by the American Concrete Pipe Association.
- d. Field modifications to the product will relieve the precast producer of liability even if such modifications result in the failure of the product.

3.3.3 Water Tightness

Where water tightness is a necessary performance characteristic of the precast concrete product's end use, watertight joints, connectors and inserts should be used to ensure the integrity of the entire system.

3.4 FIELD QUALITY CONTROL

3.4.1 Site Tests

When water tightness testing is required for an underground product, use one of the following methods:

3.4.2 Vacuum Testing

Prior to backfill vacuum test system according to ASTM C1244.

3.4.3 Water Testing

Perform water testing according to the contract documents and precast concrete producer's recommendations.

-- End of Section --

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SECTION 04 20 00

UNIT MASONRY

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 216.1 (2014) Code Requirements for Determining
Fire Resistance of Concrete and Masonry
Construction Assemblies

ACI SP-66 (2004) ACI Detailing Manual

ASTM INTERNATIONAL (ASTM)

ASTM A153/A153M (2016a) Standard Specification for Zinc
Coating (Hot-Dip) on Iron and Steel
Hardware

ASTM A167 (2011) Standard Specification for
Stainless and Heat-Resisting
Chromium-Nickel Steel Plate, Sheet, and
Strip

ASTM A615/A615M (2020) Standard Specification for Deformed
and Plain Carbon-Steel Bars for Concrete
Reinforcement

ASTM A641/A641M (2019) Standard Specification for
Zinc-Coated (Galvanized) Carbon Steel Wire

ASTM A653/A653M (2020) Standard Specification for Steel
Sheet, Zinc-Coated (Galvanized) or
Zinc-Iron Alloy-Coated (Galvannealed) by
the Hot-Dip Process

ASTM A951/A951M (2011) Standard Specification for Steel
Wire for Masonry Joint Reinforcement

ASTM A996/A996M (2016) Standard Specification for
Rail-Steel and Axle-Steel Deformed Bars
for Concrete Reinforcement

ASTM A1008/A1008M (2021a) Standard Specification for Steel,
Sheet, Cold-Rolled, Carbon, Structural,
High-Strength Low-Alloy, High-Strength
Low-Alloy with Improved Formability,
Solution Hardened, and Bake Hardenable

ASTM A1064/A1064M	(2017) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C67/C67M	(2021) Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile
ASTM C90	(2016) Standard Specification for Loadbearing Concrete Masonry Units
ASTM C129	(2017) Standard Specification for Nonloadbearing Concrete Masonry Units
ASTM C216	(2021) Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale)
ASTM C270	(2019) Standard Specification for Mortar for Unit Masonry
ASTM C476	(2020) Standard Specification for Grout for Masonry
ASTM C494/C494M	(2019) Standard Specification for Chemical Admixtures for Concrete
ASTM C641	(2017) Standard Test Method for Iron Staining Materials in Lightweight Concrete Aggregates
ASTM C652	(2021) Standard Specification for Hollow Brick (Hollow Masonry Units Made from Clay or Shale)
ASTM C780	(2020) Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
ASTM C979/C979M	(2016) Standard Specification for Pigments for Integrally Colored Concrete
ASTM C1019	(2019) Standard Test Method for Sampling and Testing Grout
ASTM C1088	(2020) Standard Specification for Thin Veneer Brick Units Made from Clay or Shale
ASTM C1314	(2014) Standard Test Method for Compressive Strength of Masonry Prisms
ASTM C1384	(2012a) Standard Specification for Admixtures for Masonry Mortars
ASTM D2000	(2018) Standard Classification System for Rubber Products in Automotive Applications
ASTM D2287	(2019) Nonrigid Vinyl Chloride Polymer and

Copolymer Molding and Extrusion Compounds

ASTM E514/E514M

(2020) Standard Test Method for Water
Penetration and Leakage Through Masonry

THE MASONRY SOCIETY (TMS)

TMS MSJC

(2016) Masonry Standard Joint Committee's
(MSJC) Book - Building Code Requirements
and Specification for Masonry Structures,
Containing TMS 402, TMS 602, and Companion
Commentaries

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Reinforcement Detail Drawings

SD-03 Product Data

Hot Weather Procedures

Cold Weather Procedures

Clay or Shale Brick; G RO

Thin Brick Veneer; G RO

Cement

Cementitious Materials

Insulation

SD-04 Samples

Mock-Up Panel; G RO

Clay or Shale Brick; G RO

Thin Brick Veneer; G RO

Concrete Masonry Units (CMU)

Admixtures for Masonry Mortar

Anchors, Ties, and Bar Positioners

Joint Reinforcement

SD-05 Design Data

Masonry Compressive Strength

Fire-Rated Concrete Masonry Units

Bracing Calculations

SD-06 Test Reports

Efflorescence Test

Field Testing of Mortar

Prism Tests

SD-07 Certificates

Special Masonry Inspector Qualifications

Clay or Shale Brick

Concrete Masonry Units (CMU)

Cementitious Materials

Admixtures for Masonry Mortar

Admixtures for Grout

Anchors, Ties, and Bar Positioners

Joint Reinforcement

SD-08 Manufacturer's Instructions

Thin Brick Veneer Applications

Admixtures for Masonry Mortar

Admixtures for Grout

SD-10 Operation and Maintenance Data

Take-Back Program

SD-11 Closeout Submittals

Recycled Content of Clay Units; S

Recycled Content of Cement; S

1.3 QUALITY ASSURANCE

1.3.1 Masonry Mock-Up Panels

1.3.1.1 Mock-Up Panel Location

After material samples are approved and prior to starting masonry work, construct a mock-up panel for each type and color of masonry required. At

least 48 hours prior to constructing the panel or panels, submit written notification to the Contracting Officer. Do not build-in mock-up panels as part of the structure; locate mock-up panels where directed. Construct portable mock-up panels or locate in an area where they will not be disrupted during construction.

1.3.1.2 Mock-Up Panel Configuration

Construct mock-up panels L-shaped or otherwise configured to represent all of the wall elements. Construct panels of the size necessary to demonstrate the acceptable level of workmanship for each type of masonry represented on the project. Provide a straight panel or a leg of an L-shaped panel of minimum size 8 feet long by 6 feet high.

1.3.1.3 Mock-Up Panel Composition

Show full color range, texture, and bond pattern of the masonry work. Demonstrate mortar joint tooling; grouting of reinforced vertical cores, collar joints, bond beams, and lintels; positioning, securing, and lapping of reinforcing steel; positioning and lapping of joint reinforcement (including prefabricated corners); and cleaning of masonry work during the construction of the panels. Also include installation or application procedures for anchors, wall ties, CMU control joints, brick expansion joints, insulation, flashing, brick soldier, row lock courses and weeps. When the panel represents reinforced masonry, include a 2 by 2 foot opening placed at least 2 feet above the panel base and 2 feet away from all free edges, corners, and control joints. Provide required reinforcing around this opening as well as at wall corners and control joints.

1.3.1.4 Mock-Up Panel Construction Method

Where anchored veneer walls or cavity walls are required, demonstrate and receive approval for the method of construction; i.e., either bring up the two wythes together or separately, with the insulation and appropriate ties placed within the specified tolerances across the cavity. Demonstrate provisions to preclude mortar or grout droppings in the cavity and to provide a clear open air space of the dimensions shown on the drawings. Where masonry is to be grouted, demonstrate and receive approval on the method that will be used to bring up the masonry wythes; support the reinforcing bars; and grout cells, bond beams, lintels, and collar joints using the requirements specified herein. When water-repellent is specified to be applied to the masonry, apply the approved product to the mock-up panel. Construct panels on a properly designed concrete foundation.

1.3.1.5 Mock-Up Panel Purpose

The completed panels is used as the standard of workmanship for the type of masonry represented. Do not commence masonry work until the mock-up panel for that type of masonry construction has been completed and approved. Protect panels from the weather and construction operations until the masonry work has been completed and approved. Perform cleaning procedures on the mockup and obtain approval of the Contracting Officer prior to cleaning the building. After completion of the work, completely remove the mock-up panels, including all foundation concrete, from the construction site.

1.3.2 Special Masonry Inspector Qualifications

Refer to Section 01 45 35 SPECIAL INSPECTIONS for qualifications and responsibilities of the masonry special inspector.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver, store, handle, and protect material to avoid chipping, breakage, and contact with soil or contaminating material. Store and prepare materials in already disturbed areas to minimize project site disturbance and size of project site.

1.4.1 Masonry Units

Cover and protect masonry units from precipitation. Conform to handling and storage requirements of TMS MSJC.

- a. Pack brick and prefaced concrete masonry units in the manufacturer's standard paper cartons, trays, or shrink wrapped pallets with a divider between each unit. Do not stack pallets. Do not remove units from cartons until cartons are placed on scaffolds or in the location where units are to be laid.
- b. Mark prefabricated lintels on top sides to show either the lintel schedule number or the number and size of top and bottom bars.

1.4.2 Reinforcement, Anchors, and Ties

Store steel reinforcing bars, coated anchors, ties, and joint reinforcement above the ground. Maintain steel reinforcing bars and uncoated ties free of loose mill scale and loose rust.

1.4.3 Cementitious Materials, Sand and Aggregates

Deliver cementitious and other packaged materials in unopened containers, plainly marked and labeled with manufacturers' names and brands. Store cementitious material in dry, weathertight enclosures or completely cover. Handle cementitious materials in a manner that will prevent the inclusion of foreign materials and damage by water or dampness. Store sand and aggregates in a manner to prevent contamination and segregation.

1.5 PROJECT/SITE CONDITIONS

Conform to TMS MSJC for hot and cold weather masonry erection.

1.5.1 Hot Weather Procedures

When ambient air temperature exceeds 100 degrees F, or exceeds 90 degrees F and the wind velocity is greater than 8 mph, comply with TMS MSJC Article 1.8 D for: Preparation prior to conducting masonry work; construction while masonry work is in progress; and protection for newly completed masonry.

1.5.2 Cold Weather Procedures

When ambient temperature is below 40 degrees F, comply with TMS MSJC Article 1.8 C for: preparation prior to conducting masonry work; construction while masonry work is in progress; and protection for newly completed masonry.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

2.1.1 Design - Specified Compressive Strength of Masonry

The specified compressive strength of masonry, $f'm$, is as indicated in structural drawings.

2.1.2 Performance - Verify Masonry Compressive Strength

Verify specified compressive strength of masonry using the "Prism Test Method" of TMS MSJC when the "Unit Strength Method" cannot be used. Submit test results.

2.2 MANUFACTURED UNITS

2.2.1 General Requirements

Do not change the source of materials, which will affect the appearance of the finished work, after the work has started except with Contracting Officer's approval. Submit test reports from an approved independent laboratory. Certify test reports on a previously tested material as the same materials as that proposed for use in this project. Submit certificates of compliance stating that the materials meet the specified requirements.

2.2.2 Clay or Shale Brick

2.2.2.1 General

2.2.2.1.1 Sample Submittal

Submit brick samples as specified, showing the color range and texture of clay or shale brick. Limit units used on the project to those that conform to the approved sample. Submit sample of colored mortar with applicable masonry unit and color samples of three stretcher units and one unit for each type of special shape. Brick finish must be as indicated in the drawings. Match color Pantone 8022 or equivalent per the base installation guidelines and must be submitted for prior approval.

2.2.2.1.2 Uniformity

Manufacture bricks at one time and from the same run. Deliver clay or shale brick units factory-blended to provide a uniform appearance and color range in the completed wall.

2.2.2.1.3 Recycled Content

Provide clay units containing a minimum of 5 percent post-consumer recycled content, and a minimum of 20 percent post-industrial recycled content.

2.2.2.1.4 Efflorescence Test

Test clay brick that will be exposed to weathering for efflorescence in accordance with ASTM C67/C67M. Schedule tests far enough in advance of starting masonry work to permit retesting if necessary. Units meeting the

definition of "effloresced" are subject to rejection.

2.2.2.2 Solid Clay or Shale Brick

Provide solid clay or shale brick that conforms to ASTM C216, Type FBX. Where brick cores, recesses, or deformation would be exposed to view, provide 100 percent solid units. Provide brick with texture and color tinge to match the brick as indicated on drawings.

Provide brick with specified sizes.

- a. Modular size, 3-5/8 inches thick, 2-1/4 inches high, and 7-5/8 inches long.

2.2.2.3 Hollow Clay or Shale Brick

Provide hollow clay or shale brick that conforms to ASTM C652, Type HBX.

- a. Provide brick size of 3-5/8 inches thick, 2-1/4 inches high, and 7-5/8 inches long.

2.2.2.4 Thin Brick Veneer

Thin brick must comply with ASTM C1088, Standard Specification for Thin Veneer Brick Units Made from Clay or Shale.

Adhere thin brick veneer using a thin set method, in which the thin brick is adhered directly to the substrate by a thin layer of adhesive or modified mortar no more than 1/8 inch thick. Masonry surface must be bondable and variation from plane must be no more than 1/4 inch in 10 feet.

Install movement joints at the spacing and construction recommended by the manufacturer.

Submit thin brick sample in the finish indicated on the drawings, along with the grout color indicated in the drawings. Brick finish must match Pantone 8022 or equivalent per the base installation guidelines and must be submitted for prior approval.

2.2.2.4.1 Materials

Provide thin brick veneer finish as indicated on the drawings. Thick brick units must be 3-5/8 inch wide, by 7-5/8 inch long, by 5/8 inch thick.

Mortar and modified mortar used for scratch and bond coats should comply with ASTM C270, Specification for Mortar for Unit Masonry, Type S, with or without a latex or polymer modifier specifically designed for use with thin veneer. Mortar used to fill joints may have a higher water content as required by installation method.

Flashing materials should be corrosion resistant, waterproof, durable and sufficiently tough and flexible so as to resist puncture and cracking. Flashing should also be compatible with other materials in the veneer assembly, such as adhesives and sealants. Weep screeds or flashing used at the base of the wall must be a minimum 0.019 inch or 26-gauge galvanized or plastic with a minimum vertical attachment flange of 3-1/2 inch. Asphalt-impregnated felt, building paper and house/building wraps are not acceptable for use as flashing.

2.2.2.4.2 Installation

Installation of mortar in thin brick veneer applications should be scheduled when temperatures will be between 40 degrees F and 90 degrees F. Otherwise, cold or hot weather construction measures must be employed.

2.2.2.4.2.1 Substrate and Surface Preparation

Where thin brick units are installed on site, proper construction and preparation of the substrate to receive them is critical. Surfaces receiving thin brick should be structurally sound and free of loose or deleterious debris or residue, including algae, mold, dust, laitance, paste, wallpaper or laminate. Remove all substances that could potentially impede the bonding of the veneer. Such substances include oils, greases, waxes, bond-release agents, sealers, solvents, paints or other coatings or surface preparations. If a substrate surface is wet, then the water source must be identified and eliminated. Surfaces on which thin brick are placed must not vary from plane by more than 1/4 inch in 10 feet. Taping sheathing joints or fastening sheathing edges with plywood clips can sometimes reduce unevenness. If a surface does not comply with surface tolerances, then a leveling coat must be applied before proceeding. Allow masonry and concrete substrates to cure for 28 days prior to installation of thin brick veneer.

2.2.2.4.2.2 Thin Set Method

Apply adhesive or modified mortar according to manufacturers instructions and recommendations. Each thin brick must be firmly pressed or rapped into place to maintain proper spacing and alignment of the joints and bond pattern, and avoid improper performance. Set brick according to manufacturer instructions and recommendations.

Fill mortar joints according to manufacturer's recommendations.

2.2.3 Concrete Units

2.2.3.1 Aggregates

Test lightweight aggregates, and blends of lightweight and heavier aggregates in proportions used in producing the units, for stain-producing iron compounds in accordance with ASTM C641, visual classification method. Do not incorporate aggregates for which the iron stain deposited on the filter paper exceeds the "light stain" classification.

Use industrial waste by-products (air-cooled slag, cinders, or bottom ash), ground waste glass and concrete, granulated slag, and expanded slag in aggregates.

2.2.3.2 Concrete Masonry Units (CMU)

2.2.3.2.1 Cement

Use only cement that has a low alkali content and is of one brand.

2.2.3.2.2 Recycled Content

Provide units with a minimum of 10 percent post-consumer recycled content, or a minimum of 40 percent post-industrial recycled content, based on mass, cost, or volume. Units may contain post-consumer or post-industrial

recycled content.

2.2.3.2.3 Size

Provide units with specified dimension of 8 inches wide, 8 inches high, and 16 inches long.

2.2.3.2.4 Weather Exposure

Provide concrete masonry units with water-repellant admixture added during manufacture where units will be exposed to weather.

2.2.3.2.5 Unit Types

- a. Hollow Load-Bearing Units: ASTM C90, lightweight. Provide load-bearing units for exterior walls, foundation walls, load-bearing walls, and shear walls.
- b. Hollow Non-Load-Bearing Units: ASTM C129, lightweight. Load-bearing units may be provided in lieu of non-load-bearing units.
- c. Solid Load-Bearing Units: ASTM C90, lightweight units. Provide solid units as indicated.

2.2.3.2.6 Jamb Units

Provide jamb units of the shapes and sizes to conform with wall units. Solid units may be incorporated in the masonry work where necessary to fill out at corners, gable slopes, and elsewhere as approved.

Provide sash jamb units with a 3/4 by 3/4 inch groove near the center at end of each unit.

2.2.3.3 Fire-Rated Concrete Masonry Units

For indicated fire-rated construction, provide concrete masonry units of minimum equivalent thickness for the fire rating indicated and the corresponding type of aggregates indicated in TABLE I. Units containing more than one of the aggregates listed in TABLE I will be rated by linear interpolation based on the percent by dry-rodded volume of each aggregate used in manufacturing the units.

TABLE I FIRE-RATED CONCRETE MASONRY UNITS							
Aggregate Type	Minimum Equivalent Thickness for Fire-Resistance Rating, inch						
	1/2 hour	3/4 hour	1 hour	1-1/2 hour	2 hours	3 hours	4 hours
Calcareous or siliceous gravel (other than limestone)	2.0	2.4	2.8	3.6	4.2	5.3	6.2
Limestone, cinders, or air-cooled slag	1.9	2.3	2.7	3.4	4.0	5.0	5.9

TABLE I FIRE-RATED CONCRETE MASONRY UNITS							
Aggregate Type	Minimum Equivalent Thickness for Fire-Resistance Rating, inch						
Expanded clay, expanded shale, or expanded slate	1.8	2.2	2.6	3.3	3.6	4.4	5.1
Expanded slag or pumice	1.5	1.9	2.1	2.7	3.2	4.0	4.7

Determine equivalent thickness in accordance with ACI 216.1. Where walls are to receive plaster or be faced with brick, or otherwise form an assembly; include the thickness of plaster or brick or other material in the assembly in determining the equivalent thickness. Submit calculation results.

2.3 EQUIPMENT

2.3.1 Vibrators

Maintain at least one spare vibrator on site at all times.

2.3.2 Grout Pumps

Pumping through aluminum tubes is not permitted.

2.4 MATERIALS

2.4.1 Mortar Materials

2.4.1.1 Colored Mortar

Use mortar pigment that conforms to ASTM C979/C979M. Add pigment to mortar to produce a uniform color matching grout color indicated in drawings. Furnish pigments in accurately pre-measured and packaged units that can be added to a measured amount of cementitious materials or supply pigments via preblended cementitious materials or dry mortar mix.

- In masonry cement or mortar cement, do not exceed 5 percent of cement weight for mineral oxide pigment; do not exceed 1 percent of cement weight for carbon black pigment.
- In cement-lime mortar mix, do not exceed 10 percent of cementitious materials' weight for mineral oxide pigment; do not exceed 2 percent of cementitious materials' weight for carbon black pigment.

2.4.1.2 Admixtures for Masonry Mortar

In cold weather, use a non-chloride based accelerating admixture that conforms to ASTM C1384, unless Type III Portland cement is used in the mortar.

In showers and kitchens, use mortar that contains a water-repellent admixture that conforms to ASTM C1384. Provide a water-repellent admixture, conforming to ASTM C1384 and of the same brand and manufacturer as the block's integral water-repellent, in the mortar used to place

concrete masonry units that have an integral water-repellent admixture.

2.4.1.3 Aggregate and Water

Provide aggregate (sand) and water that conform to materials permitted by ASTM C270.

2.4.2 Grout and Ready-Mix Grout Materials

2.4.2.1 Cementitious Materials for Grout

Provide cementitious materials that conform to those permitted by ASTM C476.

2.4.2.2 Admixtures for Grout

Water-reducing admixtures that conform to ASTM C494/C494M Type F or G and viscosity-modifying admixtures that conform to ASTM C494/C494M Type S are permitted for use in grout. Other admixtures require approval by the Contracting Officer.

In cold weather, a non-chloride based accelerating admixture may be used subject to approval by the Contracting Officer; use accelerating admixture that is non-corrosive and conforms to ASTM C494/C494M, Type C.

2.4.2.3 Aggregate and Water

Provide fine and coarse aggregates and water that conform to materials permitted by ASTM C476.

2.5 MORTAR AND GROUT MIXES

2.5.1 Mortar Mix

- a. Provide mortar Type S unless specified otherwise herein.
- b. For preblended mortar, follow manufacturer's mixing instructions.

2.5.2 Grout and Ready Mix Grout Mix

Use grout that conforms to ASTM C476, fine. Use conventional grout with a slump between 8 and 11 inches. Use self-consolidating grout with slump flow of 24 to 30 inches and a visual stability index (VSI) not greater than 1. Provide minimum grout strength of 2,000 psi in 28 days, as tested in accordance with ASTM C1019. Do not change proportions and do not use materials with different physical or chemical characteristics in grout for the work unless additional evidence is furnished that grout meets the specified requirements. Use ready-mixed grout that conforms to ASTM C476.

2.6 ACCESSORIES

2.6.1 Grout Barriers

Grout barriers for vertical cores that consist of fine mesh wire, fiberglass, or expanded metal.

2.6.2 Anchors, Ties, and Bar Positioners

2.6.2.1 General

- a. Fabricate anchors and ties without drips or crimps. Size anchors and ties to provide a minimum of 5/8 inch mortar cover from each face of masonry.
- b. Fabricate steel wire anchors and ties shall from wire conforming to ASTM A1064/A1064M and hot-dip galvanize in accordance with ASTM A153/A153M.
- c. Fabricate joint reinforcement in conformance with ASTM A951/A951M. Hot dip galvanize joint reinforcement in exterior walls and in interior walls exposed to moist environment in conformance with ASTM A153/A153M. Galvanize joint reinforcement in other interior walls in conformance with ASTM A641/A641M; coordinate with paragraph JOINT REINFORCEMENT below.
- d. Fabricate sheet metal anchors and ties in conformance with ASTM A1008/A1008M. Hot dip galvanize sheet metal anchors and ties in exterior walls and in interior walls exposed to moist environment in compliance with ASTM A153/A153M Class B. Galvanize sheet metal anchors and ties in other interior walls in compliance with ASTM A653/A653M, Coating Designation G90.
- e. Submit two anchors, ties and bar positioners of each type used, as samples.

2.6.2.2 Wall Ties for Multi-Wythe Masonry Construction

Provide rectangular-shaped wall ties, fabricated of hot-dipped galvanized W2.8 diameter steel wire. Provide rectangular wall ties no less than 4 inches wide.

Provide adjustable type wall ties, if approved for use, that consist of two essentially U-shaped elements fabricated of minimum W2.8 diameter steel wire or pintle type ties that are inserted to eyes of horizontal joint reinforcement, hot-dip galvanized. Provide adjustable ties with double pintle legs and allows a maximum offset of 1-1/4 inch between each element of the tie and maximum distance between connecting parts no more than 1/16 inch. Form the pintle and eye elements shall be formed so that both can be in the same plane. Wall ties may also be of a continuous type conforming to paragraph JOINT REINFORCEMENT.

2.6.2.3 Dovetail Anchors

Provide dovetail anchors of 3/16 inch diameter steel wire, triangular shaped, and attached to a 12 gauge or heavier steel dovetail section. Use these anchors to connect the exterior masonry wythe as it passes over the face of concrete columns, beams, or walls. Fill cells immediately above and below these anchors unless solid units are used. Furnish dovetail slots, which are specified to be installed by others, in accordance with Section 03 30 00 CAST-IN-PLACE CONCRETE.

2.6.2.4 Adjustable Anchors

2.6.2.4.1 Anchorage to Structural Steel

Provide hot-dip galvanized adjustable anchors for connecting masonry walls to the structural steel frame that have capacity in both tension and compression for the span indicated in structural drawings. Wall ties shall be provided such that there is at least one anchor for each 1.87 square feet of wall area and spaced no more than 18 inches center to center, horizontally and vertically.

2.6.2.4.2 Anchorage of Veneer to Light Gauge Steel or Concrete Backing

Use one of the following types of adjustable anchors to connect veneer to light gauge steel or concrete backing:

- a. Sheet metal at least 7/8 inch wide, 0.06 inch thick, and with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch or bent, notched or punched to provide equivalent performance;
- b. Wire anchors of minimum size W1.7 with ends bent to form a minimum 2 inches extension and without drips;
- c. Or wire pintle anchors used in conjunction with joint reinforcement.

Do not exceed 1/16 inch clearance between connecting parts of the tie. Assemble adjustable anchors to prevent disengagement. Provide pintle anchors with one or more pintle legs of wire size W2.8 and an offset not exceeding 1-1/4 inch.

2.6.2.5 Veneer Anchor Screws

Provide screws for attachment of veneer anchors to cold-formed steel framing members of size as required by design to provide the needed pullout load capacity but not less than No. 12. Provide length of screws such that the screws penetrate the holding member by not less than 5/8 inch.

2.6.2.6 Bar Positioners

Factory-fabricate bar positioners, used to prevent displacement of reinforcing bars during the course of construction, from 9 gauge steel wire or equivalent, and hot-dip galvanized. Bar positioners must be suitable for intended use and be corrosion resistant steel. Bar positioners not fully contained within the wythe must be hot-dip galvanized.

2.6.3 Joint Reinforcement

Factory fabricate joint reinforcement in conformance with ASTM A951/A951M, welded construction. Provide ladder type joint reinforcement, having one longitudinal wire in the mortar bed of each face shell for hollow units and one wire for solid units and with all wires a minimum of 9 gauge. Size joint reinforcement to provide a minimum of 5/8 inch cover from each face. Space crosswires not more than 16 inches. Provide joint reinforcement for straight runs in flat sections not less than 10 feet long. Provide joint reinforcement with factory formed corners and intersections. If approved for use, joint reinforcement may be furnished with adjustable wall tie features. Submit one piece of each type used,

including corner and wall intersection pieces, showing at least two cross wires.

2.6.4 Reinforcing Steel Bars

Reinforcing steel bars and rods shall conform to ASTM A615/A615M or ASTM A996/A996M, Grade 60.

2.6.5 Concrete Masonry Control Joint Keys

Provide control joint keys of a factory fabricated solid section of natural or synthetic rubber (or combination thereof) conforming to ASTM D2000 M2AA-805 with a minimum durometer hardness of 80 or polyvinyl chloride conforming to ASTM D2287 Type PVC 654-4 with a minimum durometer hardness of 85. Form the control joint key with a solid shear section not less than 5/8 inch thick and 3/8 inch thick flanges, with a tolerance of plus or minus 1/16 inch, to fit neatly, but without forcing, in masonry unit jamb sash grooves.

2.6.6 Clay Masonry Expansion-Joint Materials

Provide backer rod and sealant, adequate to accommodate joint compression and extension equal to 50 percent of the width of the joint. Provide the backer rod of compressible rod stock of closed cell polyethylene foam, polyurethane foam, butyl rubber foam, or other flexible, nonabsorptive material as recommended by the sealant manufacturer. Provide sealant in conformance with Section 07 92 00 JOINT SEALANTS.

Submit one piece of each type of material used.

2.6.7 Through Wall Flashing and Weeps

2.6.7.1 General

Provide stainless steel sheet, self-adhesive rubberized sheet, or reinforced membrane sheet flashing except that flashing indicated to terminate in reglets shall be metal or coated-metal flashing and except that the material shall be one which is not adversely affected by dampproofing material.

2.6.7.2 Stainless Steel Flashing

Provide stainless steel, ASTM A167, Type 304 or 316, 0.015 inch thick, No. 2D finish.

2.6.7.3 Reinforced Membrane Flashing

Provide polyester film core with a reinforcing fiberglass scrim bonded to one side. Provide membrane that is impervious to moisture, flexible, is not affected by caustic alkalis, and after being exposed for not less than 1/2 hour to a temperature of 32 degrees F, shows no cracking when, at that temperature, it is bent 180 degrees over a 1/16 inch diameter mandrel and then bent at the same point over the same size mandrel in the opposite direction 360 degrees.

2.6.7.4 Rubberized Flashing

Provide self-adhesive rubberized asphalt sheet flashing consisting of 32-mil thick pliable and highly adhesive rubberized asphalt compound

bonded completely and integrally to 8-mil thick, high density, cross-laminated polyethylene film to produce an overall thickness of 40 mils. Provide rubberized, asphalt-based mastic and surface conditioner that are each approved by flashing manufacturer for use with flashing material.

2.6.7.5 Weep Ventilators

Provide weep ventilators that are prefabricated from stainless steel or plastic. Provide inserts with grill or louver-type openings designed to allow the passage of moisture from cavities and to prevent the entrance of insects, and with a rectangular closure strip to prevent mortar droppings from clogging the opening. Provide ventilators with compressible flanges to fit in a standard 3/8 inch wide mortar joint and with height equal to the nominal height of the unit.

2.6.7.6 Single-Wythe Exterior Wall CMU Flashing System

In single-wythe exterior CMU walls, provide a system of CMU cell flashing pans and interlocking CMU web covers made from UV-resistant, high-density polyethylene. For exterior CMU walls, provide a flashing/weep system in open cores that do not receive grout. Cell flashing pans are to have integral weep spouts built into mortar bed joints that extend into the cell to prevent clogging with mortar.

2.6.7.7 Metal Drip Edge

Provide stainless steel drip edge, 15-mil thick, hemmed edges, with down-turned drip at the outside edge and upturned dam at the inside edge for use with membrane flashings.

2.6.8 Rigid Board-Type Insulation

Provide rigid board-type insulation as specified in Section 07 21 13 BOARD AND BLOCK INSULATION.

PART 3 EXECUTION

3.1 EXAMINATION

Prior to start of work, verify the applicable conditions as set forth in TMS MSJC, inspection.

3.2 PREPARATION

3.2.1 Stains

Protect exposed surfaces from mortar and other stains. When mortar joints are tooled, remove mortar from exposed surfaces with fiber brushes and wooden paddles. Protect base of walls from splash stains by covering adjacent ground with sand, sawdust, or polyethylene.

3.2.2 Loads

Do not apply uniform loads for at least 12 hours or concentrated loads for at least 72 hours after masonry is constructed. Provide temporary bracing as required.

3.2.3 Concrete Surfaces

Where masonry is to be placed, clean concrete of laitance, dust, dirt, oil, organic matter, or other foreign materials and slightly roughen to provide a surface texture with a depth of at least 1/8 inch. Sandblast, if necessary, to remove laitance from pores and to expose the aggregate.

3.2.4 Shelf Angles

Adjust shelf angles as required to keep the masonry level and at the proper elevation.

3.2.5 Bracing

Provide bracing and scaffolding necessary for masonry work. Design bracing to resist wind pressure as required by OSHA and local codes and submit bracing calculations, sealed by a registered professional engineer. Do not remove bracing in less than 10 days.

3.3 ERECTION

3.3.1 General

- a. Coordinate masonry work with the work of other trades to accommodate built-in items and to avoid cutting and patching. Lay masonry units in the indicated bond pattern. Lay facing courses level with back-up courses, unless the use of adjustable ties has been approved in which case the tolerances is plus or minus 1/2 inch. Adjust each unit to its final position while mortar is still soft and has plastic consistency.
- b. Remove and clean units that have been disturbed after the mortar has stiffened, and relay with fresh mortar. Keep air spaces, cavities, chases, expansion joints, and spaces to be grouted free from mortar and other debris. Select units to be used in exposed masonry surfaces from those having the least amount of chipped edges or other imperfections detracting from the appearance of the finished work.
- c. When necessary to temporarily discontinue the work, step (rack) back the masonry for joining when work resumes. Toothing may be used only when specifically approved by the Contracting Officer. Before resuming work, remove loose mortar and thoroughly clean the exposed joint. Cover the top of walls subjected to rain or snow with nonstaining waterproof covering or membrane when work is not in process. Extend the covering a minimum of 2 feet down on each side of the wall and hold securely in place.
- d. Ensure that units being laid and surfaces to receive units are free of water film and frost. Lay solid units in a nonfurrowed full bed of mortar. Bevel mortar for veneer wythes and slope down toward the cavity side. Shove units into place so that the vertical joints are tight. Completely fill vertical joints between solid units with mortar, except where indicated at control, expansion, and isolation joints. Place hollow units so that mortar extends to the depth of the face shell at heads and beds, unless otherwise indicated. Mortar will be permitted to protrude up to 1/2 inch into the space or cells to be grouted. Provide means to prevent mortar from dropping into the space below or clean grout spaces prior to grouting.

- e. In multi-wythe construction with collar joints no more than 3/4 inch wide, bring up the inner wythe not more than 16 inches ahead of the outer wythe. Fill collar joints with mortar during the laying of the facing wythe, and filling shall not lag the laying of the facing wythe by back-buttering each unit as it is laid.

3.3.1.1 Jointing

Tool mortar joints when the mortar is thumbprint hard. Tool horizontal joints after tooling vertical joints. Brush mortar joints to remove loose and excess mortar.

3.3.1.1.1 Tooled Joints

Tool mortar joints in exposed exterior and interior masonry surfaces concave, using a jointer that is slightly larger than the joint width so that complete contact is made along the edges of the unit. Perform tooling so that the mortar is compressed and the joint surface is sealed. Use a jointer of sufficient length to obtain a straight and true mortar joint. No exterior joints are to be left un-tooled.

3.3.1.1.2 Flush Joints

Flush cut mortar joints in concealed masonry surfaces and joints at electrical outlet boxes in wet areas. Finish flush cut joints by cutting off the mortar flush with the face of the wall. Point joints in unparged masonry walls below grade tight. For architectural units, such as fluted units, completely fill both the head and bed joints and flush cut.

3.3.1.1.3 Door and Window Frame Joints

On the exposed interior side of exterior frames, joints between frames and abutting masonry walls shall be raked to a depth of 3/8 inch. On the exterior side of exterior frames, joints between frames and abutting masonry walls shall be raked to a depth of 3/8 inch.

3.3.1.1.4 Joint Widths

- a. Construct brick masonry with mortar joint widths equal to the difference between the specified and nominal dimensions of the unit, within tolerances permitted by TMS MSJC.
- b. Provide 3/8 inch wide mortar joints in concrete masonry, except for prefaced concrete masonry units.
- c. Provide 3/8 inch wide mortar joints on unfaced side of prefaced concrete masonry units and not less than 3/16 inch nor more than 1/4 inch wide on prefaced side.
- d. Maintain mortar joint widths within tolerances permitted by TMS MSJC

3.3.1.2 Cutting and Fitting

Use full units of the proper size wherever possible, in lieu of cut units. Locate cut units where they would have the least impact on the architectural aesthetic goals of the facility. Perform cutting and fitting, including that required to accommodate the work of others, by masonry mechanics using power masonry saws. Concrete masonry units may be wet or dry cut. Before being placed in the work, dry wet-cut units to the

same surface-dry appearance as uncut units being laid in the wall. Provide cut edges that are clean, true and sharp.

- a. Carefully make openings in the masonry so that wall plates, cover plates or escutcheons required by the installation will completely conceal the openings and will have bottoms parallel with the masonry bed joints. Provide reinforced masonry lintels above openings over 12 inches wide for pipes, ducts, cable trays, and other wall penetrations, unless steel sleeves are used.
- b. Do not reduce masonry units in size by more than one-third in height and one-half in length. Do not locate cut products at ends of walls, corners, and other openings.

3.3.1.3 Unfinished Work

Rack back unfinished work for joining with new work. Tooothing may be resorted to only when specifically approved by the Contracting Officer. Remove loose mortar and thoroughly clean the exposed joints before laying new work.

3.3.1.4 Clay Masonry Expansion Joints

Provide clay masonry expansion joints as indicated. Construct by filling with a compressible foam pad. Ensure that no mortar or other noncompressible materials are within the joint. Install backer rod and sealant in accordance with Section 07 92 00 JOINT SEALANTS.

3.3.1.5 Control Joints

Provide control joints in concrete masonry as indicated. Construct in accordance with the details shown on the Drawings. Form a continuous vertical joint at control joint locations, including through bond beams, by utilizing half blocks in alternating courses on each side of the joint. Interrupt the control joint key in courses containing continuous bond beam reinforcement.

Where mortar was placed in the joint, rake both faces of the control joints to a depth of 3/4 inch. Install backer rod and sealant on both faces in accordance with Section 07 92 00 JOINT SEALANTS.

3.3.2 Clay or Shale Brick Masonry

3.3.2.1 Brick Placement

Blend all brick at the job site from several cubes to produce a uniform appearance when installed. An observable "banding" or "layering" of colors or textures caused by improperly mixed brick is unacceptable. Lay brick facing with the better face exposed. Lay brick in running bond with each course bonded at corners, unless otherwise indicated. Lay molded brick with the frog side down. Do not lay brick that is cored, recessed, or has other deformations in a manner that allows those deformations to be exposed to view; lay 100 percent solid units in these areas. Completely fill head and bed joints of solid units with mortar. Lay hollow units with mortar joints as specified for concrete masonry units.

3.3.2.2 Wetting of Units

Wetting of clay, shale brick, or hollow brick units having an initial rate

of absorption of more than 1 gram per minute per square inch of bed surface shall be in conformance with ASTM C67/C67M. Ensure that each unit is nearly saturated when wetted but surface dry when laid.

Test clay or shale brick daily on the job, prior to laying, as follows: Using a wax pencil, draw a circle the size of a quarter on five randomly selected bricks. Apply 20 drops of water with a medicine dropper to the surface within the circle on each brick. If the average time that the water is completely absorbed in the five bricks is less than 1-1/2 minutes, wet bricks represented by the five bricks tested.

3.3.2.3 Partitions

- a. Construct partitions continuous from floor to underside of floor or roof deck where shown. Fill openings in firewalls around joists and other structural members as indicated or approved. Where suspended ceilings on both sides of partitions are indicated, the partitions other than those shown to be continuous may be stopped approximately 4 inches above the ceiling level. Construct an isolation joint in the intersection between partitions and structural or exterior walls.

3.3.3 Anchored Veneer Construction

- a. Construct exterior masonry wythes to the thickness indicated on the drawings. Provide a minimum air space as indicated in the drawings behind the masonry veneer. Provide means to ensure that the cavity space and flashings are kept clean of mortar droppings and other loose debris. Maintain chases and raked-out joints free from mortar and debris.
- b. Place masonry in running bond pattern.
- c. For veneer over stud framing, do not install veneer until the exterior sheathing, moisture barrier, veneer anchors and flashing have been installed on the backing. Take extreme care to avoid damage to the moisture barrier and flashing during construction of the masonry veneer. Repair or replace portions of the moisture barrier and flashing that are damaged prior to completion of the veneer. Provide a continuous cavity as indicated.
- d. For veneer with a masonry backup wythe, lay up both the inner and the outer wythes together except when adjustable joint reinforcement assemblies are approved for use. When both wythes are not brought up together, install through-wall flashings with the exterior wythe, securing the top edge of the flashing with a termination bar and sealant, or protect flashings that are installed with the interior wythe from damage until they are fully enclosed in the wall.
- e. Provide anchors (ties) to connect the veneer to its backing in sufficient quantity to comply with the following requirements: maximum wall area per anchor {tie} of 1.87 square feet, and maximum vertical spacing of 18 inches on center, and maximum horizontal spacing of 18 inches on center. Provide additional anchors around openings larger than 16 inch in either direction. Space anchors around perimeter of opening at a maximum of 24 inches on center. Place anchors within 12 inches of openings. Anchors with drips are not permitted.
- f. With solid units, embed anchors in mortar joint and extend into the veneer a minimum of 1-1/2 inch, with at least 5/8 inch mortar cover to

the outside face.

- g. With hollow units, embed anchors in mortar or grout and extend into the veneer a minimum of 1-1/2 inch, with at least 5/8 inch mortar or grout cover to outside face.

3.3.4 Cavity Walls (Multi-Wythe Noncomposite Walls)

Provide a continuous cavity as indicated. Bevel mortar beds away from cavity to prevent projection into cavity when bricks are shoved in place. Keep cavities clear and clean of mortar droppings. At the bottom of cavity walls, in the course immediately above the through-wall flashing, temporarily omit one brick every 4 feet. Clean mortar droppings and debris out of the cavity through the temporary openings at least once each day masonry is laid, and more often when required to keep the cavities clean. Fill in the openings with bricks and mortar after the wall is complete and the cavity has been inspected and found clean.

Securely tie the two wythes together with horizontal joint reinforcement, or provide ties to connect the masonry wythes in sufficient quantity to comply with the following requirements: Maximum wall area per tie of 1.87 square feet, and maximum vertical spacing of 18 inches on center, and maximum horizontal spacing of 18 inches on center. Provide additional ties around openings larger than 16 inches in either direction. Space ties around perimeter of opening at a maximum of 3 feet on center. Place ties within 12 inches of openings. Ties with drips are not permitted.

3.3.5 ANCHORAGE

3.3.5.1 Anchorage to Concrete

Anchorage of masonry to the face of concrete columns, beams, or walls shall be with dovetail anchors spaced not over 16 inches on centers vertically and 24 inches on center horizontally.

3.3.5.2 Anchorage to Structural Steel

Masonry shall be anchored to vertical structural steel framing with adjustable steel wire anchors spaced not over 16 inches on centers vertically, and if applicable, not over 24 inches on centers horizontally.

3.3.5.3 Anchorage at Intersecting Walls

Provide wire mesh anchors at maximum 16 inches spacing at intersections of interior non-bearing masonry walls.

Anchor structural masonry walls as indicated in structural drawings.

3.3.6 Lintels

3.3.6.1 Masonry Lintels

Construct masonry lintels with lintel units filled solid with grout in all courses and reinforced with a minimum of two No. 4 bars in the bottom course unless otherwise indicated. Extend lintel reinforcement beyond each side of masonry opening 40 bar diameters or 24 inches, whichever is greater. Support reinforcing bars in place prior to grouting and locate 1/2 inch above the bottom inside surface of the lintel unit.

3.3.6.2 Precast Concrete and Steel Lintels

Provide precast concrete and steel lintels as shown on the Drawings. Set lintels in a full bed of mortar with faces plumb and true. Provide steel and precast lintels with a minimum bearing length of 8 inches unless otherwise indicated. In partially grouted masonry, provide fully grouted units under the full lintel bearing length, unless otherwise indicated.

3.4 INSTALLATION

3.4.1 Bar Reinforcement Installation

3.4.1.1 Preparation

Submit detail drawings showing bar splice locations. Identify bent bars on a bending diagram and reference and locate such bars on the drawings. Show wall dimensions, bar clearances, and wall openings. Utilize bending details that conform to the requirements of ACI SP-66. No approval will be given to the shop drawings until the Contractor certifies that all openings, including those for mechanical and electrical service, are shown. If, during construction, additional masonry openings are required, resubmit the approved shop drawings with the additional openings shown along with the proposed changes. Clearly highlight location of these additional openings. Provide wall elevation drawings with minimum scale of 1/4 inch per foot. Submit drawings including plans, elevations, and details of wall reinforcement; details of reinforcing bars at corners and wall intersections; offsets; tops, bottoms, and ends of walls; control and expansion joints; lintels; and wall openings.

Clean reinforcement of loose, flaky rust, scale, grease, mortar, grout, and other coatings that might destroy or reduce its bond prior to placing grout. Do not use bars with kinks or bends not shown on the approved shop drawings. Place reinforcement prior to grouting. Unless otherwise indicated, extend vertical wall reinforcement to within 2 inches of tops of walls.

3.4.1.2 Positioning Bars

- a. Accurately place vertical bars within the cells at the positions indicated on the drawings. A minimum clearance of 1/2 inch shall be maintained between the bars and masonry units. Provide minimum clearance between parallel bars of 1/2 inch between the bars and masonry units for coarse grout and a minimum clearance of 1/4 inch between the bars and masonry units for fine grout. Provide minimum clearance between parallel bars of 1 inch or one diameter of the reinforcement, whichever is greater. Vertical reinforcement may be held in place using bar positioners located near the ends of each bar and at intermediate intervals of not more than 192 diameters of the reinforcement or by other means to prevent displacement beyond permitted tolerances. As masonry work progresses, secure vertical reinforcement to prevent displacement beyond allowable tolerances.
- b. Wire column and pilaster lateral ties in position around the vertical reinforcing bars. Place lateral ties in contact with the vertical reinforcement and do not place in horizontal mortar bed joints.
- c. Position horizontal reinforcing bars as indicated. Stagger splices in adjacent horizontal bars, unless otherwise indicated.

- d. Form splices by lapping bars as indicated. Do not cut, bend or eliminate reinforcing bars. Foundation dowel bars may be field-bent when permitted by TMS MSJC.

3.4.1.3 Splices of Bar Reinforcement

Lap splice reinforcing bars as indicated. When used, provide welded or mechanical connections that develop at least 125 percent of the specified yield strength of the reinforcement.

3.4.2 Placing Grout

3.4.2.1 General

Fill cells containing reinforcing bars with grout. Solidly grout hollow masonry units in walls or partitions supporting plumbing, heating, or other mechanical fixtures, voids at door and window jambs, and other indicated spaces. Solidly grout cells under lintel bearings on each side of openings for full height of openings. Solidly grout walls below grade, lintels, and bond beams. Units other than open end units may require grouting each course to preclude voids in the units.

Discard site-mixed grout that is not placed within 1-1/2 hours after water is first added to the batch or when the specified slump is not met without adding water after initial mixing. Discard ready-mixed grout that does not meet the specified slump without adding water other than water that was added at the time of initial discharge. Allow sufficient time between grout lifts to preclude displacement or cracking of face shells of masonry units. Provide a grout shear key between lifts when grouting is delayed and the lower lift loses plasticity. If blowouts, flowouts, misalignment, or cracking of face shells should occur during construction, tear down the wall and rebuild.

3.4.2.2 Vertical Grout Barriers for Multi-Wythe Composite Walls

In multi-wythe composite walls, provide grout barriers in the collar joint not more than 30 feet apart, or as required, to limit the horizontal flow of grout for each pour.

3.4.2.3 Horizontal Grout Barriers

Embed horizontal grout barriers in mortar below cells of hollow units receiving grout.

3.4.2.4 Grout Holes and Cleanouts

3.4.2.4.1 Grout Holes

Provide grouting holes in slabs, spandrel beams, and other in-place overhead construction. Locate holes over vertical reinforcing bars or as required to facilitate grout fill in bond beams. Provide additional openings spaced not more than 16 inches on centers where grouting of hollow unit masonry is indicated. Form such openings not less than 4 inches in diameter or 3 by 4 inches in horizontal dimensions. Upon completion of grouting operations, plug and finish grouting holes to match surrounding surfaces.

3.4.2.4.2 Cleanouts for Hollow Unit Masonry Construction

For hollow masonry units, provide cleanout holes at the bottom of every grout pour in cores containing vertical reinforcement when the height of the grout pour exceeds 5 feet 4 inches. Where all cells are to be grouted, construct cleanout courses using bond beam units in an inverted position to permit cleaning of all cells. Provide cleanout holes at a maximum spacing of 32 inches where all cells are to be filled with grout.

Establish a new series of cleanouts if grouting operations are stopped for more than 4 hours. Provide cleanouts not less than 3 by 3 inch by cutting openings in one face shell. Manufacturer's standard cutout units may be used at the Contractor's option. Do not cleanout holes until masonry work, reinforcement, and final cleaning of the grout spaces have been completed and inspected. For walls which will be exposed to view, close cleanout holes in an approved manner to match surrounding masonry.

3.4.2.4.3 Cleanouts for Multi-Wythe Composite Masonry Construction

Provide cleanouts for construction of walls that incorporate a grout filled cavity between solid masonry wythes, provide cleanouts at the bottom of every pour by omitting every other masonry unit from one wythe. Establish a new series of cleanouts if grouting operations are stopped for more than 4 hours. Do not plug cleanout holes until masonry work, reinforcement, and final cleaning of the grout spaces have been completed and inspected. For walls which will be exposed to view, close cleanout holes in an approved manner to match surrounding masonry.

3.4.2.5 Grout Placement

A grout pour is the total height of masonry to be grouted prior to erection of additional masonry. A grout lift is an increment of grout placement within a grout pour. A grout pour is filled by one or more lifts of grout.

- a. Lay masonry to the top of a pour permitted by TMS MSJC Table 7, based on the size of the grout space and the type of grout. Prior to grouting, remove masonry protrusions that extend 1/2 inch or more into cells or spaces to be grouted. Provide grout holes and cleanouts in accordance with paragraph GROUT HOLES AND CLEANOUTS above when the grout pour height exceeds 5 feet 4 inches. Hold reinforcement, bolts, and embedded connections rigidly in position before grouting is started. Do not prewet concrete masonry units.
- b. Place grout using a hand bucket, concrete hopper, or grout pump to fill the grout space without segregation of aggregate. Operate grout pumps to produce a continuous stream of grout without air pockets, segregation, or contamination.
- c. If the masonry has cured at least 4 hours, grout slump is maintained between 10 to 11 inches, and no intermediate reinforced bond beams are placed between the top and bottom of the pour height, place conventional grout in lifts not exceeding 12 feet 8 inches. For the same curing and slump conditions but with intermediate bond beams, limit conventional grout lift to the bottom of the lowest bond beam that is more than 5 feet 4 inches above the bottom of the lift, but do not exceed 12 feet 8 inches. If masonry has not cured at least 4 hours or grout slump is not maintained between 10 to 11 inches, place conventional grout in lifts not exceeding 5 feet 4 inches.

- d. Consolidate conventional grout lift and reconsolidate after initial settlement before placing next lift. For grout pours that are 12 inches or less in height, consolidate and reconsolidate grout by mechanical vibration or puddling. For grout pours that are greater than 12 inches in height, consolidate and reconsolidate grout by mechanical vibration. Apply vibrators at uniformly spaced points not further apart than the visible effectiveness of the machine. Limit duration of vibration to time necessary to produce satisfactory consolidation without causing segregation. If previous lift is not permitted to set, dip vibrator into previous lift. Do not insert vibrators into lower lifts that are in a semi-solidified state. If lower lift sets prior to placement of subsequent lift, form a grout key by terminating grout a minimum of 1-1/2 inch below a mortar joint. Vibrate each vertical cell containing reinforcement in partially grouted masonry. Do not form grout keys within beams.
- e. If the masonry has cured 4 hours, place self-consolidating grout (SCG) in lifts not exceeding the pour height. If masonry has not cured for at least 4 hours, place SCG in lifts not exceeding 5 feet 4 inches. Do not mechanically consolidate self-consolidating grout. Place self-consolidating grout in accordance with manufacturer's recommendations.
- f. Upon completion of each day's grouting, remove waste materials and debris from the equipment, and dispose of outside the masonry.

3.4.3 Joint Reinforcement Installation

Install joint reinforcement at 16 inches on center unless otherwise indicated. Lap joint reinforcement not less than 6 inches. Install prefabricated sections at corners and wall intersections. Place the longitudinal wires of joint reinforcement in mortar beds to provide not less than 5/8 inch cover to either face of the unit.

3.4.4 Bond Beams

Reinforce and grout bond beams as indicated and as described in paragraphs above. Install grout barriers under bond beam units to retain the grout as required, unless wall is fully grouted or solid bottom units are used. For high lift grouting in partially grouted masonry, provide grout retaining material on the top of bond beams to prevent upward flow of grout. Ensure that reinforcement is continuous, including around corners, except through control joints or expansion joints, unless otherwise indicated.

3.4.5 Flashing and Weeps

- a. Install through-wall flashing at obstructions in the cavity and where indicated on Drawings. Ensure continuity of the flashing at laps and inside and outside corners by splicing in a manner approved by the flashing manufacturer. Ensure that the top edge of the flashing is sealed by turning the flashing 1/2 inch into the mortar bed joint of backup masonry. Terminate the horizontal leg of the flashing by extending the sheet metal 1/2 inch beyond the outside face of masonry and turning downward with a hemmed drip. Provide sealant below the drip edge of through-wall flashing.
- b. Wherever through-wall flashing occurs, provide weep holes to drain

flashing to exterior at acceptable locations as indicated. Provide weeps of open head joints. Locate weeps not more than 24 inches on centers in mortar joints of the exterior wythe directly on the horizontal leg of through-wall flashing over foundations, bond beams, and any other horizontal interruptions of the cavity. Place weep holes perfectly horizontal or slightly canted downward to encourage water drainage outward and not inward. Other methods may be used for providing weeps when spacing is reduced to 16 inches on center and approved by the Contracting Officer. Maintain weeps free of mortar and other obstructions.

3.5 APPLICATION

3.5.1 Insulation

Insulate cavity walls (multi-wythe noncomposite masonry walls), where shown, by installing board-type insulation on the cavity side of the inner wythe. Apply board type insulation directly to the masonry or thru-wall flashing with adhesive. Neatly fit insulation between obstructions without impaling insulation on ties or anchors. Apply insulation in parallel courses with vertical joints breaking midway over the course below and in moderate contact with adjoining units without forcing. Cut to fit neatly against adjoining surfaces.

3.5.2 Interface with Other Products

3.5.2.1 Built-In Items

Fill spaces around built-in items with mortar. Point openings around flush-mount electrical outlet boxes in wet locations with mortar. Embed anchors, ties, wall plugs, accessories, flashing, pipe sleeves and other items required to be built-in as the masonry work progresses. Fully embed anchors, ties and joint reinforcement in the mortar. Fill cells receiving anchor bolts and cells of the first course below bearing plates with grout, unless otherwise indicated.

3.5.2.2 Door and Window Frame Joints

On the exposed interior and exterior sides of exterior frames, rake joints between frames and abutting masonry walls to a depth of 3/8 inch.

3.5.2.3 Bearing Plates

Set bearing plates for beams, joists, joist girders and similar structural members to the proper line and elevation with damp-pack bedding mortar, except where non-shrink grout is indicated. Provide bedding mortar and non-shrink grout as specified in Section 03 30 00 CAST-IN-PLACE CONCRETE.

3.5.3 Tolerances

Lay masonry plumb, true to line, with courses level within the tolerances of TMS MSJC, Article 3.3 F.

3.6 FIELD QUALITY CONTROL

3.6.1 Tests

3.6.1.1 Field Testing of Mortar

Perform mortar testing at the following frequency: 3 times per day. For each required mortar test, provide a minimum of three mortar samples. Perform initial mortar testing prior to construction for comparison purposes during construction.

Prepare and test mortar samples for mortar aggregate ratio in accordance with ASTM C780 Appendix A4. Prepare and test mortar compressive strength specimens in accordance with ASTM C780 Appendix A6.

3.6.1.2 Clay Brick Efflorescence Test

Test clay brick that will be exposed to weathering for efflorescence in accordance with ASTM C67/C67M. Schedule tests far enough in advance of starting masonry work to permit retesting if necessary. Units meeting the definition of "effloresced" are subject to rejection.

3.6.1.3 Prism Tests

Perform at least one prism test sample for each 5,000 square feet of wall but not less than three such tests for any building. Evaluate three prisms in each test. Fabricate, store, handle, and test prisms in accordance with ASTM C1314.

Seven-day tests may be used provided the relationship between the 7- and 28-day strengths of the masonry is established by the tests of the materials used. If the compressive strength of any prism falls below the specified value by more than 500 psi, take steps to assure that the load-carrying capacity of the structure is not jeopardized. If the likelihood of low-strength masonry is confirmed and computations indicate that the load-carrying capacity may have been significantly reduced, tests of cores drilled, or prisms sawed, from the area in question may be required. In such case, take three specimens for each prism test more than 500 psi below the specified value. Masonry in the area in question will be considered structurally adequate if the average compressive strength of three specimens is equal to or exceeds the specified value. Additional testing of specimens extracted from locations represented by erratic core or prism strength test results will be permitted.

3.6.1.4 Single-Wythe Masonry Wall Water Penetration Test

Prior to start of field construction of the single-wythe concrete masonry wall, perform masonry wall water penetration test on mock-up wall assemblies consisting of the identical design, materials, mix, and construction methods as the actual wall construction and in accordance with ASTM E514/E514M. Prepare a minimum of three specimens and cure for minimum 28 days prior to testing. Construct panels by the same methods, processes, and applications to be used on the project's construction site. Spray test for 6 hours on each specimen. If water is visible on back of test panels during the test and areas of dampness on the backside of the test panels do not exceed 25 percent of the wall area, the panels will be considered to have passed. Dampness is defined as any area of surface darkening or discoloration due to moisture penetration or accumulation below the observed surface.

Construct additional test panels for each failed test performed until three test panels pass the test. Factors that can affect test performance include materials, mixing, and quality of application and workmanship. Materials, mixing, and methods adjustments may be necessary in order to provide construction that passes the water penetration test. Document and record the test specimen construction materials and application and provide written test report in accordance with ASTM E514/E514M, supplemented by a detailed discussion of the specifics of test panel construction, application methods and processes used, quality of construction, and any variances or deviations that may have occurred between test panels during test panel construction. For failed test panels, identify in the supplemental report the variances, deficiencies or flaws that contributed to test panel failure and itemize the precautions to be taken in field construction of the masonry wall to prevent similar deficiencies and assure the wall construction replicates test panel conditions that pass the water penetration test. Submit the complete, certified test report, including supplemental report, to the Contracting Officer prior to start of single-wythe concrete masonry wall construction. Significant changes to materials, proportions, or construction techniques from those used in the passing water penetration test are grounds for performing new tests, at the discretion of the Contracting Officer.

3.6.2 Special Inspection

Perform special inspections and testing in accordance with Section 01 45 35 SPECIAL INSPECTIONS.

3.7 POINTING AND CLEANING

After mortar joints have attained their initial set, but prior to hardening, completely remove mortar and grout daubs and splashings from masonry-unit surfaces that will be exposed or painted. Before completion of the work, rake out defects in joints of masonry to be exposed or painted, fill with mortar, and tool to match existing joints. Immediately after grout work is completed, remove scum and stains that have percolated through the masonry work using a low pressure stream of water and a stiff bristled brush. Do not clean masonry surfaces, other than removing excess surface mortar, until mortar in joints has hardened. Leave masonry surfaces clean, free of mortar daubs, dirt, stain, and discoloration, including scum from cleaning operations, and with tight mortar joints throughout. Do not use metal tools and metal brushes for cleaning.

3.7.1 Dry-Brushing Concrete Masonry

Dry brush exposed concrete masonry surfaces at the end of each day's work and after any required pointing, using stiff-fiber bristled brushes.

3.7.2 Clay Brick Surfaces

Clean exposed clay brick masonry surfaces to obtain surfaces free of stain, dirt, mortar and grout daubs, efflorescence, and discoloration or scum from cleaning operations. Perform cleaning in accordance with the approved cleaning procedure demonstrated on the mockup.

After cleaning, examine the sample panel of similar material for discoloration or stain as a result of cleaning. If the sample panel is discolored or stained, change the method of cleaning to ensure that the

masonry surfaces in the structure will not be adversely affected. Water-soak exposed masonry surfaces and then clean with a proprietary masonry cleaning agent specifically recommended for the color and texture by the clay brick manufacturer and manufacturer of the cleaning product. Apply the solution with stiff fiber brushes, followed immediately by thorough rinsing with clean water. Use proprietary cleaning agents in conformance with the cleaning product manufacturer's printed recommendations. Remove efflorescence in conformance with the brick manufacturer's recommendations.

3.8 CLOSE-OUT TAKE-BACK PROGRAM

Collect information from manufacturer for take-back program options. Set aside masonry units, full and partial scrap and packaging to be returned to manufacturer for recycling into new product. When such a service is not available, seek local recyclers to reclaim the materials. Submit documentation that includes contact information, summary of procedures, and the limitations and conditions applicable to the project. Indicate manufacturer's commitment to reclaim materials for recycling and/or reuse.

3.9 PROTECTION

Protect facing materials against staining. Cover top of walls with nonstaining waterproof covering or membrane to protect from moisture intrusion when work is not in progress. Continue covering the top of the unfinished walls until the wall is waterproofed with a complete roof or parapet system. Extend covering a minimum of 2 feet down on each side of the wall and hold securely in place. Before starting or resuming work, clean top surface of masonry in place of loose mortar and foreign material.

-- End of Section --

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SECTION 05 12 00

STRUCTURAL STEEL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 303	(2016) Code of Standard Practice for Steel Buildings and Bridges
AISC 325	(2017) Steel Construction Manual
AISC 326	(2009) Detailing for Steel Construction
AISC 341	(2016) Seismic Provisions for Structural Steel Buildings
AISC 360	(2022) Specification for Structural Steel Buildings
AISC 420	(2010) Certification Standard for Shop Application of Complex Protective Coating Systems
AISC DESIGN GUIDE 10	(1997) Erection Bracing of Low-Rise Structural Steel Buildings

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

ANSI/ASNT CP-189	(2020) ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B46.1	(2020) Surface Texture, Surface Roughness, Waviness and Lay

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(2012) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS D1.1/D1.1M	(2020; Errata 1 2021) Structural Welding Code - Steel
AWS D1.8/D1.8M	(2016) Structural Welding Code—Seismic Supplement
AWS QC1	(2016) Specification for AWS Certification

of Welding Inspectors

ASTM INTERNATIONAL (ASTM)

ASTM A6/A6M	(2021) Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
ASTM A29/A29M	(2020) Standard Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought
ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A307	(2021) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A500/A500M	(2021a) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A563	(2015) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A780/A780M	(2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A992/A992M	(2020) Standard Specification for Structural Steel Shapes
ASTM B695	(2021) Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
ASTM C827/C827M	(2016) Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures
ASTM C1107/C1107M	(2020) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM F436/F436M	(2019) Standard Specification for Hardened Steel Washers Inch and Metric Dimensions
ASTM F844	(2019) Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use
ASTM F959/F959M	(2017a) Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural

Fasteners, Inch and Metric Series

ASTM F1136/F1136M	(2011) Standard Specification for Zinc/Aluminum Corrosion Protective Coatings for Fasteners
ASTM F1554	(2020) Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
ASTM F2329/F2329M	(2015) Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners
ASTM F2833	(2011; R 2017) Standard Specification for Corrosion Protective Fastener Coatings with Zinc Rich Base Coat and Aluminum Organic/Inorganic Type
ASTM F3125/F3125M	(2019) Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC PA 1	(2016) Shop, Field, and Maintenance Coating of Metals
SSPC Paint 20	(2019) Zinc-Rich Primers (Type I, Inorganic, and Type II, Organic)
SSPC Paint 29	(2002; E 2004) Zinc Dust Sacrificial Primer, Performance-Based
SSPC SP 3	(2018) Power Tool Cleaning
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-301-01	(2019) Structural Engineering

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR Part 1926, Subpart R	Steel Erection

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL

PROCEDURES:

SD-01 Preconstruction Submittals

Erection and Erection Bracing Drawings; G RO

SD-02 Shop Drawings

Fabrication Drawings Including Details of Connections; G RO

SD-03 Product Data

Shop Primer

Welding Electrodes and Rods

Direct Tension Indicator Washers

Non-Shrink Grout

Tension Control Bolts

Recycled Content for Structural Steel; S

SD-06 Test Reports

Class B Coating

Bolts, Nuts, and Washers

Weld Inspection Reports

Direct Tension Indicator Washer Inspection Reports

Bolt Testing Reports

SD-07 Certificates

Steel

Bolts, Nuts, and Washers

Galvanizing

Welding Procedures and Qualifications

Welding Electrodes and Rods

Certified Welding Inspector

NDT Technician

Welding Procedure Specifications (WPS)

1.3 SEISMIC PROVISIONS

Provide the structural steel system in accordance with AISC 341, Chapter J as amended by UFC 3-301-01.

1.4 QUALITY ASSURANCE

1.4.1 Preconstruction Submittals

1.4.1.1 Erection and Erection Bracing Drawings

Submit for record purposes. Indicate the sequence of erection, temporary shoring and bracing. The erection drawings must conform to AISC 303. Erection drawings must be reviewed, stamped and sealed by a registered professional engineer.

1.4.2 Fabrication Drawing Requirements

Submit fabrication drawings for approval prior to fabrication. Prepare in accordance with AISC 303, AISC 326 and AISC 325. Fabrication drawings must not be reproductions of contract drawings. Sign and seal fabrication drawings by a registered professional engineer. Include complete information for the fabrication and erection of the structure's components, including the location, type, and size of bolts, welds, member sizes and lengths, connection details, blocks, copes, and cuts. Use AWS A2.4 standard welding symbols. Clearly highlight any deviations from the details shown on the contract drawings highlighted on the fabrication drawings. Explain the reasons for any deviations from the contract drawings.

1.4.3 Delegated Connection Design

Design structural steel connection indicated in the contract documents per AISC 303, Option 3, using the connection loads indicated. Submit design calculations for steel connections signed and sealed by a registered professional engineer.

1.4.4 Certifications

1.4.4.1 Welding Procedures and Qualifications

Prior to welding, submit certification for each welder stating the type of welding and positions qualified for, the code and procedure qualified under, date qualified, and the firm and individual certifying the qualification tests. If the qualification date of the welder or welding operator is more than 6 months old, the welding operator's qualification certificate must be accompanied by a current certificate by the welder attesting to the fact that he has been engaged in welding since the date of certification, with no break in welding service greater than 6 months.

Conform to all requirements specified in AWS D1.1/D1.1M and AWS D1.8/D1.8M.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide the structural steel system, including shop primer and galvanizing, complete and ready for use. Provide structural steel systems including design, materials, installation, workmanship, fabrication, assembly, erection, inspection, quality control, and testing in accordance with AISC 303, AISC 360, AISC 341, and UFC 3-301-01 except as modified in this contract.

2.2 STEEL

2.2.1 Structural Steel

Wide flange and WT shapes, ASTM A992/A992M. Angles, Channels and Plates, ASTM A36/A36M. Provide structural steel containing a minimum of 80 percent recycled content. Submit data identifying percentage of recycled content for structural steel.

2.2.2 Structural Steel Tubing

ASTM A500/A500M, Grade C. Provide structural steel tubing containing a minimum of 90 percent recycled content. Submit data identifying percentage of recycled content for structural steel tubing.

2.3 BOLTS, NUTS, AND WASHERS

Submit the certified manufacturer's mill reports which clearly show the applicable ASTM mechanical and chemical requirements together with the actual test results for the supplied fasteners.

2.3.1 Common Grade Bolts

2.3.1.1 Bolts

ASTM A307, Grade A, plain finish hot dipped zinc coating. The bolt heads and the nuts of the supplied fasteners must be marked with the manufacturer's identification mark, the strength grade and type specified by ASTM specifications.

2.3.1.2 Nuts

ASTM A563, Grade A, heavy hex style.

2.3.1.3 Washers

ASTM F844.

2.3.2 High-Strength Bolts

High strength bolts and nuts must be shipped together in the same shipping container. Fasteners indicated to be galvanized shall be tested by the supplier to show that the galvanized nut with the supplied lubricant provided may be rotated from the snug tight condition well in excess of the rotation required for pretensioned installation without stripping. The supplier shall supply nuts that have been lubricated and tested with the supplied bolts.

2.3.2.1 Bolts

ASTM F3125/F3125M, Grade A325M A325, Type 1 Heavy Hex Head Style, plain finish hot dipped zinc coating.

2.3.2.2 Nuts

ASTM A563, Grade and Style as specified in the applicable ASTM bolt standard.

2.3.2.3 Direct Tension Indicator Washers

ASTM F959/F959M. Provide ASTM B695, Class 55, Type 1 galvanizing. Submit product data for direct tension indicator washers.

2.3.2.4 Washers

ASTM F436/F436M, plain carbon steel.

2.3.3 Tension Control Bolts

ASTM F3125/F3125M, Grade F1852, Type 1, twistoff style assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon steel nuts, and hardened carbon steel washers. Assembly finish must be mechanically deposited zinc coating. Submit product data for tension control bolts.

2.3.4 Foundation Anchorage

2.3.4.1 Anchor Rods

ASTM F1554 Gr 55, Class 1A minimum.

2.3.4.2 Anchor Nuts

ASTM A563, Grade A, hex style.

2.3.4.3 Anchor Washers

ASTM F844.

2.3.4.4 Anchor Plate Washers

ASTM A36/A36M.

2.4 STRUCTURAL STEEL ACCESSORIES

2.4.1 Welding Electrodes and Rods

AWS D1.1/D1.1M and AWS D1.8/D1.8M. Submit product data for welding electrodes and rods.

2.4.2 Non-Shrink Grout

ASTM C1107/C1107M, with no ASTM C827/C827M shrinkage. Grout must be nonmetallic. Submit product data for non-shrink grout.

2.4.3 Welded Shear Stud Connectors

ASTM A29/A29M, Grades 1010 through 1020. AWS D1.1/D1.1M, Table 7.1, Type B.

2.5 GALVANIZING

ASTM F2329/F2329M, ASTM F1136/F1136M, ASTM F2833 or ASTM B695 for threaded parts or ASTM A123/A123M for structural steel members, as applicable, unless specified otherwise galvanize after fabrication where practicable.

2.6 FABRICATION

Fabrication must be in accordance with the applicable provisions of AISC 325. Fabrication and assembly must be done in the shop to the greatest extent possible. Punch, subpunch and ream, or drill bolt holes perpendicular to the surface of the member.

Compression joints depending on contact bearing must have a surface roughness not in excess of 500 micro inch as determined by ASME B46.1, and ends must be square within the tolerances for milled ends specified in ASTM A6/A6M.

Shop splices of members between field splices will be permitted only where indicated on the Contract Drawings. Splices not indicated require the approval of the Contracting Officer.

2.6.1 Markings

Prior to erection, identify members by a painted erection mark. Connecting parts assembled in the shop for reaming holes in field connections must be match marked with scratch and notch marks. Do not locate erection markings on areas to be welded. Do not locate match markings in areas that will decrease member strength or cause stress concentrations. Affix embossed tags to hot-dipped galvanized members.

2.6.2 Shop Primer

SSPC Paint 20 or SSPC Paint 29, (zinc rich primer). Shop prime structural steel, except as modified herein, in accordance with SSPC PA 1. Do not prime steel surfaces embedded in concrete, galvanized surfaces, surfaces to receive sprayed-on fireproofing, surfaces to receive epoxy coatings, section, or surfaces within 0.5 inch of the toe of the welds prior to welding (except surfaces on which metal decking and shear studs are to be welded). If flash rusting occurs, re-clean the surface prior to application of primer. Apply primer in accordance with endorsement "SPE-P1" of AISC 420 or approved equal NACE or SSPC certification to a minimum dry film thickness of 2.0 mil. Submit shop primer product data.

Prime slip critical surfaces with a Class B coating in accordance with AISC 325. Submit test report for Class B coating.

Prior to assembly, prime surfaces which will be concealed or inaccessible after assembly. Do not apply primer in foggy or rainy weather; when the ambient temperature is below 45 degrees F or over 95 degrees F; or when the primer may be exposed to temperatures below 40 degrees F within 48 hours after application, unless approved otherwise by the Contracting Officer. Repair damaged primed surfaces with an additional coat of primer.

2.6.2.1 Cleaning

SSPC SP 6/NACE No.3, except steel exposed in spaces above ceilings, attic spaces, furred spaces, and chases that will be hidden to view in finished construction may be cleaned to SSPC SP 3 when recommended by the shop primer manufacturer. Maintain steel surfaces free from rust, dirt, oil, grease, and other contaminants through final assembly.

2.7 DRAINAGE HOLES

Drill adequate drainage holes to eliminate water traps. Hole diameter

must be 1/2 inch and location indicated on the detail drawings. Hole size and locations must not affect the structural integrity.

PART 3 EXECUTION

3.1 ERECTION

- a. Erection of structural steel, except as indicated in item b. below, must be in accordance with the applicable provisions of AISC 325, AISC 303 and 29 CFR Part 1926, Subpart R.
- b. For low-rise structural steel buildings (60 feet tall or less and a maximum of 2 stories), erect the structure in accordance with AISC DESIGN GUIDE 10.

After final positioning of steel members, provide full bearing under base plates and bearing plates using nonshrink grout. Place nonshrink grout in accordance with the manufacturer's instructions.

3.1.1 STORAGE

Store the material out of contact with the ground in such manner and location as to minimize deterioration.

3.2 CONNECTIONS

Except as modified in this section, design connections indicated in accordance with AISC 360. Build connections into existing work. Do not tighten anchor bolts set in concrete with impact torque wrenches. Holes must not be cut or enlarged by burning. Bolts, nuts, and washers must be clean of dirt and rust, and lubricated immediately prior to installation.

3.2.1 Common Grade Bolts

Tighten ASTM A307 bolts to a "snug tight" fit. "Snug tight" is the tightness that exists when plies in a joint are in firm contact. If firm contact of joint plies cannot be obtained with a few impacts of an impact wrench, or the full effort of a man using a spud wrench, contact the Contracting Officer for further instructions.

3.2.2 High-Strength Bolts

Provide direct tension indicator washers in all ASTM F3125/F3125M, Grade A325 bolted connections. Bolts must be installed in connection holes and initially brought to a snug tight fit. After the initial tightening procedure, fully tension bolts, progressing from the most rigid part of a connection to the free edges.

Fastener components shall be protected from dirt and moisture in closed containers at the site of the installation. Fastener components that are not incorporated into the work shall be returned to protected storage at the end of the work shift.

3.2.2.1 Installation of Direct Tension Indicator Washers (DTIW)

Where possible, install the DTIW under the bolt head and tighten the nut. If the DTIW is installed adjacent to the turned element, provide a flat washer between the DTIW and nut when the nut is turned for tightening, and between the DTIW and bolt head when the bolt head is turned for tightening.

3.2.3 Tension Control Bolts

Bolts must be installed in connection holes and initially brought to a snug tight fit. After the initial tightening procedure, fully tension bolts, progressing from the most rigid part of a connection to the free edges.

3.3 GAS CUTTING

Use of gas-cutting torch in the field for correcting fabrication errors is not permitted on any major member in the structural framing. Use of a gas cutting torch will be permitted on minor members not under stress only after approval has been obtained from the Contracting Officer.

3.4 WELDING

Welding must be in accordance with AWS D1.1/D1.1M and AWS D1.8/D1.8M. Grind exposed welds smooth as indicated. Provide AWS D1.1/D1.1M qualified welders, welding operators, and tackers.

Develop and submit the Welding Procedure Specifications (WPS) for all welding, including welding done using prequalified procedures. Submit for approval all WPS, whether prequalified or qualified by testing.

3.4.1 Removal of Temporary Welds, Run-Off Plates, and Backing Strips

Remove backing strips from bottom flange of moment connections, backgouge the root pass to sound weld metal and reinforce with a 5/16 inch fillet weld minimum.

3.5 SHOP PRIMER REPAIR

Repair shop primer in accordance with the paint manufacturer's recommendation for surfaces damaged by handling, transporting, cutting, welding, or bolting.

3.5.1 Field Priming

Field prime steel exposed to the weather, or located in building areas without HVAC for control of relative humidity. After erection, the field bolt heads and nuts, field welds, and any abrasions in the shop coat must be cleaned and primed with paint of the same quality as that used for the shop coat.

3.6 GALVANIZING REPAIR

Repair damage to galvanized coatings using ASTM A780/A780M zinc rich paint for galvanizing damaged by handling, transporting, cutting, welding, or bolting. Do not heat surfaces to which repair paint has been applied.

3.7 FIELD QUALITY CONTROL

Perform field tests, and provide labor, equipment, and incidentals required for testing. Notify the Contracting Officer in writing of defective welds, bolts, nuts, and washers within 7 working days of the date of the inspection.

3.7.1 Welds

3.7.1.1 Visual Inspection

AWS D1.1/D1.1M. Furnish the services of AWS-certified welding inspectors for fabrication and erection inspection and testing and verification inspections. A Certified Welding Inspector must perform visual inspection on 100 percent of all welds. Document this inspection in the Visual Weld Inspection Log. Submit certificates indicating that certified welding inspectors meet the requirements of AWS QC1.

Inspect proper preparation, size, gaging location, and acceptability of all welds; identification marking; operation and current characteristics of welding sets in use.

3.7.1.2 Nondestructive Testing

Nondestructive testing must be in accordance with AWS D1.1/D1.1M and AWS D1.8/D1.8M. Ultrasonic testing must be performed in accordance with Table 6.2 of AWS D1.1/D1.1M. Test locations must be selected by the Contracting Officer. All personnel performing NDT must be certified in accordance with ANSI/ASNT CP-189 in the method of testing being performed. Submit certificates showing compliance with ANSI/ASNT CP-189 for all NDT technicians. If more than 20 percent of welds made by a welder contain defects identified by testing, then all groove welds made by that welder must be tested by ultrasonic testing, and all fillet welds made by that welder must be inspected by magnetic particle testing (MT) or dye penetrant testing (PT) as approved by the Contracting Officer. When groove welds made by an individual welder are required to be tested, magnetic particle or dye penetrant testing may be used only in areas inaccessible to ultrasonic testing. Retest all repaired areas. Submit weld inspection reports.

Testing frequency: Provide the following types and number of tests:

Test Type	Number of Tests
Ultrasonic	50 percent of CJP Welds
Magnetic Particle	50 percent of PJP and Fillet Welds
Dye Penetrant	50 percent of PJP and Fillet Welds

3.7.2 Direct Tension Indicator Washers

3.7.2.1 Direct Tension Indicator Washer Compression

Test direct tension indicator washers in place to verify that they have been compressed sufficiently to provide the 0.015 inch gap, as required by ASTM F959/F959M. Submit direct tension indicator washer inspection reports.

3.7.3 High-Strength Bolts

3.7.3.1 Testing Bolt, Nut, and Washer Assemblies

Test a minimum of 3 bolt, nut, and washer assemblies from each mill certificate batch in a tension measuring device at the job site prior to the beginning of bolting start-up. Demonstrate that the bolts and nuts,

when used together, can develop tension not less than the provisions specified in AISC 360, depending on bolt size and grade. The bolt tension must be developed by tightening the nut. A representative of the manufacturer or supplier must be present to ensure that the fasteners are properly used, and to demonstrate that the fastener assemblies supplied satisfy the specified requirements. Submit bolt testing reports.

3.7.3.2 Inspection

Inspection procedures must be in accordance with AISC 360. Confirm and report to the Contracting Officer that the materials meet the project specification and that they are properly stored. Confirm that the faying surfaces have been properly prepared before the connections are assembled. Observe the specified job site testing and calibration, and confirm that the procedure to be used provides the required tension. Monitor the work to ensure the testing procedures are routinely followed on joints that are specified to be fully tensioned.

Inspect calibration of torque wrenches for high-strength bolts.

3.7.3.3 Testing

The Government has the option to perform nondestructive tests on 5 percent of the installed bolts to verify compliance with pre-load bolt tension requirements. Provide the required access for the Government to perform the tests. The nondestructive testing will be done in-place using an ultrasonic measuring device or any other device capable of determining in-place pre-load bolt tension. The test locations must be selected by the Contracting Officer. If more than 10 percent of the bolts tested contain defects identified by testing, then all bolts used from the batch from which the tested bolts were taken, must be tested at the Contractor's expense. Retest new bolts after installation at the Contractor's expense.

3.7.4 Inspection and Testing of Steel Stud Welding

Perform verification inspection and testing of steel stud welding conforming to the requirements of AWS D1.1/D1.1M, Stud Welding Clause. The Contracting Officer will serve as the verification inspector. Bend test studs that do not show a full 360 degree weld flash or have been repaired by welding as required by AWS D1.1/D1.1M, Stud Welding Clause. Studs that crack under testing in the weld, base metal or shank will be rejected and replaced by the Contractor at no additional cost.

-- End of Section --

SECTION 05 30 00

STEEL DECKS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI D100 (2017) Cold-Formed Steel Design Manual

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2020; Errata 1 2021) Structural Welding Code - Steel

AWS D1.3/D1.3M (2018) Structural Welding Code - Sheet Steel

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M (2019) Standard Specification for Carbon Structural Steel

ASTM A123/A123M (2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A653/A653M (2020) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM A780/A780M (2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

ASTM A792/A792M (2021a) Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process

ASTM A1008/A1008M (2021a) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable

ASTM C423 (2009a) Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

ASTM D746 (2014) Standard Test Method for

Brittleness Temperature of Plastics and
Elastomers by Impact

ASTM D1056 (2020) Standard Specification for Flexible
Cellular Materials - Sponge or Expanded
Rubber

ASTM D1149 (2007; R 2012) Standard Test Method for
Rubber Deterioration - Surface Ozone
Cracking in a Chamber

ASTM E84 (2020) Standard Test Method for Surface
Burning Characteristics of Building
Materials

FM GLOBAL (FM)

FM APP GUIDE (updated on-line) Approval Guide
<http://www.approvalguide.com/>

FM DS 1-28R (1998) Data Sheet: Roof Systems

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 20 (2019) Zinc-Rich Primers (Type I,
Inorganic, and Type II, Organic)

STEEL DECK INSTITUTE (SDI)

ANSI/SDI QA/QC (2017) Standard for Quality Control and
Quality Assurance for Installation of
Steel Deck

ANSI/SDI RD (2017) Standard for Steel Roof Deck

SDI DDM04 (2015; Errata 1-3 2016; Add 1 2015; Add 2
20162006) Diaphragm Design Manual; 4th
Edition

SDI DDP (1987; R 2000) Deck Damage and Penetrations

SDI MOC3 (2016) Manual of Construction with Steel
Deck (3rd Edition)

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-301-01 (2019) Structural Engineering

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1926 Safety and Health Regulations for
Construction

UNDERWRITERS LABORATORIES (UL)

UL 580 (2006; Reprint Mar 2019) UL Standard for
Safety Tests for Uplift Resistance of Roof
Assemblies

UL Fire Resistance

(2014) Fire Resistance Directory

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fabrication Drawings; G RO

SD-03 Product Data

Accessories

Deck Units

Galvanizing Repair Paint

Mechanical Fasteners

Touch-Up Paint

Sound Absorbing Materials

Welding Equipment

Welding Rods and Accessories

Recycled Content of Steel Products; S

SD-04 Samples

Metal Roof Deck Units

Flexible Closure Strips

Acoustical Material

SD-05 Design Data

Deck Units; G RO

SD-07 Certificates

Powder-Actuated Tool Operator

Welder Qualifications

Welding Procedures

Fire Safety

Wind Storm Resistance

Manufacturer's Certificate

1.3 QUALITY ASSURANCE

1.3.1 Deck Units

Furnish deck units and accessory products from a manufacturer regularly engaged in manufacture of steel decking. Provide manufacturer's certificates attesting that the decking material meets the specified requirements.

1.3.2 Certification of Powder-Actuated Tool Operator

Provide manufacturer's certificate attesting that the operators are authorized to use the low velocity powder-actuated tool.

1.3.3 Qualifications for Welding Work

Follow Welding Procedures of AWS D1.3/D1.3M for sheet steel and AWS D1.1/D1.1M for stud welding. Submit qualified Welder Qualifications in accordance with AWS D1.3/D1.3M for sheet steel and AWS D1.1/D1.1M for stud welding, or under an equivalent approved qualification test. Perform tests on test pieces in positions and with clearances equivalent to those actually encountered. If a test weld fails to meet requirements, perform an immediate retest of two test welds until each test weld passes. Failure in the immediate retest will require the welder be retested after further practice or training, performing a complete set of test welds.

Submit manufacturer's catalog data for Welding Equipment and Welding Rods and Accessories.

1.3.4 Regulatory Requirements

1.3.4.1 Fire Safety

Test roof deck as a part of a roof deck construction assembly of the type used for this project, listing as fire classified in the UL Fire Resistance, or listing as Class I construction in the FM APP GUIDE, and so labeled.

1.3.4.2 Wind Storm Resistance

Provide roof construction assembly capable of withstanding a nominal uplift pressure as indicated in the structural drawings when tested in accordance with the uplift pressure test described in the FM DS 1-28R or as described in UL 580 and in general compliance with UFC 3-301-01.

1.3.5 Fabrication Drawings

Show type and location of units, location and sequence of connections, bearing on supports, methods of anchoring, attachment of accessories, adjusting plate details, cant strips, ridge and valley plates, metal closure strips, size and location of holes to be cut and reinforcement to be provided, the manufacturer's erection instructions and other pertinent details.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver deck units to the site in a dry and undamaged condition. Store

and handle steel deck in a manner to protect it from corrosion, deformation, and other types of damage. Do not use decking for storage or as working platform until units have been fastened into position. Exercise care not to damage material or overload decking during construction. The maximum uniform distributed storage load must not exceed the design live load. Stack decking on platforms or pallets and cover with weathertight ventilated covering. Elevate one end during storage to provide drainage. Maintain deck finish at all times to prevent formation of rust. Repair deck finish using touch-up paint. Replace damaged material.

1.5 DESIGN REQUIREMENTS FOR ROOF DECKS

1.5.1 Properties of Sections

Properties of metal roof deck sections must comply with engineering design width as limited by the provisions of AISI D100.

1.5.2 Allowable Loads

Indicate total uniform dead and live load for detailing purposes.

PART 2 PRODUCTS

2.1 DECK UNITS

Submit manufacturer's design calculations, or applicable published literature for the structural properties of the proposed deck units.

Provide products with an average recycled content of steel products so postconsumer recycled content plus one half of preconsumer recycled content not less than 25 percent.

2.1.1 Roof Deck

Conform to ASTM A792/A792M or ASTM A1008/A1008M for deck used in conjunction with insulation and built-up roofing. Fabricate roof deck units of 0.0295 inch design thickness or thicker steel. The steel design thickness required by the design drawings and zinc-coated in conformance with ASTM A653/A653M, Z275 G90 coating class or aluminum-zinc coated in accordance with ASTM A792/A792M Coating Designation AZM165 AZ55. Furnish sample of Metal Roof Deck Units used to illustrate actual cross section dimensions and configurations.

2.1.2 Acoustical Roof Deck

Provide a Noise Reduction Coefficient (NRC) rating of not less than 0.80, in conjunction with the roof insulation specified, when tested in accordance with ASTM C423. Provide sound absorbing materials with either glass fiber in roll or premolded form for acoustical steel deck (noncellular) or glass fiber rigid strip for acoustical steel deck (cellular) in accordance with manufacturer's standards to meet minimum NRC rating.

2.1.3 Length of Deck Units

Provide deck units of sufficient length to span three or more spacings where possible.

2.1.4 Shop Priming

Shop prime accessories and underside of deck at the factory after coating. Clean surfaces in accordance with the manufacturer's standard procedure followed by a spray, dip or roller coat of rust-inhibitive primer, oven cured.

2.1.5 Touch-Up Paint

Provide a high zinc-dust content paint for regalvanizing welds in galvanized steel conforming to ASTM A780/A780M.

Provide touch-up paint for zinc-coated units of an approved galvanizing repair paint with a high-zinc dust content. Touch-up welds with paint conforming to SSPC Paint 20 in accordance with ASTM A780/A780M. Maintain finish of deck units and accessories by using touch-up paint whenever necessary to prevent the formation of rust.

2.2 ACCESSORIES

Provide accessories of same material as deck, unless specified otherwise. Provide manufacturer's standard type accessories, as specified.

2.2.1 Adjusting Plates

Provide adjusting plates, or segments of deck units, of same thickness and configuration as deck units in locations too narrow to accommodate full size units. Provide factory cut plates of predetermined size where possible.

2.2.2 End Closures

Fabricated of sheet metal by the deck manufacturer. Provide end closures minimum 0.0295 inch thick to close open ends at end walls, eaves, and openings through deck.

2.2.3 Partition Closures

Provide closures for closing voids above interior walls and partitions that are perpendicular to the direction of the configurations. Provide minimum one inch thick soft composition rubber closures above walls and partitions contiguous to acoustical steel deck. Provide sheet steel closures above fire-resistant interior walls and partitions located on both sides of wall or partition. Provide glass fiber blanket insulation in the space between pairs of closures at acoustical partitions.

2.2.4 Flexible Closure Strips for Roof Decks

Provide strips made of vulcanized, closed-cell, synthetic rubber material specified and premolded to the configuration required to provide tight-fitting closures at open ends and sides of steel roof decking.

Conforming to ASTM D1056, Grade 2A1, with the following additional properties:

Brittleness temperature of minus 40 degrees F when tested in accordance with ASTM D746.

Flammability resistance with a flame spread rating of less than 25

when tested in accordance with ASTM E84.

Resistance to ozone must be "no cracks" after exposure of a sample kept under a surface tensile strain of 25 percent to an ozone concentration of 100 parts per million of air by volume in air for 100 hours at 104 degrees F and tested in accordance with ASTM D1149.

Provide an elastomeric type adhesive as recommended by the manufacturer of the flexible closure strips.

2.2.5 Sheet Metal Collar

Where deck is cut for passage of pipes, ducts, columns, etc., and deck is to remain exposed, provide a neatly cut sheet metal collar to cover edges of deck. Do not cut deck until after installation of supplemental supports.

2.2.6 Cover Plates

Sheet metal to close panel edge and end conditions, and where panels change direction or butt. Polyethylene-coated, self-adhesive, 2 inch wide joint tape may be provided in lieu of cover plates on flat-surfaced decking butt joints.

Fabricate cover plates for abutting floor deck units from the specified structural-quality steel sheets not less than nominal 18 gauge thick before galvanizing. Provide 6 inch wide cover plates and form to match the contour of the floor deck units.

2.2.7 Access Hole Covers

Sheet metal, minimum 0.0474 inch thick.

2.2.8 Cant Strips for Roof Decks

Fabricate cant strips from the specified commercial-quality steel sheets not less than nominal 0.0358 inch thick before galvanizing. Bend strips to form a 45-degree cant not less than 5 inch wide, with top and bottom flanges a minimum 3 inch wide. Length of strips 10 feet.

2.2.9 Ridge and Valley Plates for Roof Decks

Fabricate plates from the specified structural-quality steel sheets, not less than nominal 0.0358 inch thick before galvanizing. Provide plates of minimum 4-1/2 inch wide and bent to provide tight fitting closures at ridges and valleys. Provide a minimum length of ridge and valley plates of 10 feet.

2.2.10 Metal Closure Strips for Roof Decks

Fabricate strips from the specified commercial-quality steel sheets not less than nominal 0.0358 inch thick before galvanizing. Provide strips from the configuration required to provide tight-fitting closures at open ends and sides of steel roof decking.

2.2.11 Galvanized Steel Angles for Roof Decks

Provide hot-rolled carbon steel angles conforming to ASTM A36/A36M, and hot-dip galvanized in accordance with ASTM A123/A123M.

2.2.12 Sound Absorbing Material

Provide glass fiber in roll or premolded form for acoustical noncellular steel roof deck and glass fiber rigid strip for acoustical cellular steel deck in accordance with the manufacturer's standards. Provide a sample of acoustical material to be used.

2.2.13 Mechanical Fasteners

Provide mechanical fasteners, such as powder actuated fasteners, pneumatically driven fasteners or self-drilling screws, for anchoring the deck to structural supports and adjoining units as indicated.

2.2.14 Miscellaneous Accessories

Furnish the manufacturer's standard accessories to complete the deck installation. Furnish metal accessories of the same material as the deck and with the minimum design thickness as follows: saddles, 0.0474 inch welding washers, 0.0598 inch other metal accessories, 0.0358 inch unless otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

Prior to installation of decking units and accessories, examine worksite to verify that as-built structure will permit installation of decking system without modification.

3.2 INSTALLATION

Install steel deck units in accordance with 29 CFR 1926, Subpart R - Steel Erection, ANSI/SDI QA/QC, ANSI/SDI RD, SDI DDM04 and approved shop drawings. Place units on structural supports, properly adjusted, leveled, and aligned at right angles to supports before permanently securing in place. Damaged deck and accessories including material which is permanently stained or contaminated, deformed, or with burned holes shall not be installed. Extend deck units over three or more supports unless absolutely impractical. Report inaccuracies in alignment or leveling to the Contracting Officer and make necessary corrections before permanently anchoring deck units. Locate deck ends over supports only. Lap 2 inch deck ends. Do not use unanchored deck units as a work or storage platform. Permanently anchor units placed by the end of each working day. Do not support suspended ceilings, light fixtures, ducts, utilities, or other loads by steel deck unless indicated. Distribute loads by appropriate means to prevent damage. Neatly fit acoustical material into the rib voids.

3.2.1 Attachment

Immediately after placement and alignment, and after correcting inaccuracies, permanently fasten steel deck units to structural supports and to adjacent deck units by welding with normal 5/8 inch diameter puddle welds, fastened with screws, powder-actuated fasteners, or pneumatically driven fasteners as indicated on the design drawings and in accordance with manufacturer's recommended procedure and ANSI/SDI RD. Clamp or weight deck units to provide firm contact between deck units and structural supports while performing welding or fastening. Attachment of

adjacent deck units by button-punching is prohibited.

3.2.1.1 Welding

Perform welding in accordance with AWS D1.3/D1.3M using methods and electrodes recommended by the manufacturers of the base metal alloys being used. Ensure only operators previously qualified by tests prescribed in AWS D1.3/D1.3M make welds. Immediately recertify, or replace qualified welders, that are producing unsatisfactory welding. Conform to the recommendations of the Steel Deck Institute and the steel deck manufacturer for location, size, and spacing of fastening. Do not use welding washers at sidelaps. Holes and similar defects will not be acceptable. Attach all partial or segments of deck units to structural supports in accordance with Section 2.5 of SDI DDM04. Immediately clean welds by chipping and wire brushing. Heavily coat welds, cut edges and damaged portions of coated finish with zinc-dust paint conforming to ASTM A780/A780M finish with the manufacturer's standard touch-up paint.

3.2.1.2 Mechanical Fastening

Anchor deck to structural supports and adjoining units with mechanical fasteners. Drive the powder-actuated fasteners with a low-velocity piston tool by an operator authorized by the manufacturer of the powder-actuated tool. Drive pneumatically fasteners with a low-velocity fastening tool and comply with the manufacturer's recommendations.

3.2.1.3 Sidelap Fastening

Lock sidelaps between adjacent floor deck units together by welding or screws as indicated.

3.2.2 Openings

Cut or drill all holes and openings required and be coordinated with the drawings, specifications, and other trades. Frame and reinforce openings through the deck in conformance with SDI DDP. Reinforce holes and openings 6 to 12 inch across by 0.0474 inch thick steel sheet at least 12 inch wider and longer than the opening and be fastened to the steel deck at each corner of the sheet and at a maximum of 6 inch on center. Reinforce holes and openings larger than 12 inch by steel channels or angles installed perpendicular to the steel joists and supported by the adjacent steel joists. Install steel channels or angles perpendicular to the deck ribs and fasten to the channels or angles perpendicular to the steel joists. Deck manufacturer shall approve holes or openings larger than 6 inch in diameter prior to drilling or cutting. Openings must not interfere with seismic members such as chords and drag struts.

3.2.3 Deck Damage

SDI MOC3, for repair of deck damage.

3.2.4 Touch-Up Paint

3.2.4.1 Roof Deck

After roof decking installation, wire brush, clean, and touchup paint the scarred areas on top and bottom surfaces of metal roof decking. The scarred areas include welds, weld scars, bruises, and rust spots. Touchup galvanized surfaces with galvanizing repair paint. Touchup painted

surfaces with repair paint of painted surfaces.

3.2.5 Accessory Installation

3.2.5.1 Adjusting Plates

Provide in locations too narrow to accommodate full-size deck units and install as shown on shop drawings.

3.2.5.2 End Closures

Provide end closure to close open ends of cells at columns, walls, and openings in deck.

3.2.5.3 Closures Above Partitions

Provide for closing voids between cells over partitions that are perpendicular to direction of cells. Provide a one-piece closure strip for partitions 4 inch nominal or less in thickness and two-piece closure strips for wider partitions. Provide sheet metal closures above fire-rated partitions at both sides of partition with space between filled with fiberglass insulation. Provide flexible rubber closures above acoustic-rated partitions at both sides of partition with space between filled with blanket insulation.

3.2.5.4 Cover Plates

Provide metal cover plates, or joint tape, at joints between cellular decking sheets to be used as electrical raceways.

3.2.5.5 Access Hole Covers

Provide access whole covers to seal holes cut in decking to facilitate welding of the deck to structural supports.

3.2.5.6 Hangers

Provide as indicated to support utility system and suspended ceilings. Space devices as indicated.

3.2.6 Sound Absorbing Material

Install sound absorbing glass fiber roll or premolded form, neatly in voids between perforated webs of acoustical noncellular steel deck or glass fiber rigid strip, in cells of acoustical cellular steel deck. Keep sound absorbing material dry before, during and after installation.

3.2.7 Preparation of Fire-Proofed Surfaces

Provide deck surfaces, both composite and noncomposite, which are to receive sprayed-on fireproofing, galvanized and free of all grease, mill oil, paraffin, dirt, salt, and other contaminants which impair adhesion of the fireproofing. Complete any required cleaning prior to steel deck installation using a cleaning method that is compatible with the sprayed-on fireproofing.

3.3 CANT STRIPS FOR ROOF DECKS

Provide strips to be fusion welded to surface of roof decking, secured to

wood nailers by galvanized screws or to steel framing by galvanized self-tapping screws or welds. Do not exceed spacing of welds and fasteners of 12 inch. Lap end joints a minimum 3 inch and secure with galvanized sheet metal screws spaced a maximum 4 inch on center.

3.4 RIDGE AND VALLEY PLATES FOR ROOF DECKS

Provide plates to be fusion welded to top surface of roof decking. Lap end joints a minimum 3 inch. For valley plates, provide endlaps to be in the direction of water flow.

3.5 CLOSURE STRIPS FOR ROOF DECKS

Provide closure strips at open, uncovered ends and edges of the roof decking and in voids between roof decking and top of walls and partitions where indicated. Install closure strips in position in a manner to provide a weathertight installation.

3.6 ROOF INSULATION SUPPORT FOR ROOF DECKS

Provide metal closure strips for support of roof insulation where rib openings in top surface of metal roof decking occur adjacent to edges and openings. Weld metal closure strips in position.

3.7 CLEANING AND PROTECTION FOR ROOF DECKS

Upon completion of the deck, sweep surfaces clean and prepare for installation of the roofing.

3.8 FIELD QUALITY CONTROL

3.8.1 Headed Stud Inspection

In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

- a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
- b. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

3.8.2 Deck Weld Inspection

Visual inspect welds in accordance with AWS D1.3/D1.3M.

3.8.3 Decks Not Receiving Concrete

Inspect the decking top surface for distortion after installation. For roof decks not receiving concrete, verify distortion by placing a straight edge across three adjacent top flanges. The maximum allowable gap between the straight edge and the top flanges should not exceed manufacturing and construction tolerances of supporting members. When gap is more than the allowable, provide corrective measures or replacement. Reinspect decking after performing corrective measures or replacement.

SOF Military Working Dog Kennel
Hunter Army Airfield, Georgia

PN 69262

-- End of Section --

SECTION 05 40 00

COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 318 (2014; Errata 1-2 2014; Errata 3-5 2015; Errata 6 2016; Errata 7-9 2017) Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary (ACI 318R-14)

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI S100 (2012) North American Specification for the Design of Cold-Formed Steel Structural Members

AISI S200 (2007) North American Standard for Cold-Formed Steel Framing - General Provision

AISI S201 (2007) North American Standard for Cold-Formed Steel Framing - Product Data

AISI S202 (2011) Code of Standard Practice for Cold-formed Steel Structural Framing

AISI S211 (2007) North American Standard for Cold-Formed Steel Framing - Wall Stud Design

AISI S212 (2007) North American Standard for Cold-Formed Steel Framing - Header Design

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2020; Errata 1 2021) Structural Welding Code - Steel

AWS D1.3/D1.3M (2018) Structural Welding Code - Sheet Steel

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M (2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A153/A153M (2016a) Standard Specification for Zinc

Coating (Hot-Dip) on Iron and Steel
Hardware

ASTM A307	(2021) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A370	(2020) Standard Test Methods and Definitions for Mechanical Testing of Steel Products
ASTM A653/A653M	(2020) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A1003/A1003M	(2015) Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members
ASTM C955	(2017) Standard Specification for Cold-Formed Steel Structural Framing Members
ASTM C1007	(2020) Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories
ASTM C1513	(2018) Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections
ASTM E329	(2021) Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
ASTM E488/E488M	(2015) Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements
ASTM F1554	(2020) Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
ASTM F1941	(2010) Standard Specification for Electrodeposited Coatings on Threaded Fasteners (Unified Inch Screw Threads (UN/UNR))
ASTM F2329/F2329M	(2015) Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2018) International Building Code

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-301-01

(2019) Structural Engineering

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Framing Components; G AE

SD-03 Product Data

Steel Studs, Joists, Tracks, Bracing, Bridging and Accessories; G AE

Recycled Content of Steel Products; S

SD-05 Design Data

Metal Framing Calculations; G RO

SD-07 Certificates

Load-Bearing Cold-Formed Metal Framing

Welds

1.3 DELIVERY, STORAGE, AND HANDLING

Steel framing and related accessories shall be stored and handled in accordance with the AISI S202, "Code of Standard Practice for Cold-Formed Steel Structural Framing".

1.4 LOAD-BEARING COLD-FORMED METAL FRAMING

Include top and bottom tracks, bracing, fastenings, and other accessories necessary for complete installation. Framing members shall have the structural properties indicated. Where physical structural properties are not indicated, they shall be as necessary to withstand all imposed loads. Design framing in accordance with AISI S100.

Submit mill certificates or test reports from independent testing agency, qualified in accordance with ASTM E329, showing that the steel sheet used in the manufacture of each cold-formed component complies with the minimum yield strengths and uncoated steel thickness specified. Test reports shall be based on the results of three coupon tests in accordance with ASTM A370.

1.5 MAXIMUM DEFLECTION

Deflections of structural members shall not exceed the more restrictive of

the limitations of ICC IBC and UFC 3-301-01 steel stud backup for brick or masonry CMU shall have a maximum deflection of height/600.

1.6 QUALITY ASSURANCE

- a. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a registered professional engineer.
- b. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E329 for testing indicated.
- c. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- d. Welding Qualifications: Qualify procedures and personnel according to the following:
 - (1) AWS D1.1/D1.1M, "Structural Welding Code - Steel".
 - (2) AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel".
- e. AISI Specifications and Standards: Comply with:
 - (1) AISI S100, "North American Specification for the Design of Cold-Formed Steel Structural Members".
 - (2) AISI S200, "North American Standard for Cold-Formed Steel Framing - General Provision".
 - (3) AISI S201, "North American Standard for Cold-Formed Steel Framing - Product Data".
 - (4) AISI S202, "Code of Standard Practice for Cold-Formed Steel Structural Framing".
 - (5) AISI S211, "North American Standard for Cold-Formed Steel Framing - Wall Stud Design".
 - (6) AISI S212, "North American Standard for Cold-Formed Steel Framing - Header Design".

1.6.1 Drawing Requirements

Submit framing components to show sizes, thicknesses, layout, material designations, methods of installation, and accessories including the following:

- a. Cross sections, plans, and/or elevations showing component types and locations for each framing application; including shop coatings and material thicknesses for each framing component.
- b. Connection details showing fastener type, quantity, location, and other information to assure proper installation.

- c. Drawings depicting panel configuration, dimensions, components, locations, and construction sequence if the Contractor elects to install prefabricated/prefinished frames.

Sign and seal fabrication drawings by a registered professional engineer.

1.6.2 Design Data Required

Submit metal framing calculations with design criteria and structural loading to verify sizes, thickness, and spacing of members and connections signed and sealed by a registered professional engineer. Show methods and practices used in installation.

PART 2 PRODUCTS

2.1 STEEL STUDS, JOISTS, TRACKS, BRACING, BRIDGING AND ACCESSORIES

Framing components shall comply with ASTM C955 and the following.

- a. Provide products with an average recycled content of steel products so postconsumer recycled content plus one half of preconsumer recycled content not less than 25 percent.
- b. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 - (1) Grade: As required by structural performance.
 - (2) Coating: G90 (Z275).
- c. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - (1) Minimum Base-Metal Thickness: 0.0428 inch.
 - (2) Minimum Flange Width: 1-5/8 inches.
- d. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
 - (1) Minimum Base-Metal Thickness: 0.0428 inch.
 - (2) Minimum Flange Width: 1-1/4 inches.
- e. Roof Truss Members: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, and as required by structural performance.

2.1.1 Studs and Joists of 54 mils (0.054 Inch) and Heavier

Galvanized steel, ASTM A653/A653M and ASTM A1003/A1003M, SS Grade 50, G90.

2.1.2 Studs and Joists of 43 mils (0.043 Inch) and Lighter

Studs and Joists of 43 mils (0.043 Inch) and Lighter, Track, and Accessories (All thicknesses): Galvanized steel, ASTM A653/A653M and ASTM A1003/A1003M, SS, Grade 33 33,000 psi G90.

2.1.3 Sizes, Thickness, Section Modulus, and Other Structural Properties

Size and thickness as required.

2.2 MARKINGS

Studs and track shall have product markings stamped on the web of the section. The markings shall be repeated throughout the length of the member at a maximum spacing of 4 feet on center and shall be legible and easily read. The product marking shall include the following:

- a. An ICC number.
- b. Manufacturer's identification.
- c. Minimum delivered uncoated steel thickness.
- d. Protective coating designator.
- e. Minimum yield strength.

2.3 CONNECTIONS

2.3.1 Steel-To-Concrete Connections

- a. Anchor Rods: ASTM F1554, Grade as required by structural performance.
- b. Post-Installed Concrete Anchors: Adhesive or expansion anchors fabricated from corrosion-resistant materials with allowable load capacities in accordance with ICC-ES AC193 and ACI 318 greater than or equal to the design load as determined by testing per ASTM E488/E488M conducted by a qualified testing agency.
- c. Power-Actuated Fasteners: Fabricated from corrosion-resistant materials with allowable load capacities in accordance with ICC-ES AC 70 greater than or equal to the design load as determined by testing per ASTM E1190 conducted by a qualified testing agency.

2.3.2 Steel-To-Steel Connections

- a. Screws: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping steel screws of the type and size indicated. Provide low-profile head beneath sheathing and manufacturer's standard elsewhere. Electroplated to a minimum of 5 micron zinc coating per ASTM F1941 or hot-dipped galvanized per ASTM A123/A123M or ASTM A153/A153M.
- b. Bolts: ASTM A307 coated by hot-dip process per ASTM F2329/F2329M or zinc-coated by mechanical-deposition process per ASTM B695, Class 55.
- c. Welding Electrodes: Comply with AWS standards.

2.4 PLASTIC GROMMETS

Supply plastic grommets for stud webs as recommended by stud manufacturer, to protect electrical wires and plumbing piping. Prevent metal-to-metal contact between wiring/piping and studs.

2.5 SEALER GASKET

Closed-cell neoprene foam, 1/4-inch thick, selected from manufacturer's standard widths to match width of bottom track on concrete slab or foundation.

PART 3 EXECUTION

3.1 FASTENING

Fasten framing members together by welding or by using self-drilling, self-tapping screws. Electrodes and screw connections shall be as required and indicated in the design calculations.

3.1.1 Welds

All welding shall be performed in accordance with AWS D1.3/D1.3M, as modified by AISI S100. All welders, welding operations, and welding procedures shall be qualified according to AWS D1.3/D1.3M. Submit certified copies of welder qualifications test records showing qualification in accordance with AWS D1.3/D1.3M. All welds shall be cleaned and coated with rust inhibitive galvanizing paint. Do not field weld materials lighter than 43 mils.

3.1.2 Screws

Screws shall be of the self-drilling self-tapping type, size, and location as required. Screw penetration through joined materials shall not be less than three exposed threads. Minimum spacings and edge distances for screws shall be as specified in AISI S100. Screws covered by sheathing materials shall have low profile heads.

3.1.3 Anchors

Anchors shall be of the type, size, and location as required.

3.1.4 Powder-Actuated Fasteners

Powder-actuated fasteners shall be of the type, size, and location as required.

3.2 INSTALLATION

Install cold-formed framing in accordance with ASTM C1007 and AISI S200.

Install cold-formed steel framing according to AISI S202 and to manufacturer's written instructions unless more stringent requirements are indicated.

3.2.1 Tracks

Provide accurately aligned runners at top and bottom of studs. Install sealer gasket under bottom of track on concrete slab or foundation. Anchor tracks as indicated in design calculations. Butt weld joints in tracks or splice with stud inserts. Fasteners shall be at least 3 inches from the edge of concrete slabs.

3.2.2 Studs

Cut studs square and set with firm bearing against webs of top and bottom tracks. Position studs vertically in tracks and space as indicated in design. Do not splice studs. Provide at least two studs at jambs of doors and other openings 2 feet wide or larger. Provide jack studs over openings, as necessary, to maintain indicated stud spacing. Provide tripled studs at corners, positioned to receive interior and exterior finishes. Fasten studs to top and bottom tracks by welding or screwing both flanges to the tracks. Framed wall openings shall include headers and supporting components as shown on the drawings. Headers shall be installed in all openings that are larger than the stud spacing in a wall. In curtain wall construction, provide for vertical movement where studs connect to the structural frame. Provide horizontal bracing in accordance with the design calculations and AISI S100. Bracing shall be not less than the following:

<u>LOAD</u>	<u>HEIGHT</u>	<u>BRACING</u>
Wind load only	Up to 10 feet	One row at mid-height
	Over 10 feet	Rows 5'-0" o.c. maximum

3.2.3 Joists

- a. Provide a stud directly under each joist or truss. The maximum spacing of studs as indicated shall be maintained.
- b. Install temporary bracing and supports. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

3.2.4 Erection Tolerances

- a. Framing members which will be covered by finishes such as wallboard, plaster, or ceramic tile set in a mortar setting bed, shall be within the following limits:
 - (1) Layout of walls and partitions: 1/4 inch from intended position;
 - (2) Plates and runners: 1/4 inch in 8 feet from a straight line;
 - (3) Studs: 1/4 inch in 8 feet out of plumb, not cumulative; and
 - (4) Face of framing members: 1/4 inch in 8 feet from a true plane.

-- End of Section --

SECTION 05 50 13

MISCELLANEOUS METAL FABRICATIONS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ALUMINUM ASSOCIATION (AA)

AA DAF45 (2003; Reaffirmed 2009) Designation System
for Aluminum Finishes

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 303 (2016) Code of Standard Practice for Steel
Buildings and Bridges

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B18.2.1 (2012; Errata 2013) Square and Hex Bolts
and Screws (Inch Series)

ASME B18.2.2 (2015) Nuts for General Applications:
Machine Screw Nuts, Hex, Square, Hex
Flange, and Coupling Nuts (Inch Series)

ASME B18.6.2 (2020) Square Head Set Screws and Slotted
Headless Set Screws (Inch Series)

ASME B18.6.3 (2013; R 2017) Machine Screws, Tapping
Screws, and Machine Drive Screws (Inch
Series)

ASME B18.21.1 (2009; R 2016) Washers: Helical
Spring-Lock, Tooth Lock, and Plain Washers
(Inch Series)

ASME B18.21.2M (1999; R 2014) Lock Washers (Metric Series)

ASME B18.22M (1981; R 2017) Metric Plain Washers

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP A10.3 (2020) Safety Requirements for
Powder-Actuated Fastening Systems American
National Standard for Construction and
Demolition Operations

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2020; Errata 1 2021) Structural Welding
Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A47/A47M	(1999; R 2018; E 2018) Standard Specification for Ferritic Malleable Iron Castings
ASTM A53/A53M	(2018) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2016a) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A307	(2021) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A500/A500M	(2021a) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A653/A653M	(2020) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A924/A924M	(2020) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B26/B26M	(2018; E 2018) Standard Specification for Aluminum-Alloy Sand Castings
ASTM B108/B108M	(2019) Standard Specification for Aluminum-Alloy Permanent Mold Castings
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B221	(2021) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM C1513	(2018) Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections
ASTM D1187/D1187M	(1997; E 2011; R 2011) Asphalt-Base Emulsions for Use as Protective Coatings

for Metal

ASTM F1554 (2020) Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

MASTER PAINTERS INSTITUTE (MPI)

MPI 79 (2016) Primer, Alkyd, Anti-Corrosive for Metal

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 3 (2018) Power Tool Cleaning

SSPC SP 6/NACE No.3 (2007) Commercial Blast Cleaning

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2024) Safety -- Safety and Occupational Health (SOH) Requirements

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Bollards/Pipe Guards

Embedded Angles and Plates, Installation Drawings

SD-03 Product Data

Recycled Content; S

SD-07 Certificates

Certificates of Compliance

1.3 QUALIFICATION OF WELDERS

Qualify welders in accordance with AWS D1.1/D1.1M. Use procedures, materials, and equipment of the type required for the work.

1.4 DELIVERY, STORAGE, AND PROTECTION

Protect from corrosion, deformation, and other types of damage. Store items in an enclosed area free from contact with soil and weather. Remove and replace damaged items with new items.

1.5 MISCELLANEOUS REQUIREMENTS

1.5.1 Fabrication Drawings

Submit fabrication drawings showing layout(s), connections to structural system, and anchoring details as specified in AISC 303.

1.5.2 Installation Drawings

Submit templates, erection, and installation drawings indicating thickness, type, grade, class of metal, and dimensions. Show construction details, reinforcement, anchorage, and installation in relation to the building construction.

PART 2 PRODUCTS

2.1 RECYCLED CONTENT

Provide products with recycled content. Provide certificates of compliance for recycled content.

2.2 MATERIALS

Provide exposed fastenings of compatible materials (avoid contact of dissimilar metals). Coordinate color and finish with the material to which fastenings are applied.

2.2.1 Structural Carbon Steel

Provide in accordance with ASTM A36/A36M.

2.2.2 Structural Tubing

Provide in accordance with ASTM A500/A500M.

2.2.3 Steel Pipe

Provide in accordance with ASTM A53/A53M, Type E or S, Grade B.

2.2.4 Fittings for Steel Pipe

Provide standard malleable iron fittings in accordance with ASTM A47/A47M.

2.2.5 Anchor Bolts

Provide in accordance with ASTM F1554. Where exposed, provide anchor bolts of the same material, color, and finish as the metal to which they are applied.

2.2.5.1 Lag Screws and Bolts

Provide in accordance with ASME B18.2.1, type and grade best suited for the purpose.

2.2.5.2 Toggle Bolts

Provide in accordance with ASME B18.2.1.

2.2.5.3 Bolts, Nuts, Studs and Rivets

Provide in accordance with ASME B18.2.2 or ASTM A307.

2.2.5.4 Powder Actuated Fasteners

Follow safety provisions in accordance with ASSP A10.3.

2.2.5.5 Screws

Provide in accordance with ASME B18.2.1, ASME B18.6.2, ASME B18.6.3 and ASTM C1513.

2.2.5.6 Washers

Provide plain washers in accordance with ASME B18.22M, ASME B18.21.1. Provide beveled washers for American Standard beams and channels, square or rectangular, tapered in thickness, and smooth. Provide lock washers in accordance with ASME B18.21.2M, ASME B18.21.1.

2.2.6 Aluminum Alloy Products

Provide in accordance with ASTM B209 for sheet plate, ASTM B221 for extrusions and ASTM B26/B26M or ASTM B108/B108M for castings. Provide aluminum extrusions at least 1/8 inch thick and aluminum plate or sheet at least 0.050 inch thick.

2.3 FABRICATION FINISHES

2.3.1 Galvanizing

Hot-dip galvanize items specified to be zinc-coated, after fabrication where practicable. Provide galvanizing in accordance with ASTM A123/A123M, ASTM A153/A153M, ASTM A653/A653M or ASTM A924/A924M, Z275 G90.

2.3.2 Galvanize

Anchor bolts, grating fasteners, washers, and parts or devices necessary for proper installation, unless indicated otherwise.

2.3.3 Shop Cleaning and Painting

2.3.3.1 Surface Preparation

Blast clean surfaces in accordance with SSPC SP 6/NACE No.3. Surfaces that will be exposed in spaces above ceiling or in attic spaces, crawl spaces, furred spaces, and chases may be cleaned in accordance with SSPC SP 3 in lieu of being blast cleaned. Wash cleaned surfaces which become contaminated with rust, dirt, oil, grease, or other contaminants with solvents until thoroughly clean. Steel to be embedded in concrete must be free of dirt and grease prior to embed. Do not paint or galvanize bearing surfaces, including contact surfaces within slip critical joints. Shop coat these surfaces with rust prevention.

2.3.3.2 Pretreatment, Priming and Painting

Apply pre-treatment, primer, and paint in accordance with manufacturer's printed instructions.

2.3.4 Nonferrous Metal Surfaces

Protect by plating, anodic, or organic coatings.

2.3.5 Aluminum Surfaces

2.3.5.1 Surface Condition

Before finishes are applied, remove roll marks, scratches, rolled-in scratches, kinks, stains, pits, orange peel, die marks, structural streaks, and other defects which will affect uniform appearance of finished surfaces.

2.3.5.2 Aluminum Finishes

Unexposed sheet, plate and extrusions may have mill finish as fabricated. Sandblast castings' finish, medium, AA DAF45. Unless otherwise specified, provide all other aluminum items with an anodized finish. Provide a coating thickness not less than that specified for protective and decorative type finishes for items used in interior locations or architectural Class I type finish for items used in exterior locations. Provide in accordance with AA DAF45. Provide a polished satin finish on items to be anodized.

2.4 BOLLARDS/PIPE GUARDS

Provide 6 inch prime coated standard weight steel pipe in accordance with ASTM A53/A53M. Anchor posts in concrete as indicated and fill solidly with concrete with minimum compressive strength of 2,500 psi.

2.5 MISCELLANEOUS PLATES AND SHAPES

Provide items that do not form a part of the structural steel framework, such as lintels, sill angles, support framing for ceiling-mounted toilet partitions, miscellaneous mountings and frames. Provide lintels fabricated from structural steel shapes over openings in masonry walls and partitions as required to support wall loads over openings. Provide with connections and fasteners or welds. Construct to have at least 8 in bearing on masonry at each end.

Provide angles and plates in accordance with ASTM A36/A36M, for embedment as indicated. Galvanize embedded items exposed to the elements in accordance with ASTM A123/A123M.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Install items at locations indicated in accordance with manufacturer's instructions. Verify all field dimensions prior to fabrication. Include materials and parts necessary to complete each assembly, whether indicated or not. Misalignment and miss-sizing of holes for fasteners is cause for rejection. Conceal fastenings where practicable. Joints exposed to weather must be watertight.

3.2 WORKMANSHIP

Provide miscellaneous metalwork that is true and accurate in shape, size, and profile. Make angles and lines continuous and straight. Make curves

consistent, smooth and unfaceted. Provide continuous welding along the entire area of contact except where tack welding is permitted. Do not tack weld exposed connections. Unless otherwise indicated and approved, provide a smooth finish on exposed surfaces. Provide countersunk rivets where exposed. Provide coped and mitered corner joints aligned flush and without gaps.

3.3 ANCHORAGE, FASTENINGS, AND CONNECTIONS

Provide anchorage as necessary, whether indicated or not, for fastening miscellaneous metal items securely in place. Include slotted inserts, expansion shields, powder-driven fasteners, toggle bolts (when approved for concrete), through bolts for masonry, headed shear studs, machine and carriage bolts for steel, through bolts, lag bolts, and screws for wood. Do not use wood plugs. Provide non-ferrous attachments for non-ferrous metal. Provide exposed fastenings of compatible materials (avoid contact of dissimilar metals), that generally match in color and finish the surfaces to which they are applied. Conceal fastenings where practicable. Provide all fasteners flush with the surfaces they fasten, unless indicated otherwise.

3.4 BUILT-IN WORK

Where necessary and not otherwise indicated, form built-in metal work for anchorage with concrete or masonry. Provide built-in metal work in ample time for securing in place as the work progresses.

3.5 WELDING

Perform welding, welding inspection, and corrective welding in accordance with AWS D1.1/D1.1M. Use continuous welds on all exposed connections. Grind visible welds smooth in the finished installation. Provide welded headed shear studs in accordance with AWS D1.1/D1.1M, Clause 7, except as otherwise specified. Provide in accordance with the safety requirements of EM 385-1-1.

3.6 DISSIMILAR METALS

Where dissimilar metals are in contact, protect surfaces with a coating in accordance with MPI 79 to prevent galvanic or corrosive action. Where aluminum is in contact with concrete, plaster, mortar, masonry, wood, or absorptive materials subject to wetting, protect in accordance with ASTM D1187/D1187M, asphalt-base emulsion. Clean surfaces with metal shavings from installation at the end of each work day.

3.7 PREPARATION

3.7.1 Material Coatings and Surfaces

Remove rust preventive coating just prior to field erection, using a remover approved by the metal manufacturer. Surfaces, when assembled, must be free of rust, grease, dirt and other foreign matter.

3.7.2 Environmental Conditions

Do not clean or paint surfaces when damp or exposed to foggy or rainy weather, when metallic surface temperature is less than minus 5 degrees F above the dew point of the surrounding air, or when surface temperature is below 45 degrees F or over 95 degrees F, unless approved by the

Contracting Officer. Metal surfaces to be painted must be dry for a minimum of 48 hours prior to the application of primer or paint.

3.8 EXPANSION JOINT COVERS

Provide in accordance with manufacturer's written instructions and with seismic requirements indicated. Verify installation allows specified movement prior to completion of work.

3.9 COVER PLATES AND FRAMES

Provide tops of cover plates and frames flush with finished surface. Test for trip hazards and adjust for any encountered lippage.

3.10 INSTALLATION OF BOLLARDS/PIPE GUARDS

Set bollards/pipe guards vertically in concrete piers. Fill hollow cores with concrete having a compressive strength of 3,000 psi.

3.11 INSTALLATION OF DOWNSPOUT TERMINATIONS

Secure downspouts terminations to downspouts and substrate per manufacturer's instructions.

3.12 INSTALLATION MISCELLANEOUS PLATES AND SHAPES

Provide lintels fabricated from structural steel shapes over openings in masonry walls and partitions as indicated and as required to support wall loads over openings. Provide with connections and fasteners or welds. Construct to have at least 8 inches bearing on masonry at each end.

-- End of Section --

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN FOREST FOUNDATION (AFF)

ATFS STANDARDS (2015) American Tree Farm System Standards
of Sustainability 2015-2020

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)

ALSC PS 20 (2015) American Softwood Lumber Standard

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION
(AREMA)

AREMA Eng Man (2017) Manual for Railway Engineering

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B18.2.1 (2012; Errata 2013) Square and Hex Bolts
and Screws (Inch Series)

ASME B18.2.2 (2015) Nuts for General Applications:
Machine Screw Nuts, Hex, Square, Hex
Flange, and Coupling Nuts (Inch Series)

ASME B18.5.2.1M (2006; R 2011) Metric Round Head Short
Square Neck Bolts

ASME B18.5.2.2M (1982; R 2010) Metric Round Head Square
Neck Bolts

ASME B18.6.1 (2016) Wood Screws (Inch Series)

AMERICAN WOOD COUNCIL (AWC)

AWC NDS (2015) National Design Specification (NDS)
for Wood Construction

AWC WFCM (2012) Wood Frame Construction Manual for
One- and Two-Family Dwellings

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA BOOK (2015) AWPA Book of Standards

AWPA M2 (2019) Standard for the Inspection of
Preservative Treated Wood Products for

Industrial Use

AWPA M6	(2013) Brands Used on Preservative Treated Materials
AWPA P5	(2015) Standard for Waterborne Preservatives
AWPA P18	(2014) Nonpressure Preservatives
AWPA U1	(2021) Use Category System: User Specification for Treated Wood

APA - THE ENGINEERED WOOD ASSOCIATION (APA)

APA L870	(2010) Voluntary Product Standard, PS 1-09, Structural Plywood

ASTM INTERNATIONAL (ASTM)

ASTM A153/A153M	(2016a) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A307	(2021) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM F547	(2017) Standard Terminology of Nails for Use with Wood and Wood-Base Materials

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

CSA GROUP (CSA)

CSA Z809-08	(R2013) Sustainable Forest Management

FM GLOBAL (FM)

FM 4435	(2013) Roof Perimeter Flashing

FOREST STEWARDSHIP COUNCIL (FSC)

FSC STD 01 001	(2015) Principles and Criteria for Forest Stewardship

GREEN SEAL (GS)

GS-36	(2013) Adhesives for Commercial Use

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2018) International Building Code

NATIONAL HARDWOOD LUMBER ASSOCIATION (NHLA)

NHLA Rules (2015) Rules for the Measurement &
Inspection of Hardwood & Cypress

NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)

NELMA Grading Rules (2013) Standard Grading Rules for
Northeastern Lumber

PROGRAMME FOR ENDORSEMENT OF FOREST CERTIFICATION (PEFC)

PEFC ST 2002:2013 (2015) PEFC International Standard Chain
of Custody of Forest Based Products
Requirements

REDWOOD INSPECTION SERVICE (RIS) OF THE CALIFORNIA REDWOOD
ASSOCIATION (CRA)

RIS Grade Use (1998) Redwood Lumber Grades and Uses

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168 (2017) Adhesive and Sealant Applications

SOUTHERN CYPRESS MANUFACTURERS ASSOCIATION (SCMA)

SCMA Spec (1986; Supple. No. 1, Aug 1993) Standard
Specifications for Grades of Southern
Cypress

SOUTHERN PINE INSPECTION BUREAU (SPIB)

SPIB 1003 (2014) Standard Grading Rules for Southern
Pine Lumber

SUSTAINABLE FOREST INITIATIVE (SFI)

SFI 2015-2019 (2015) Standards, Rules for Label Use,
Procedures and Guidance

U.S. DEPARTMENT OF COMMERCE (DOC)

DOC/NIST PS56 (1973) Structural Glued Laminated Timber

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-1923 (Rev A; Notice 3) Shield, Expansion (Lag,
Machine and Externally Threaded Wedge Bolt
Anchors)

CID A-A-1924 (Rev A; Notice 3) Shield, Expansion (Self
Drilling Tubular Expansion Shell Bolt
Anchors)

CID A-A-1925 (Rev A; Notice 3) Shield Expansion (Nail
Anchors)

UNDERWRITERS LABORATORIES (UL)

UL 2818 (2013) GREENGUARD Certification Program
For Chemical Emissions For Building
Materials, Finishes And Furnishings

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

WCLIB 17 (2015) Standard Grading Rules

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

WWPA G-5 (2017) Western Lumber Grading Rules

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Nailers and Nailing Strips

Drawings of field erection details, including materials and methods of fastening nailers in conformance with Factory Mutual wind uplift rated systems specified in other Sections of these specifications.

SD-03 Product Data

Adhesives

SD-06 Test Reports

Preservative-treated Lumber and Plywood

SD-07 Certificates

Certificates of Grade

Preservative Treatment

Indoor Air Quality for Aerosol Adhesives; S

Indoor Air Quality for Non-aerosol Adhesives; S

SD-10 Operation and Maintenance Data

Plastic

When not labeled, identify types in Operation and Maintenance Manual.

Take-back Program

Include contact information, summary of procedures, and the limitations and conditions applicable to the project. Indicate manufacturer's commitment to reclaim materials for recycling or reuse.

1.3 DELIVERY AND STORAGE

Deliver materials to the site in an undamaged condition. Store, protect, handle, and install prefabricated structural elements in accordance with manufacturer's instructions and as specified. Store materials off the ground to provide proper ventilation, with drainage to avoid standing water, and protection against ground moisture and dampness. Store materials with a moisture barrier at both the ground level and as a cover forming a well ventilated enclosure. Store wood I-beams and glue-laminated beams and joists on edge. Adhere to requirements for stacking, lifting, bracing, cutting, notching, and special fastening requirements. Do not use materials that have visible moisture or biological growth. Remove defective and damaged materials and provide new materials. Store separated reusable wood waste convenient to cutting station and area of work.

1.4 GRADING AND MARKING

1.4.1 Lumber

Mark each piece of framing and board lumber or each bundle of small pieces of lumber with the grade mark of a recognized association or independent inspection agency. Such association or agency must be certified by the Board of Review, American Lumber Standards Committee, to grade the species used. Surfaces that are to be exposed to view must not bear grademarks, stamps, or any type of identifying mark. Hammer marking will be permitted on timbers when all surfaces will be exposed to view.

1.4.2 Plywood

Mark each sheet with the mark of a recognized association or independent inspection agency that maintains continuing control over the quality of the plywood. The mark must identify the plywood by species group or span rating, exposure durability classification, grade, and compliance with APA L870. Surfaces that are to be exposed to view must not bear grademarks or other types of identifying marks.

1.4.3 Preservative-Treated Lumber and Plywood

The Contractor is responsible for the quality of treated wood products. Each treated piece must be inspected in accordance with AWPA M2 and permanently marked or branded, by the producer, in accordance with AWPA M6. The Contractor must provide Contracting Officer's Representative (COR) with the inspection report of an approved independent inspection agency that offered products comply with applicable AWPA Standards. The appropriate Quality Mark on each piece will be accepted, in lieu of inspection reports, as evidence of compliance with applicable AWPA treatment standards.

1.4.4 Hardboard, Gypsum Board, and Fiberboard

Mark each sheet or bundle to identify the standard under which the material is produced and the producer.

1.5 SIZES AND SURFACING

ALSC PS 20 for dressed sizes of yard and structural lumber. Lumber must be surfaced four sides. Size references, unless otherwise specified, are nominal sizes, and actual sizes must be within manufacturing tolerances allowed by the standard under which the product is produced. Other measurements are IP or SI standard.

1.6 MOISTURE CONTENT

Air-dry or kiln-dry lumber. Kiln-dry treated lumber after treatment. Maximum moisture content of wood products must be as follows at the time of delivery to the job site:

- a. Framing lumber and board, 19 percent maximum.
- b. Timbers 5 inches and thicker, 25 percent maximum.
- c. Materials other than lumber; moisture content must be in accordance with standard under which the product is produced.

1.7 PRESERVATIVE TREATMENT

Treat wood products with waterborne wood preservatives conforming to AWPA P5. Pressure treatment of wood products must conform to the requirements of AWPA BOOK Use Category System Standards U1 and T1. Pressure-treated wood products must not contain arsenic, chromium, or other agents classified as carcinogenic, probably carcinogenic, or possibly carcinogenic to humans (compounds in Groups 1, 2A, or 2B) by the International Agency for Research on Cancer (IARC), Lyon, France. Pressure-treated wood products must not exceed the limits of the U.S. EPA's Toxic Characteristic Leaching Procedure (TCLP), and must not be classified as hazardous waste. Submit certification from treating plant stating chemicals and process used and net amount of preservatives retained are in conformance with specified standards. In accordance with AWPA U1 provide non-copper preservative treatment such as EL2, PTI or SBX, DOT for products in direct contact with sheet metal.

- a. 0.25 pcf intended for above ground use.
- b. 0.40 pcf intended for ground contact and fresh water use. 0.60 pcf intended for Ammoniacal Copper Quaternary Compound (ACQ)-treated foundations. 0.80 to 1.00 pcf intended for ACQ-treated pilings. All wood must be air or kiln dried after treatment. Specific treatments must be verified by the report of an approved independent inspection agency, or the AWPA Quality Mark on each piece. Do not incise surfaces of lumber that will be exposed. Minimize cutting and avoid breathing sawdust. Brush coat areas that are cut or drilled after treatment with either the same preservative used in the treatment or with a 2 percent copper naphthenate solution. All lumber and woodwork must be preservative treated. Plastic lumber must not be preservative treated. The following items must be preservative treated:
 - (1) Wood framing, woodwork, and plywood up to and including the subflooring at the first-floor level of structures having crawl spaces when the bottoms of such items are 24 inches or less from the earth underneath.
 - (2) Wood members that are in contact with water.

- (3) Exterior wood steps, platforms, and railings; and all wood framing of open, roofed structures.
- (4) Wood sills, soles, plates, furring, and sleepers that are less than 24 inches from the ground, furring and nailers that are set into or in contact with concrete or masonry.
- (5) Nailers, edge strips, crickets, curbs, and cants for roof decks.

1.7.1 New Construction

Use a boron-based preservative conforming to AWPAC P18, sodium silicate wood mineralization process, or Ammoniacal Copper Quaternary Compound to treat wood. Use boron-based preservatives for above-ground applications only.

1.8 QUALITY ASSURANCE

1.8.1 Drawing Requirements

For fabricated structural members, trusses, glulam members, indicate materials, details of construction, methods of fastening, and erection details. Include reference to design criteria used and manufacturers design calculations. Submit drawings for all proposed modifications of structural members. Do not proceed with modifications until the submittal has been approved.

1.8.2 Data Required

Submit calculations and drawings for all proposed modifications of structural members. Do not proceed with modifications until the submittal has been approved.

1.8.3 Humidity Requirements

Sequence work to minimize use of temporary HVAC to dry out building and control humidity.

1.9 ENVIRONMENTAL REQUIREMENTS

During and immediately after installation of treated wood, engineered wood products, and laminated wood products at interior spaces, provide temporary ventilation.

1.10 CERTIFICATIONS

1.10.1 Certified Wood Grades

Provide certificates of grade from the grading agency on graded but unmarked lumber or plywood attesting that materials meet the grade requirements specified herein.

1.10.2 Certified Sustainably Harvested Wood

Provide wood certified as sustainably harvested by FSC STD 01 001, ATFS STANDARDS, CSA Z809-08, SFI 2015-2019, or other third party program certified by PEFC ST 2002:2013. Provide a letter of Certification of Sustainably Harvested Wood signed by the wood supplier. Identify

certifying organization and their third party program name and indicate compliance with chain-of-custody program requirements. Submit sustainable wood certification data; identify each certified product on a line item basis. Submit copies of invoices bearing certification numbers.

1.10.3 Indoor Air Quality Certifications

Submit required indoor air quality certifications in one submittal package.

1.10.3.1 Adhesives and Sealants

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party programs that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Recovered Lumber

Use recovered lumber where practical. Unless otherwise noted, recovered lumber must be delivered clean and free of contamination. Provide grading certificates for any recovered wood materials used in structural applications. Lumber must meet the other criteria within this section. Provide documentation certifying products are from recovered lumber sources.

2.1.2 Natural Decay- and Insect-Resistant Wood

Naturally durable wood must be certified sustainably harvested natural-decay and insect-resistant wood. An occasional piece with corner sapwood is permitted if 90 percent or more of the width of each side on which the sapwood occurs is heartwood.

2.2 LUMBER

2.2.1 Framing Lumber

Framing lumber such as studs, plates, caps, collar beams, cant strips, bucks, sleepers, nailing strips, and nailers and board lumber such as subflooring and wall and roof sheathing must be one of the species listed in the table below. Minimum grade of species must be as listed. Finger-jointed lumber may be used in the same applications as solid lumber of an equivalent species and grade, provided the finger-jointed lumber meets all the requirements of the certification and the quality control programs of the rules writing agency having jurisdiction and all applicable requirements of DOC/NIST PS56. Provide certified sustainably harvested framing lumber.

<u>Table of Grades for Framing and Board Lumber</u>			
<u>Grading Rules</u>	<u>Species</u>	<u>Framing</u>	<u>Board Lumber</u>
WWPA G-5 standard grading rules	Aspen, Douglas Fir-Larch, Douglas Fir South, Engelmann Spruce-Lodgepole Pine, Engelmann Spruce, Hem-Fir, Idaho White Pine, Lodgepole Pine, Mountain Hemlock, Mountain Hemlock-Hem-Fir, Ponderosa Pine-Sugar Pine, Ponderosa Pine-Lodgepole Pine, Subalpine Fir, White Woods, Western Woods, Western Cedars, Western Hemlock	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	All Species: No. 3 Common
WCLIB 17 standard grading rules	Douglas Fir-Larch, Hem-Fir, Mountain Hemlock, Sitka Spruce, Western Cedars, Western Hemlock	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	All Species: Standard

<u>Table of Grades for Framing and Board Lumber</u>			
<u>Grading Rules</u>	<u>Species</u>	<u>Framing</u>	<u>Board Lumber</u>
SPIB 1003 standard grading rules	Southern Pine	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	No. 2 Boards
SCMA Spec standard specifications	Cypress	No. 2 Common	No. 2 Common
NELMA Grading Rules standard grading rules	Balsam Fir, Eastern Hemlock-Tamarack, Eastern Spruce, Eastern White Pine, Northern Pine, Northern Pine-Cedar	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	All Species: No. 3 Common except Standard for Eastern White and Northern Pine
RIS Grade Use standard specifications	Redwood	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	Construction Heart

<u>Table of Grades for Framing and Board Lumber</u>			
<u>Grading Rules</u>	<u>Species</u>	<u>Framing</u>	<u>Board Lumber</u>
NHLA Rules rules for the measurement and inspection of hardwood and cypress lumber	Cypress	No. 2 Dimension	No. 2 Common

2.3 PLYWOOD, STRUCTURAL-USE, AND ORIENTED STRAND BOARD (OSB) PANELS

2.3.1 Other Uses

2.3.1.1 Plywood

Plywood as indicated in drawings. C-D Grade, Exposure 1. Provide certified sustainably harvested plywood for other uses.

2.4 OTHER MATERIALS

2.4.1 Miscellaneous Wood Members

2.4.1.1 Nonstress Graded Members

Members must include bridging, corner bracing, furring, grounds, and nailing strips. Members must be in accordance with TABLE I for the species used. Sizes must be as follows unless otherwise shown:

Member	Size inch
Bridging	1 x 3 or 1 x 4 for use between members 2 x 12 and smaller; 2 x 4 for use between members larger than 2 x 12.
Corner bracing	1 x 4.
Furring	1 x 2
Grounds	Plaster thickness by 38.
Nailing strips	1 x 3 or 1 x 4 when used as shingle base or interior finish, otherwise 2 inch stock.

2.4.1.2 Wood Bumpers

AREMA Eng Man, Industrial grade cross ties

2.4.1.3 Sill Plates

Sill plates must be standard or number 2 grade.

2.4.1.4 Blocking

Blocking must be standard or number 2 grade.

2.4.1.5 Rough Bucks and Frames

Rough bucks and frames must be straight standard or number 2 grade.

2.4.2 Adhesives

Comply with applicable regulations regarding toxic and hazardous materials and as specified. Provide non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide aerosol adhesives used on the interior of the building meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of GS-36. Provide certification or validation of indoor air quality for non-aerosol adhesives applied on the interior of the building (inside of the weatherproofing system). Provide certification or validation of indoor air quality for aerosol adhesives used on the interior of the building (inside of the weatherproofing system).

2.5 ROUGH HARDWARE

Unless otherwise indicated or specified, rough hardware must be of the type and size necessary for the project requirements. Sizes, types, and spacing of fastenings of manufactured building materials must be as recommended by the product manufacturer unless otherwise indicated or specified. Rough hardware exposed to the weather or embedded in or in contact with preservative treated wood, exterior masonry, or concrete walls or slabs must be hot-dip zinc-coated in accordance with ASTM A153/A153M. Nails and fastenings for fire-retardant treated lumber and woodwork exposed to the weather must be copper alloy or hot-dipped galvanized fasteners as recommended by the treated wood manufacturer.

2.5.1 Bolts, Nuts, Studs, and Rivets

ASME B18.2.1, ASME B18.5.2.1M, ASME B18.5.2.2M and ASME B18.2.2.

2.5.2 Anchor Bolts

ASTM A307, size as indicated, complete with nuts and washers.

2.5.3 Expansion Shields

CID A-A-1923, CID A-A-1924, and CID A-A-1925. Except as shown otherwise, maximum size of devices must be 3/8 inch.

2.5.4 Lag Screws and Lag Bolts

ASME B18.2.1.

2.5.5 Wood Screws

ASME B18.6.1.

2.5.6 Nails and Staples

ASTM F547, size and type best suited for purpose. For sheathing and subflooring, length of nails must be sufficient to extend 1 inch into supports. In general, 8-penny or larger nails must be used for nailing through 1 inch thick lumber and for toe nailing 2 inch thick lumber; 16-penny or larger nails must be used for nailing through 2 inch thick lumber. Nails used with treated lumber and sheathing must be hot-dipped galvanized in accordance with ASTM A153/A153M. Nailing must be in accordance with the recommended nailing schedule contained in AWC WFCM. Where detailed nailing requirements are not specified, nail size and spacing must be sufficient to develop an adequate strength for the connection. The connection's strength must be verified against the nail capacity tables in AWC NDS. Reasonable judgment backed by experience must ensure that the designed connection will not cause the wood to split. If a load situation exceeds a reasonable limit for nails, a specialized connector must be used.

2.5.7 Clip Angles

Steel, 3/16 inch thick, size as indicated; or zinc-coated steel or iron commercial clips designed for connecting wood members.

2.5.8 Tie Straps

For joists supported by the lower flange of steel beams, provide 1/8 by 1-1/2 inch steel strap, 2 feet long, except as indicated otherwise.

2.5.9 Panel Edge Clips

Extruded aluminum or galvanized steel, H-shaped clips to prevent differential deflection of roof sheathing.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

Conform to AWC WFCM and install in accordance with the National Association of Home Builders (NAHB) Advanced Framing Techniques: Optimum Value Engineering, unless otherwise indicated or specified. Select lumber sizes to minimize waste. Fit framing lumber and other rough carpentry, set accurately to the required lines and levels, and secure in place in a rigid manner. Space plastic lumber boards as necessary to allow for lengthwise expansion and contraction. Do not splice framing members between bearing points. Set joists, rafters, and purlins with their crown edge up. Frame members for the passage of pipes, conduits, and ducts. Provide adequate support as appropriate to the application, climate, and modulus of elasticity of the product. Do not cut or bore structural members for the passage of ducts or pipes without approval. Reinforce all members damaged by such cutting or boring by means of specially formed and approved sheet metal or bar steel shapes, or remove and provide new, as approved. Provide as necessary for the proper completion of the work all framing members not indicated or specified. Spiking and nailing not indicated or specified otherwise must be in accordance with the Nailing Schedule contained in ICC IBC; perform bolting in an approved manner.

Spikes, nails, and bolts must be drawn up tight. Install plastic lumber with screws or bolts; if nails are used, use ring shank or spiral shank nails. Use slate or steel shims when leveling joists, beams, and girders on masonry or concrete. Do not use shimming on wood or metal bearings. When joists, beams, and girders are placed on masonry or concrete, a wood base plate must be positioned and leveled with grout. The joist, beam, or girder must then be placed on the plate. When joists, beams, and girders are set into masonry or concrete, a pocket must be formed into the wall. The joist, beam, or girder must then be placed into the pocket and leveled with a steel shim.

3.1.1 Wall Sheathing

3.1.1.1 Gypsum Sheathing Board

Apply gypsum sheathing board either horizontally or vertically. Butt joints and locate over the centerlines of supports. Horizontally applied sheathing must be T&G, applied with tongued edge up. Stagger vertical joints and abut sheet closely to frames of openings. Nail sheathing with 11 gauge, 3/8 inch head, zinc-coated nails 1-1/2 inches long for 1/2 inch sheathing and 1-3/4 inches long for 5/8 inch sheathing, spaced 3/8 inch minimum from edges. Provide 2 by 4 blocking for horizontal edges of 4 foot wide panels not otherwise supported.

- a. Gypsum Sheathing Board Used with Diagonal-Braced Framing: Sheathing must be either 2 or 4 feet wide. Apply sheathing 2 feet wide horizontally. Nail 4 inches maximum o.c. at edges and over intermediate bearings. Apply sheathing 4 feet wide either horizontally or vertically. Nail 4 inches maximum o.c. at edges and 8 inches maximum o.c. at intermediate bearings.
- b. Gypsum Sheathing Board Used with Unbraced Frames: Sheathing must be 4 feet wide and applied vertically. Extend sheathing over and nail to both sill and top plates. Nail 4 inches maximum o.c. at edges and 8 inches maximum o.c. at intermediate bearings.

3.2 MISCELLANEOUS

3.2.1 Wood Roof Nailers, Edge Strips, Crickets, Curbs, and Cants

Provide sizes and configurations indicated or specified and anchored securely to continuous construction.

3.2.1.1 Roof Nailing Strips

Provide roof nailing strips for roof decks as specified herein. Apply nailing strips in straight parallel rows in the direction and spacing indicated.

- a. Surface-Applied Nailers: Must be 3 inches wide and of thickness to finish flush with the top of the insulation. Anchor strips securely to the roof deck with powder actuated fastening devices or expansion shields and bolts, spaced not more than 24 inches o.c.
- b. Embedded Nailers: Must be nominal 2 by 3 with 2 inch sides beveled. Set and anchor nailers to finish flush with the roof deck surface.

3.2.1.2 Roof Edge Strips and Nailers

Provide at perimeter of roof, around openings through roof, and where roofs abut walls, curbs, and other vertical surfaces. Except where indicated otherwise, nailers must be 6 inches wide and the same thickness as the insulation. Anchor nailers securely to underlying construction. Anchor perimeter nailers in accordance with FM 4435.

3.2.1.3 Crickets, Cants, and Curbs

Provide as indicated, specified, or necessary.

3.2.2 Wood Blocking

Provide proper sizes and shapes at proper locations for the installation and attachment of wood and other finish materials, fixtures, equipment, and items indicated or specified.

3.3 WASTE MANAGEMENT OF WOOD PRODUCTS

In accordance with the Waste Management Plan and as specified. Clearly separate damaged wood and other scrap lumber for acceptable alternative uses on site, including bracing, blocking, cripples, ties, and shims.

Separate treated, stained, painted, and contaminated wood and place in designated area for hazardous materials. Dispose of according to local regulations. Do not burn scrap lumber that has been pressure treated, or lumber that is less than one year old.

-- End of Section --

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SECTION 06 41 16.00 10

PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A161.2 (1998) Decorative Laminate Countertops,
Performance Standards for Fabricated High
Pressure

ASTM INTERNATIONAL (ASTM)

ASTM E84 (2020) Standard Test Method for Surface
Burning Characteristics of Building
Materials

ASTM F547 (2017) Standard Terminology of Nails for
Use with Wood and Wood-Base Materials

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.9 (2020) Cabinet Hardware

COMPOSITE PANEL ASSOCIATION (CPA)

CPA A208.2 (2016) Medium Density Fiberboard (MDF) for
Interior Applications

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA LD 3 (2005) Standard for High-Pressure
Decorative Laminates

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS SCS Global Services (SCS) Indoor Advantage

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BD+C (2009; R 2010) Leadership in Energy and
Environmental Design(tm) Building Design
and Construction (LEED-NC)

UL ENVIRONMENT (ULE)

ULE Greenguard ULE Greenguard Certification Program

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

ANSI/WDMA I.S.1A (2013) Interior Architectural Wood Flush
Doors

WOODWORK INSTITUTE (WI)

NAAWS 3.1 (2017; 2018 Errata Edition) North American
Architectural Woodwork Standards

1.2 SYSTEM DESCRIPTION

Work in this section includes laminate clad custom casework cabinets as shown on the drawings and as described in this specification. This Section includes high-pressure laminate surfacing and cabinet hardware. Comply with EPA requirements in accordance with Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING. All exposed and semi-exposed surfaces, whose finish is not otherwise noted on the drawings or finish schedule, shall be sanded smooth and shall receive a clear finish of polyurethane. Wood finish may be shop finished or field applied in accordance with Section 09 90 00 PAINTS AND COATINGS.

1.3 SUSTAINABILITY REPORTING

Materials in this technical specification may contribute towards contract compliance with sustainability requirements. See Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING for project LEED BD+C local/regional materials, low-emitting materials, recycled content, and rapidly renewable materials LEED documentation requirements.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawings

Installation

SD-03 Product Data

Wood Materials

Certification

SD-04 Samples

Plastic Laminates; G RO

Cabinet Hardware

SD-07 Certificates

Quality Assurance

Laminate Clad Casework

1.5 QUALITY ASSURANCE

1.5.1 General Requirements

Unless otherwise noted on the drawings, all materials, construction methods, and fabrication shall conform to and comply with the custom grade quality standards as outlined in NAAWS 3.1, Section for laminate clad cabinets. These standards shall apply in lieu of omissions or specific requirements in this specification. Contractors and their personnel engaged in the work shall be able to demonstrate successful experience with work of comparable extent, complexity and quality to that shown and specified. Submit a quality control statement which illustrates compliance with and understanding of NAAWS 3.1 requirements, in general, and the specific NAAWS 3.1 requirements provided in this specification. The quality control statement shall also certify a minimum of ten years Contractor's experience in laminate clad casework fabrication and construction. The quality control statement shall provide a list of a minimum of five successfully completed projects of a similar scope, size, and complexity.

1.5.2 Sustainable Design Certification

Product shall be third party certified in accordance with ULE Greenguard, SCS Scientific Certification Systems Indoor Advantage or equal. Certification shall be performed annually and shall be current.

1.6 DELIVERY, STORAGE, AND HANDLING

Casework may be delivered knockdown or fully assembled. Deliver all units to the site in undamaged condition, stored off the ground in fully enclosed areas, and protected from damage. The storage area shall be well ventilated and not subject to extreme changes in temperature or humidity.

1.7 SEQUENCING AND SCHEDULING

Coordinate work with other trades. Units shall not be installed in any room or space until painting, and ceiling installation are complete within the room where the units are located. Floor cabinets shall be installed before finished flooring materials are installed.

PART 2 PRODUCTS

2.1 WOOD MATERIALS

2.1.1 Lumber

- a. All framing lumber shall be kiln-dried Grade III to dimensions as shown on the drawings. Frame front, where indicated on the drawings, shall be nominal 3/4 inch hardwood.

2.1.2 Panel Products

2.1.2.1 Plywood

All plywood panels used for framing purposes shall be veneer core hardwood

plywood, NAAWS 3.1 Grade AA. Nominal thickness of plywood panels shall be as indicated in this specification and on the drawings.

2.1.2.2 Medium Density Fiberboard

Medium density fiberboard (MDF) shall be an acceptable panel substrate where noted on the drawings. Medium density fiberboard shall meet the minimum standards listed in CPA A208.2.

2.2 SOLID POLYMER MATERIAL

Solid surfacing casework components shall conform to the requirements of Section 06 61 16 SOLID SURFACING FABRICATIONS.

2.3 HIGH PRESSURE DECORATIVE LAMINATE (HPDL)

All plastic laminates shall meet the requirements of ANSI/NEMA LD 3 and ANSI A161.2 for high-pressure decorative laminates. Design, colors, surface finish and texture, and locations shall be as indicated on Section 09 06 00 SCHEDULES FOR FINISHES. Submit two samples of each plastic laminate pattern and color. Samples shall be a minimum of 5 by 7 inches in size. Plastic laminate types and nominal minimum thicknesses for casework components shall be as indicated in the following paragraphs.

2.3.1 Horizontal General Purpose Standard (HGS) Grade

Horizontal general purpose standard grade plastic laminate shall be 0.048 inches (plus or minus 0.005 inches) in thickness. This laminate grade is intended for horizontal surfaces where postforming is not required.

2.3.2 Vertical General Purpose Standard (VGS) Grade

Vertical general purpose standard grade plastic laminate shall be 0.028 inches (plus or minus 0.004 inches) in thickness. This laminate grade is intended for exposed exterior vertical surfaces of casework components where postforming is not required.

2.3.3 Horizontal General Purpose Postformable (HGP) Grade

Horizontal general purpose postformable grade plastic laminate shall be 0.042 inches (plus or minus 0.005 inches) in thickness. This laminate grade is intended for horizontal surfaces where post forming is required.

2.3.4 Vertical General Purpose Postformable (VGP) Grade

Vertical general purpose postformable grade plastic laminate shall be 0.028 inches (plus or minus 0.004 inches) in thickness. This laminate grade is intended for exposed exterior vertical surfaces of components where postforming is required for curved surfaces.

2.3.5 Horizontal General Purpose Fire Rated (HGF) Grade

Horizontal general purpose fire rated grade plastic laminate shall be 0.048 inches (plus or minus 0.005 inches) in thickness. Laminate grade shall have a class 1, class A fire rating in accordance with ASTM E84.

2.3.6 Vertical General Purpose Fire Rated (VGF) Grade

Vertical general purpose fire rated grade plastic laminate shall be 0.028

inches (plus or minus 0.004 inches) in thickness. This laminate grade shall have a class 1, class A fire rating in accordance with ASTM E84.

2.3.7 Cabinet Liner Standard (CLS) Grade

Cabinet liner standard grade plastic laminate shall be 0.020 inches in thickness. This laminate grade is intended for light duty semi-exposed interior surfaces of casework components.

2.3.8 Backing Sheet (BK) Grade

Undecorated backing sheet grade laminate is formulated specifically to be used on the backside of plastic laminated panel substrates to enhance dimensional stability of the substrate. Backing sheet thickness shall be 0.020 inches. Backing sheets shall be provided for all laminated casework components where plastic laminate finish is applied to only one surface of the component substrate.

2.4 THERMOSET DECORATIVE OVERLAYS (MELAMINE)

Thermoset decorative overlays (melamine panels) shall be used for casework cabinet interior drawer interior surfaces.

2.5 EDGE BANDING

Edge banding for casework doors and drawer fronts shall be PVC vinyl and shall be 0.020 inch thick. Material width shall be 15/16 inches. Color and pattern shall match exposed door and drawer front laminate pattern and color.

2.6 CABINET HARDWARE

Submit one sample of each cabinet hardware item specified to include hinges, pulls, and drawer glides. All hardware shall conform to ANSI/BHMA A156.9, unless otherwise noted, and shall consist of the following components:

2.6.1 Door Hinges

Heavy Duty Concealed type, BHMA No. B01602.

2.6.2 Cabinet Pulls

4-1/8 inch rectangular pull. Finish Satin Nickel.

2.6.3 Drawer Slide

Side mounted side mounted type, BHMA No. B05091 with full extension and a minimum 75 pound load capacity. Slides shall include an integral stop to avoid accidental drawer removal.

2.6.4 Adjustable Shelf Support System

Recessed (mortised) metal standards, BHMA No. B04071, finish: 626. Support clips for the standards shall be closed type, BHMA No. B04081, finish: 626.

2.7 FASTENERS

Nails, screws, and other suitable fasteners shall be the size and type

best suited for the purpose and shall conform to ASTM F547 where applicable.

2.8 ADHESIVES, CAULKS, AND SEALANTS

2.8.1 Adhesives

Adhesives shall be of a formula and type recommended by AWI. Adhesives shall be selected for their ability to provide a durable, permanent bond and shall take into consideration such factors as materials to be bonded, expansion and contraction, bond strength, fire rating, and moisture resistance. Adhesives shall meet local regulations regarding VOC emissions and off-gassing.

2.8.1.1 Wood Joinery

Adhesives used to bond wood members shall be a Type II for interior use urea-formaldehyde resin formula. Adhesives shall withstand a bond test as described in ANSI/WDMA I.S.1A.

2.8.1.2 Laminate Adhesive

Adhesive used to join high-pressure decorative laminate to wood shall be a water-based contact adhesive. PVC edgebanding shall be adhered using a polymer-based hot melt glue.

2.8.2 Caulk

Caulk used to fill voids and joints between laminated components and between laminated components and adjacent surfaces shall be clear, 100 percent silicone.

2.8.3 Sealant

Sealant shall be of a type and composition recommended by the substrate manufacturer to provide a moisture barrier at sink cutouts and all other locations where unfinished substrate edges may be subjected to moisture.

2.9 ACCESSORIES

2.10 FABRICATION

Verify field measurements as indicated in the shop drawings before fabrication. Fabrication and assembly of components shall be accomplished at the shop site to the maximum extent possible. Construction and fabrication of cabinets and their components shall meet or exceed the requirements for AWI custom grade unless otherwise indicated in this specification. Cabinet style, in accordance with NAAWS 3.1, Section 400-G descriptions, shall be flush overlay.

2.10.1 Base and Wall Cabinet Case Body

2.10.1.1 Cabinet Components

Frame members shall be glued-together, kiln-dried hardwood lumber. Top corners, bottom corners, and cabinet bottoms shall be braced with either hardwood blocks or water-resistant glue and nailed in place metal or plastic corner braces. Cabinet components shall be constructed from the following materials and thicknesses:

2.10.1.1.1 Body Members (Ends, Divisions, Bottoms, and Tops)

3/4 inch medium density fiberboard (MDF) panel product

2.10.1.1.2 Face Frames and Rails

3/4 inch hardwood lumber

2.10.1.1.3 Shelving

3/4 inch medium density fiberboard (MDF) panel product

2.10.1.1.4 Cabinet Backs

1/4 inch medium density fiberboard (MDF) panel product

2.10.1.1.5 Drawer Sides, Backs, and Subfronts

1/2 inch hardwood lumber

2.10.1.1.6 Drawer Bottoms

1/4 inch medium density fiberboard (MDF) panel product

2.10.1.1.7 Door and Drawer Fronts

3/4-inch medium density fiberboard (MDF) panel product

2.10.1.2 Joinery Method for Case Body Members

2.10.1.2.1 Tops, Exposed Ends, and Bottoms

a. Stop dado, glued under pressure, and either nailed, stapled or screwed (fasteners will not be visible on exposed parts).

b. Spline or biscuit, glued under pressure.

2.10.1.2.2 Exposed End Corner and Face Frame Attachment

2.10.1.2.2.1 Non-Mitered Joint (90 degree)

butt joint glued under pressure (no visible fasteners)

2.10.1.2.2.2 Butt Joint

glued and nailed

2.10.1.2.3 Cabinet Backs (Wall Hung Cabinets)

Wall hung cabinet backs must not be relied upon to support the full weight of the cabinet and its anticipated load for hanging/mounting purposes. Method of back joinery and hanging/mounting mechanisms should transfer the load to case body members. Fabrication method shall be:

2.10.1.2.3.1 Side Bound

Side bound, captured in groove or rabbetts; glued and fastened.

2.10.1.2.4 Cabinet Backs (Floor Standing Cabinets)

2.10.1.2.4.1 Side Bound

Side bound, captured in grooves; glued and fastened to top and bottom.

2.10.1.2.4.2 Side Bound with Rabbetts

Side bound, placed in rabbetts; glued and fastened in rabbetts.

2.10.1.2.5 Wall Anchor Strips

Wall Anchor Strips shall be required for all cabinets with backs less than 1/2 inch thick. Strips shall consist of minimum 1/2 inch thick lumber, minimum 2-1/2 inches width; securely attached to wall side of cabinet back - top and bottom for wall hung cabinets, top only for floor standing cabinets.

2.10.2 Cabinet Floor Base

Floor cabinets shall be mounted on a base constructed of nominal 2 inch thick lumber. Base assembly components shall be treated lumber. Finished height for each cabinet base shall be as indicated on the drawings. Bottom edge of the cabinet door or drawer face shall be flush with top of base.

2.10.3 Cabinet Door and Drawer Fronts

Door and drawer fronts shall be fabricated from 3/4 inch medium density fiberboard (MDF). All door and drawer front edges shall be surfaced with PVC edgebanding, color and pattern to match exterior face laminate.

2.10.4 Drawer Assembly

2.10.4.1 Drawer Components

Drawer components shall consist of a removable drawer front, sides, backs, and bottom. Drawer components shall be constructed of the following materials and thicknesses:

2.10.4.1.1 Drawer Sides and Backs For Transparent Finish

1/2 inch thick solid hardwood lumber

2.10.4.1.2 Drawer Sides and Backs For Laminate Finish

1/2 inch thick 7-ply hardwood veneer core substrate

2.10.4.1.3 Drawer Sides and Back For Thermoset Decorative Overlay (Melamine) Finish

1/2 inch thick medium density particleboard or MDF fiberboard substrate

2.10.4.1.4 Drawer Bottom

1/4 inch thick thermoset decorative overlay melamine panel product

2.10.4.2 Drawer Assembly Joinery Method

- a. Multiple dovetail (all corners) or French dovetail front/dadoed back, glued under pressure.

2.10.5 Shelving

2.10.5.1 General Requirements

Shelving shall be fabricated from 3/4 inch medium density fiberboard (MDF). All shelving top and bottom surfaces shall be finished with thermoset decorative overlay (melamine). Shelf edges shall be finished in a thermoset decorative overlay (melamine).

2.10.5.2 Shelf Support System

The shelf support system shall be:

2.10.5.2.1 Recessed (Mortised) Metal Shelf Standards

Mortise standards flush with the finishes surface of the cabinet interior side walls, two per side. Position and space standards on the side walls to provide a stable shelf surface that eliminates tipping when shelf front is weighted. Install and adjust standards vertically to provide a level, stable shelf surface when clips are in place.

2.10.6 Laminate Application

Laminate application to substrates shall follow the recommended procedures and instructions of the laminate manufacturer and ANSI/NEMA LD 3, using tools and devices specifically designed for laminate fabrication and application. Provide a balanced backer sheet (Grade BK) wherever only one surface of the component substrate requires a plastic laminate finish. Apply required grade of laminate in full uninterrupted sheets consistent with manufactured sizes using one piece for full length only, using adhesives specified herein or as recommended by the manufacturer. Fit corners and joints hairline. All laminate edges shall be machined flush, filed, sanded, or buffed to remove machine marks and eased (sharp corners removed). Clean up at easing shall be such that no overlap of the member eased is visible. Fabrication shall conform to ANSI A161.2. Laminate types and grades for component surfaces shall be as follows unless otherwise indicated on the drawings:

2.10.6.1 Base/Wall Cabinet Case Body

- a. Exterior (exposed) surfaces to include exposed and semi-exposed face frame surfaces: HPDL Grade VGS.
- b. Interior (semi-exposed) surfaces to include interior back wall, bottom, and side walls: Thermoset Decorative Overlay (melamine).

2.10.6.2 Adjustable Shelving

2.10.6.2.1 Top and Bottom Surfaces

Thermoset Decorative Overlay (melamine)

2.10.6.2.2 All Edges

PVC edgebanding

2.10.6.3 Fixed Shelving

2.10.6.3.1 Top and Bottom Surfaces

Thermoset Decorative Overlay (melamine)

2.10.6.3.2 Exposed Edges

Thermoset Decorative Overlay (melamine)

2.10.6.4 Door, Drawer Fronts, Access Panels

2.10.6.4.1 Exterior (Exposed) and Interior (Semi-Exposed) Faces

HPDL Grade VGS

2.10.6.4.2 Edges

PVC edgebanding

2.10.6.5 Drawer Assembly

All interior and exterior surfaces: Thermoset Decorative Overlay (melamine).

2.10.6.6 Tolerances

Flushness, flatness, and joint tolerances of laminated surfaces shall meet the NAAWS 3.1 custom grade requirements.

2.10.7 Finishing

2.10.7.1 Filling

No fasteners shall be exposed on laminated surfaces. All nails, screws, and other fasteners in non-laminated cabinet components shall be countersunk and the holes filled with wood filler consistent in color with the wood species.

PART 3 EXECUTION

3.1 INSTALLATION

Installation shall comply with applicable requirements for NAAWS 3.1 custom quality standards. Countertops and fabricated assemblies shall be installed level, plumb, and true to line, in locations shown on the drawings. Cabinets and other laminate clad casework assemblies shall be attached and anchored securely to the floor and walls with mechanical fasteners that are appropriate for the wall and floor construction.

3.1.1 Anchoring Systems

3.1.1.1 Floor

Base cabinets shall utilize a floor anchoring system. Anchoring and

mechanical fasteners shall not be visible from the finished side of the casework assembly. Cabinet assemblies shall be attached to anchored bases without visible fasteners. Where assembly abuts a wall surface, anchoring shall include a minimum 1/2 inch thick lumber or panel product hanging strip, minimum 2-1/2 inch width; securely attached to the top of the wall side of the cabinet back.

3.1.1.2 Wall

Cabinet to be wall mounted shall utilize minimum 1/2 inch thick lumber or panel product hanging strips, minimum 2-1/2 inch width; securely attached to the wall side of the cabinet back, both top and bottom.

3.1.2 Hardware

Casework hardware shall be installed in types and locations as indicated on the drawings. Where fully concealed European-style hinges are specified to be used with particleboard or fiberboard doors, the use of plastic or synthetic insertion dowels shall be used to receive 3/16 inch "Euro screws". The use of wood screws without insertion dowels is prohibited.

3.1.3 Doors, Drawers and Removable Panels

The fitting of doors, drawers and removable panels shall be accomplished within target fitting tolerances for gaps and flushness in accordance with NAAWS 3.1 custom grade requirements.

3.1.4 Plumbing Fixtures

Install sinks, sink hardware, and other plumbing fixtures in locations as indicated on the drawings and in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE.

-- End of Section --

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SECTION 06 61 16

SOLID SURFACING FABRICATIONS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM D570	(1998; E 2010; R 2010) Standard Test Method for Water Absorption of Plastics
ASTM D638	(2014) Standard Test Method for Tensile Properties of Plastics
ASTM D696	(2016) Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 degrees C and 30 degrees C With a Vitreous Silica Dilatometer
ASTM D790	(2017) Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D2583	(2013a) Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM G21	(2015; R 2021; E 2021) Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

INTERNATIONAL CAST POLYMER ASSOCIATION (ICPA)

ICPA SS-1	(2001) Performance Standard for Solid Surface Materials

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA LD 3

(2005) Standard for High-Pressure
Decorative Laminates

NSF INTERNATIONAL (NSF)

NSF/ANSI 51

(2012) Food Equipment Materials

1.2 SYSTEM DESCRIPTION

- a. Work under this section includes counter tops and shower wall panels and other items utilizing solid surfacing material fabrications as indicated on the drawings and as described in this specification. Do not change source of supply for materials after work has started, if the appearance of finished work would be affected.
- b. In most instances, installation of solid surfacing material fabricated components and assemblies requires strong correctly located structural support provided by other trades. To provide a stable, sound, secure installation, close coordination is required between the solid surfacing material fabricator/installer and other trades to ensure that necessary structural wall support, cabinet counter top structural support, proper clearances, and other supporting components are provided for the installation of wall panels, counter tops, shelving, and all other solid surfacing material fabrications to the degree and extent recommended by the solid surfacing material manufacturer.
- c. Provide appropriate staging areas for solid surfacing material fabrications. Allow variation in component size and location of openings of plus or minus 1/8 inch.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Fabrication Drawings

Installation

SD-03 Product Data

Solid Polymer

Indoor air quality for solid surface seam and sealant products; S

SD-04 Samples

Material; G RO

SD-06 Test Reports

Test Report Results

SD-07 Certificates

Qualifications

Indoor Air Quality for solid surface fabrication products; S

SD-10 Operation and Maintenance Data

Solid Polymer, Data Package 1; G RO

1.4 QUALITY ASSURANCE

1.4.1 Qualifications

To ensure warranty coverage, provide manufacturer certified solid surfacing fabricators to fabricate the solid surfacing material being utilized. Mark all fabrications with the fabricator's certification label affixed in an inconspicuous location. Minimum of 5 years of experience working with solid surfacing materials is required of fabricators. Submit solid surfacing material manufacturer's certification attesting to fabricator qualification approval.

1.5 DELIVERY, STORAGE, AND HANDLING

Do not deliver materials to project site until areas are ready for installation. Deliver components and materials to the site undamaged, in containers clearly marked and labeled with manufacturer's name. Store materials indoors and take adequate precautions to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation, for duration of project.

1.6 WARRANTY

Provide manufacturer's warranty to repair or replace defective materials and workmanship for a period of 10 years from date of final acceptance of the work.

PART 2 PRODUCTS

2.1 MATERIAL

Submit detail fabrication drawings and installation drawings of each solid surfacing fabrication indicated. Include elevations, dimensions, clearances, details of construction and anchorage, and details of joints and connections.

Submit manufacturers' descriptive product data for solid polymer fabrication indicated. Include manufacturers' literature, finishes, profiles and thicknesses of materials.

Submit manufacturers' operations and maintenance data for solid polymer fabrication in accordance with Section 01 78 23 OPERATIONS AND MAINTENANCE DATA.

2.1.1.1 Solid Surfacing Material

Provide solid polymer that is a homogeneous filled solid polymer; not coated, laminated or of a composite construction, complying with ICPA SS-1. Provide material that meets or exceeds the minimum physical and performance properties specified. Superficial damage to a depth of 0.01 inch must be repairable by sanding or polishing. Material thickness is as indicated on the drawings; required minimum thickness is 1/4 inch. Submit a minimum 4 inch by 4 inch sample of each color and pattern for approval; include full range of color and pattern variation. Retain approved samples as a standard for this work. Submit test report results from an independent testing laboratory attesting that the submitted solid surfacing materials meet or exceed each of the specified performance requirements.

- a. Horizontal Surfaces: 1/2 inch thick material
- b. Vertical Surfaces: 1/4 inch thick material
- c. Provide materials that meet the emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type). Provide certification or validation of indoor air quality for solid surface fabrication products.

2.1.1.2 Cast, 100 Percent Acrylic Polymer Solid Surfacing Material

Cast, 100 percent acrylic solid polymer material composed of acrylic polymer, mineral fillers, and pigments. Provide acrylic polymer that meets or exceeds the following minimum performance requirements:

PROPERTY	REQUIREMENT (min. or max.)	TEST PROCEDURE
Tensile Strength	4000 psi (max.)	ASTM D638
Hardness	55-Barcol Impressor (min.)	ASTM D2583
Thermal Expansion	.000023 in/in/F (max.)	ASTM D696
Boiling Water Surface Resistance	No Change	ANSI/NEMA LD 3-3.05
High Temperature Resistance	No Change	ANSI/NEMA LD 3-3.06
Impact Resistance (Ball drop)		ANSI/NEMA LD 3-303
1/4 inch sheet	36-inches, 1/2 lb ball, no failure	
1/2 inch sheet	140-inches, 1/2 lb ball, no failure	
3/4 inch sheet	200-inches, 1/2 lb ball, no failure	

PROPERTY	REQUIREMENT (min. or max.)	TEST PROCEDURE
Mold & Mildew Growth	No growth	ASTM G21
Bacteria Growth	No growth	ASTM G21
Liquid Absorption (Weight in 24 hrs.)	0.1 percent max.	ASTM D570
Flammability		ASTM E84
Flame Spread	25 max.	
Smoke Developed	30 max.	
Sanitation	"Food Contact" approval	NSF/ANSI 51
Flexural Strength	6,800 psi (min.)	ASTM D790

2.1.3 Acrylic-modified Polymer Solid Surfacing Material

Cast, solid polymer material composed of a formulation containing acrylic and polyester polymers, mineral fillers, and pigments. Provide acrylic polymer content not less than 5 percent and not more than 10 percent in order to meet the following minimum performance requirements:

PROPERTY	REQUIREMENT (min. or max.)	TEST PROCEDURE
Tensile Strength	4100 psi (max.)	ASTM D638
Hardness	50-Barcol Impressor (min.)	ASTM D2583
Thermal Expansion	.000023 in/in/F (max.)	ASTM D696
Boiling Water Surface Resistance	No Change	ANSI/NEMA LD 3-3.05
High Temperature Resistance	No Change	ANSI/NEMA LD 3-3.06
Impact Resistance (Ball drop)		ANSI/NEMA LD 3-303
1/4 inch sheet	36 inches, 1/2 lb ball, no failure	
1/2 inch sheet	140 inches, 1/2 lb ball, no failure	

PROPERTY	REQUIREMENT (min. or max.)	TEST PROCEDURE
3/4 inch sheet	200 inches, 1/2 lb ball, no failure	
Mold & Mildew Growth	No growth	ASTM G21
Bacteria Growth	No growth	ASTM G21
Liquid Absorption (Weight in 24 hrs.)	0.6 percent max.	ASTM D570
Flammability		ASTM E84
Flame Spread	25 max.	
Smoke Developed	100 max.	
Sanitation	"Food Contact" approval	NSF/ANSI 51
Flexural Strength	6,800 psi (min.)	ASTM D790

2.1.4 Material Patterns and Colors

Provide pattern and color for all solid surfacing material components and fabrications as specified in Section 09 06 00 SCHEDULES FOR FINISHES. Colors listed are not intended to limit the selection of equal colors from other manufacturers. Provide products with consistent patterned color throughout thickness of the product.

2.1.5 Surface Finish

Provide a uniform appearance on exposed finished surfaces and edges. Exposed surface finish is matte; gloss rating of 5-20.

2.2 ACCESSORY PRODUCTS

Provide accessory products, as specified below, as manufactured by the solid surfacing material manufacturer or as approved by the solid surfacing material manufacturer for use with the solid surfacing materials being specified.

2.2.1 Adhesives

Provide a two-part seam adhesive kit to create permanent, inconspicuous, non-porous, hard seams and joints by chemical bond between solid surfacing materials and components to create a monolithic appearance of the fabrication. Provide adhesive approved by the solid surfacing material manufacturer. Color-match adhesive to the surfaces being bonded where solid-colored, solid surfacing materials are being bonded together. Provide clear or color matched seam adhesive where particulate patterned, solid surfacing materials are being bonded together.

2.2.2 Seam and Sealant Emissions

Provide seam and other accessory materials that meet the emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type). Provide validation of indoor air quality for solid surface seam and sealant products.

2.2.3 Silicone Sealant

Provide silicone sealant, mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, acid-curing; ASTM C920, Type S, Grade NS, Class 25, Use NT; clear formulation; approved for use by the solid surfacing material manufacturer.

2.2.4 Mounting Hardware

Provide mounting hardware, including sink/bowl clips, inserts and fasteners for attachment of undermount sinks and lavatories.

2.3 FABRICATIONS

Provide factory or shop fabricate components to sizes and shapes indicated, to the greatest extent practical, in accordance with approved Shop Drawings and manufacturer's requirements. Provide factory cutouts for sinks, lavatories, and plumbing fixtures where indicated on the drawings. Contours and radii must be routed to template, with edges smooth. Defective and inaccurate work will be rejected. Submit product data indicating product description, fabrication information, and compliance with specified performance requirements for solid surfacing material, joint adhesive, sealants, and heat reflective tape. Both the manufacturer of materials and the fabricator are required to submit a detailed description of operations and processes in place that support efficient use of natural resources, energy efficiency, emissions of ozone depleting chemicals, management of water and operational waste, indoor environmental quality, and other production techniques supporting sustainable design and products.

2.3.1 Joints and Seams

Form joints and seams between solid surfacing material components using manufacturer's approved seam adhesive. Provide inconspicuous joints in appearance without voids to create a monolithic appearance.

2.3.2 Edge Finishing

Rout and finish component edges to a smooth, uniform appearance and finish. Provide edge shapes and treatments, including any inserts, as detailed on the drawings. Rout all cutouts, then sand all edges smooth. Repair or reject defective or inaccurate work.

2.3.3 Counter Top Splashes

Fabricate backsplashes and end splashes from 1/2 inch thick solid surfacing material to be 4 inches high. Provide backsplashes and end splashes for all counter tops. Shop fabricate backsplashes and provide loose, to be field attached.

2.3.3.1 End Splashes

Provide end splashes loose for installation at the job site after horizontal surfaces to which they are to be attached have been installed.

2.3.4 Counter Tops

Fabricate all solid surfacing material, counter top components from 1/2 inch thick material. Indicate details, dimensions, locations, and quantities on the drawings. Provide counter tops with 4 inch high loose as indicated. Attach 2 inch wide reinforcing strip of solid surfacing material under each horizontal counter top seam. Submit a minimum 1 foot wide by 6 inch deep, full size sample for each type of counter top shown on the project drawings; include the edge profile and backsplash as detailed on the drawings and at least one seam. Retain approved sample as standard for this work. Provide square edge profile.

2.3.4.1 Counter Tops with Sinks

- a. Provide stainless steel or vitreous china sink; include cutouts to template for counter tops with sinks as furnished by the sink manufacturer. Provide manufacturer's standard sink mounting hardware for stainless steel installation. Seal between sink and counter top with specified silicone sealant. Provide sink, faucet, and plumbing requirements in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE.

2.3.5 Shower Wall Panel System

Provide shower wall enclosures with a system of solid surfacing material components to include: Panels soap dish shampoo shelf panel edge trim; dimensions of all components are standard manufacturer's dimensions to be field cut to fit. Form panels from manufacturer's standard 1/4 inch thick sheet product. Provide panels full width and height with seams occurring only at the inside corners of the enclosure. Provide soap dish and shampoo shelf of configuration, shape, and location as standard with the manufacturer's system.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Components

Install all components and fabricated units plumb, level, and rigid. Make field joints between solid surfacing material components using solid surfacing material manufacturer's approved seam adhesives, to provide a monolithic appearance with joints inconspicuous in the finished work. Attach metal or vitreous china sinks and lavatory bowls to counter tops using solid surfacing material manufacturer's recommended clear silicone sealant and mounting hardware. Install solid polymer sinks and bowls using a color-matched seam adhesive.

3.1.1.1 Loose Counter Top Splashes

Mount loose splashes in the locations noted on the drawings. Adhere loose splashes to the counter top with a color matched silicone sealant when the solid surfacing material components are solid colors. Use a clear silicone sealant to provide adhesion of particulate patterned solid

surfacing material splashes to counter tops.

3.1.1.2 Wall Panels & Panel Systems

Installation of wall panels and system components to substrates must include the use of a specified panel adhesive. Use specified seam adhesive to adhere all solid surfacing material components to each other with the exception of expansion joints and inside corners. All inside corners and expansion joints between solid surfacing material components must be joined with specified silicone sealant. All joints between solid surfacing material components and non-solid polymer surfaces must be sealed with specified silicone sealant.

3.1.2 Silicone Sealant

Use specified silicone sealant to seal all expansion joints between solid surfacing material components and all joints between solid surfacing material components and other adjacent surfaces such as walls, floors, ceiling, and plumbing fixtures. Provide sealant bead smooth and uniform in appearance and minimum size necessary to bridge any gaps between the solid surfacing material and the adjacent surface. Provide continuous bead and run the entire length of the joint being sealed.

3.1.3 Plumbing

Make plumbing connections to sinks and lavatories in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE.

3.2 CLEAN-UP

Components must be cleaned after installation and covered to protect against damage during completion of the remaining project items. Damaged components must be repaired or replaced at the Contractor's sole expense.

-- End of Section --

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SECTION 07 05 23

PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS

PART 1 GENERAL

1.1 SUMMARY

Employ an independent agency to conduct the pressure test on the building envelope in accordance with this specification section and ASTM E779.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referenced within the text by the basic designation only.

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

ANSI/ASNT CP-105	(2020) ASNT Standard Topical Outlines for Qualification of Nondestructive Testing Personnel
ANSI/ASNT CP-189	(2020) ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel
ASNT SNT-TC-1A	(2020) Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing

ASTM INTERNATIONAL (ASTM)

ASTM D3464	(1996; R 2014) Standard Test Method for Average Velocity in a Duct Using a Thermal Anemometer
ASTM E779	(2019) Standard Test Method for Determining Air Leakage Rate by Fan Pressurization
ASTM E1186	(2017) Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems
ASTM E1258	(1988; R 2018) Standard Test Method for Airflow Calibration of Fan Pressurization Devices
ASTM E1827	(2011; R 2017) Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door
ASTM E2029	(2011) Standard Test Method for Volumetric and Mass Flow Rate Measurement in a Duct Using Tracer Gas Dilution

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 6781-2 (2010) Performance of Buildings -
Detection of Heat, Air, and Moisture
Irregularities in Buildings by Infrared
Methods - Part2: Equipment Requirements

ISO 6781-3 (2015) Performance of Buildings -
Detection of Heat, Air, and Moisture
Irregularities in Buildings by Infrared
Methods - Part 3: Qualifications of
Equipment Operators, Data Analysts, and
Report Writers

1.3 DEFINITIONS

The following terms as they apply to this section:

1.3.1 Air Barrier Envelope

The surface that separates the inside air from the outside air. The combination of air barrier assemblies and air barrier components, connected by air barrier accessories are designed to provide a continuous barrier to the movement of air through an environmental separator. A single building may have more than one air barrier envelope. The air barrier surface includes the top, bottom, and sides of the envelope. The term "air barrier envelope" is also known as "air barrier system" or simply "air barrier".

1.3.2 Air Leakage Rate

How leaky, or conversely how air tight a building envelope is. The air leakage is normally described in terms of air flow rate for the surface area of the envelope at a defined differential pressure.

1.3.3 Bias Pressure

Also known as zero flow pressure, baseline pressure, offset pressure or background pressure. With the envelope not artificially pressurized, bias is the differential pressure that always exists between the envelope that has been prepared (sealed) for the pressure test and the outdoors. Bias pressure is made up of two components, fixed static offset (usually due to stack effect or the HVAC system) and fluctuating pressure (usually due to wind or a moving elevator). Because of pressure fluctuations many bias pressure readings are recorded and averaged for use in the calculations.

1.3.4 Blower Door

Commonly used term for an apparatus used to pressurize and depressurize the space within the building envelope and quantify air leakage through the envelope. The blower door typically includes a door fan and an air resistant fabric or a series of hard panels that extends to cover and seal the door opening between the fan shroud and door frame. The door fan is a calibrated fan capable of measuring air flow and is usually placed in the opening of an exterior door. With the air barrier otherwise sealed, air produced by the door fan pressurizes or de-pressurizes the envelope, depending on the fan's orientation.

1.3.5 Environmental Separator

The parts of a building that separate the controlled interior environment from the uncontrolled exterior environment, or that separate spaces within a building that have dissimilar environments. The term "environmental separator" is also known as the "control layer".

1.3.6 Pressure Test

A generic term for a test in which the envelope is either pressurized or de-pressurized with respect to the outdoors.

1.3.6.1 Negative Pressure Test (Depressurization Test)

A test wherein air inside the envelope is drawn to the outdoors. This places the envelope at a lower (negative) pressure with respect to the outdoors.

1.3.6.2 Positive Pressure Test (Pressurization Test)

A test wherein outdoor air is pushed into the envelope. This air movement places the envelope at a higher (positive) pressure with respect to the outdoors.

1.4 WORK PLAN

Submit the following not later than 120 calendar days after contract award, but before start of pressure testing work, steps to be taken by the lead pressure test technician to accomplish the required testing.

a. Memorandum of test procedure.

- (1) Proposed dates for conducting the pressure, thermographic and fog tests.
- (2) Submit detailed pressure test procedures prior to the test. Provide a plan view showing proposed locations (personnel doors or other similar openings) to install blower doors or flexible ducts (for trailer-mounted fans), if used.

b. Test equipment to be used.

c. Scaffolding, scissor lifts, power, electrical extension cords, duct tape, plastic sheeting and other Contractor's support equipment required to perform all tests.

d. Other Contractor's support personnel who will be on site for testing.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Work Plan; G RO

SD-03 Product Data

Thermal Imaging Camera; G RO

SD-05 Design Data

Envelope Surface Area Calculations; G RO

SD-07 Certificates

Pressure Test Agency

Thermographer Qualifications

Test Instruments

Date Of Last Calibration

SD-06 Test Reports

Pressure Test Procedures

Air Leakage Test Report; G RO

Diagnostic Test Report; G RO

1.6 QUALITY ASSURANCE

1.6.1 Modification of References

Perform all pressure and diagnostic tests according to the referenced publications listed in paragraph REFERENCES and as modified by this section. Consider the advisory or recommended provisions, of the referred references, as mandatory.

1.6.2 Qualifications

1.6.2.1 Pressure Test Agency

Submit, no later than 15 calendar days after contract award, information certifying that the pressure test agency is not affiliated with any other company participating in work on this contract. The work of the test agency is limited to pressure testing the building envelope, performing a thermography test and fog test, and investigating, through various methods, the location of air leaks through the air barrier. See paragraph PRESSURE TEST AGENCY for additional requirements. For thermographer qualifications, see paragraph THERMOGRAPHER QUALIFICATIONS.

Use the sample TEST AGENCY QUALIFICATIONS SHEET form (Appendix C), to submit the following information.

- a. Verification of 2 years of experience as an agency in pressure testing commercial and/or industrial buildings.
- b. List of at least ten commercial/industrial facilities with building envelopes that the agency has tested within the past 2 years. Include building name, address, and name of prime construction contractor and

contractor's point-of-contact information.

- c. Confirmation of 2 years of commercial and or industrial building pressure test experience for the lead pressure test technician and the thermographer in using the specified ASTM E779 testing standard. References from five Contracting Officers for facilities where the lead test technician has supervised commercial and or industrial building pressure tests in the last 2 years.
- d. Verification that the lead pressure test technician has been employed by a building pressure testing agency in the capacity of a lead pressure test technician for not less than 1 year.

1.6.2.2 Thermographer Qualifications

To perform an infrared diagnostic evaluation, use a lead thermographer who has at least an active Level II Certification that is based on the requirements in ANSI/ASNT CP-105 or ANSI/ASNT CP-189 and is in accordance with ASNT SNT-TC-1A. The course of study is to be specifically focused on infrared thermography for building science. The thermographer must have at least two years of building science thermography experience in IR testing commercial or industrial buildings. The thermographer must also have experience in building envelopes and building science in order to make effective recommendations to the Contractor should the envelope require additional sealing. Thermographic equipment operators, data analysts and report writers must comply with the requirements of ISO 6781-3. Submit the thermographer's certificate for approval. Submit a list of at least ten commercial/industrial buildings on which the thermographer has performed IR thermography in the past two years. The thermographer is to have a current active certification. Submit certification at least 60 days prior to thermography testing.

1.6.3 Test Instruments and Date of Last Calibration

Submit a signed and dated list of test instruments, their application, manufacturer, model, serial number, range of operation, accuracy and date of most recent calibration. Calibration data applicable to fan systems must be in accordance with ASTM E1258.

1.6.4 Test Reports

No later than 14 days after completion of the pressure test, submit electronic copies of an organized report. The report is to contain a table of contents, an executive summary, an introduction, a results section and a discussion of the results. Submit the air leakage test report as described in paragraph AIR LEAKAGE TEST REPORT. Submit a diagnostic test report as described in paragraph LOCATING LEAKS BY DIAGNOSTIC TESTING. The diagnostic test report is to include the Thermographic Investigation Report and the Fog Test Report (if performed).

Submit field data and completed report forms found in the appendices. Use the sample forms, Test Agency Qualification Sheet, Air Leakage Test Form and Air Leakage Test Results Form to summarize the tests for the appropriate building envelope. Submit both electronically populated and field hand filled-in forms.

Report Data. Include in the report the following information for all tests:

- a. Date of issue
- b. Project title and number
- c. Name, address, and telephone number of testing agency
- d. Dates and locations of samples and tests or inspections
- e. Names of individuals making the inspection or test
- f. Designation of the work and test method
- g. Identification of product and specification section
- h. Complete inspection or test data
- i. Test results and an interpretation of test results
- j. Comments or professional opinion on whether inspected or tested work complies with contract document requirements
- k. Recommendations on retesting

1.7 CLIMATE CONDITIONS SUITABLE FOR A PRESSURE TEST

As the test date approaches, monitor the weather forecast for the test site. Avoid testing on days forecast to experience high winds, rain, or snow. Monitor weather forecasts prior to shipping pressure test equipment to the site. Based on current and forecast weather conditions, the Contracting Officer's representative is to grant final approval for testing to occur.

1.7.1 Rain

For safety reasons, avoid testing during rain or if rain is anticipated during testing. If pneumatic hoses are installed and exposed to rain inspect the hose to ensure rainwater has not migrated into the hose ends. Orient all exposed hose ends to keep them out of water puddles. Success in temporarily sealing outdoor ventilation components such as louvers and exhaust fans may also be compromised by rain. Don't seal roof-mounted ventilation components during times of potential lightning.

1.7.2 Wind

Because wind can skew pressure test results, test only on days and at times when winds are anticipated to be the calmest. Avoid pressure testing during gusty or high wind conditions. Avoid installing test fans on the windward side of the building if wind gusts during the test are anticipated to be greater than 10 miles per hour.

PART 2 PRODUCTS

2.1 PRESSURE TEST EQUIPMENT

Depending on site conditions and size of the envelope, the test may be conducted using blower door equipment and/or trailer-mounted fans or the building's own supply air system. The testing agency is to supply sufficient quantity of blower equipment that will produce a minimum of 75 Pa differential pressure between the envelope and outdoors using the test

methods described herein. Supplying additional blower test equipment to provide additional airflow capacity or to act as a backup is highly recommended.

2.1.1 Blower Door Fans and Trailer Mounted Fans

Each air flow measuring system including blower door fans and trailer mounted fans are to be calibrated within the last 5 years. Calibrated blower door fans and trailer mounted fans must measure accurately to within plus or minus 5 percent of the flow reading. Blower door equipment and trailer mounted fans are to be specifically designed to pressurize building envelopes. Each set of blower door equipment is to include fan(s), digital gauge(s), door frame, door fabric or hard panels.

2.1.2 Digital Gauges as Test Instruments

Use only digital gauges as measuring instruments in the pressure test; analog gauges are not acceptable. The gauges must be accurate to within 1.0 percent of the pressure reading or 0.15 Pa, whichever is greater. Each gauge is to have been calibrated within two years of the test. The calibration is to be checked against a National Institute of Standards and Technology (NIST, formerly National Bureau of Standards) traceable standard.

2.2 THERMAL IMAGING CAMERA REQUIREMENTS

The thermal imaging camera used in the thermography test must have a thermal sensitivity (Noise Equivalent Temperature Difference.) of +/- 0.18 degrees F at 86 degrees F or less. Ensure the camera's operating spectral range falls between 2 and 15 micrometers. Ensure the camera's IR image viewing screen resolution measures at least 320x240 pixels. Ensure the camera has a means of recording thermal images seen on the camera viewing screen. The camera is to display output as individual still frame images that also can be downloaded and inserted into an electronic Thermographic Investigation Report. All thermographic equipment must comply with the requirements of ISO 6781-2. Submit camera make and model, and catalog information that defines the camera thermal sensitivity for approval.

PART 3 EXECUTION

3.1 PRESSURE TEST AGENCY

The test agency is to be an independent third party subcontractor, not an affiliated or subsidiary of the prime contractor, subcontractors or A/E firm. The agency is to be regularly engaged in pressure testing of commercial/industrial building envelopes. If using blower door or trailer-mounted fans, the lead test technician must have at least two years of experience in using such equipment in building envelope pressurization tests. Formal training using pressure test equipment is highly recommended. Technicians using the building's air handling system for pressure testing are to have tested at least five commercial/industrial buildings within the past two years with each building having over 50,000 square feet of floor area. Submit the name, address and floor areas of each of these five buildings for approval.

3.1.1 Field Work

The lead pressure test technician and thermographer are to be present at the project site while testing is performed and is to be responsible for

conducting, supervising, and managing of their respective test work. Management includes health and safety of test agency employees.

3.1.2 Reporting Work

The lead pressure test technician is to prepare, sign, and date the test agenda, equipment list, and submit a certified Air Leakage Test Report. The thermographer is to prepare, sign, and date the test agenda, equipment list, and submit a certified Thermographic Investigation Report. The contractor is to prepare a final report that identifies improvements that were made to the envelope to reduce air leaks, mitigate thermal bridging, eliminate moisture migration, repair insulation voids discovered during diagnostic tests. Jointly submit all reports.

3.2 ENVELOPE SURFACE AREA CALCULATION

The architectural air barrier boundary includes the floor, walls, and ceiling. After construction of the air barrier envelope is complete, field measure the envelope to ensure the physical measurements match the design drawings and the air barrier envelope surface area calculations are generated. If the calculation result is not within 10 percent of the defined air barrier boundary calculation result as indicated, submit the envelope surface area calculation and results for review.

3.3 PREPARING THE BUILDING ENVELOPE FOR THE PRESSURE TEST

3.3.1 Testing During Construction

The pressure test cannot be conducted until all components of the air barrier system have been installed. After all sealing as described herein has been completed, inspect the envelope to ensure it has been adequately prepared. During the pressure test, stop all ongoing construction within and neighboring the envelope which may impact the test or the air barrier integrity. The pressure test may be conducted before finishes that are not part of the air barrier envelope have been installed. For example, if suspended ceiling tile, interior gypsum board or cladding systems are not part of the air barrier the test can be conducted before they are installed. Recommend testing prior to installing the finished ceilings within the envelope and immediately surrounding it. The absence of finished ceilings allows for inspection and diagnostic testing of the roof/wall interface and for implementation of repairs to the air barrier, if necessary to comply with the maximum allowed leakage.

3.3.2 Sealing the Air Barrier Envelope

Seal all penetrations through the air barrier. Unavoidable penetrations due to electrical boxes or conduit, plumbing, and other assemblies that are not air tight are to be made so by sealing the assembly and the interface between the assembly and the air barrier or by extending the air barrier over the assembly. Support the air barrier so as to withstand the maximum positive and negative air pressure to be placed on the building without displacement or damage, and transfer the load to the structure. Durably construct the air barrier to last the anticipated service life of the assembly and to withstand the maximum positive and negative pressures placed on it during pressure testing. Do not install lighting fixtures that are equipped with ventilation holes through the air barrier.

3.3.3 Sealing Plumbing

Prime all plumbing traps located within the envelope full of water.

3.3.4 Close and Lock Doors

Close and lock all doors and windows in the envelope perimeter. For doors not equipped with latching hardware, temporarily secure them in the closed position. Secure the doors in such a way that they remain fully closed even when the maximum anticipated differential air pressure produced during the test acts on them.

3.3.5 Hold Excluded Building Areas at the Outdoor Pressure Level

Keep building areas immediately surrounding but excluded from the test envelope at the outdoor pressure level during the pressure test. Maintain these areas at the outdoor pressure level by propping exterior doors open, opening windows and de-energizing all air moving devices in or serving these areas.

3.3.6 Maintain an Even Pressure within the Envelope

Ensure the pressure differences within the envelope are minimized by opening all internal air pathways including propping open all interior doors. Distribute test fans throughout the envelope as necessary to ensure the internal pressures are uniform (within 10 percent of the average differential pressure). Ideally, do not install suspended ceilings until after all pressure tests have been completed. If, however the envelope includes finished suspended ceiling spaces, temporarily remove approximately 5 percent of all ceiling tiles or a minimum of 1 tile from each isolated suspended ceiling space, whichever comprises the greatest surface area. Temporarily remove additional ceiling tiles during testing to allow for inspection and diagnostic testing of the ceiling/wall interface. An alternative to removing ceiling tiles is to measure the differential pressure between each isolated suspended ceiling space and the outdoors when the area below the suspended ceiling is maintained at a differential pressure of 75 Pa with respect to the outdoors. If the suspended ceiling differential pressure measurement is within ten percent of the 75 Pa pressure below the suspended ceiling no ceiling tiles need to be removed.

3.3.7 Maintain Access to Mechanical and Electrical Rooms

Maintain access to mechanical rooms and electrical rooms associated with the envelope to allow for de-energizing ventilation equipment and resetting circuit breakers tripped by blower door equipment, if used.

3.3.8 Minimize Potential for Blowing Dust and Debris

Because high velocity air will be blown into and out of the envelope during the test, debris, including dust and litter, may become airborne. Airborne debris may become trapped or entangled in test equipment, thereby skewing test results. Ensure areas within and surrounding the envelope are free of dust, litter and construction materials that are easily airborne. If pressurizing existing, occupied areas, provide adequate notice to building occupants of blowing dust and debris, and general disruption of normal activities during the test.

3.3.9 De-energize Air Moving Devices

De-energize all air moving devices serving the envelope to keep air within the envelope as still as reasonably achievable. De-energize all fans that deliver air to, exhaust air from, or recirculate air within the envelope. Also de-energize all fans serving areas adjacent to but excluded from the envelope.

3.3.10 Installing Blower Door Equipment in a Door Opening

Where blower door fans are used, before installing blower door equipment, select a door opening that does not restrict air flow into and out of the envelope and has at least 5 feet clear distance in front of and behind the door opening. Disconnect the door actuator and secure the door open to prevent it from being drawn into the fan by fan pressure. Avoid installing blower door equipment on the windward side of the building.

3.4 BUILDING ENVELOPE AIR TIGHTNESS REQUIREMENT

For each building envelope, perform the Architectural Only test and if noted below, the Architectural Plus HVAC System test. The purpose of the pressure (air leakage) test is to determine final compliance with the airtightness requirement by demonstrating the performance of the continuous air barrier. An effective air barrier envelope minimizes infiltration and exfiltration through unintended air paths (leaks). The tests may be performed in any desired order.

3.4.1 Architectural Only Test

The test envelope is the architectural air barrier boundary as defined on the contract drawings. This boundary includes connecting walls, roof and floor which comprise a complete, whole, and continuous three dimensional envelope. Perform both a positive pressure test and a negative pressure test on this envelope, unless otherwise directed.

3.4.1.1 Test Goal

Input data from the test into the Air Leakage Rate by Fan Pressurization spreadsheet as described in paragraph CALCULATION PROGRAM via the Air Leakage Test Form. Compare output from the spreadsheet against the maximum allowable leakage defined in Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM. The envelope passes the test if the leakage rate, as calculated using the spreadsheet, is equal to or lower than the Architectural Only leakage rate goal.

3.4.1.2 Preparing the Envelope for the Pressure Test - Seal All Openings through the Air Barrier

Temporarily close all perimeter windows, roof hatches and doors in the envelope perimeter except for those doors that are to remain open to accommodate blower door or trailer mounted fan test equipment installation. Seal, or isolate all other intentional openings, pathways and fenestrations through the architectural envelope prior to pressure testing. Follow the Recommended Test Envelope Conditions identified in ASTM E1827, Table 1, for the Closed Envelope condition. These openings may include boiler flues, fuel-burning water heater flues, fuel-burning kitchen equipment, clothes dryer vents, fireplaces, wall or ceiling grilles, diffusers etc. Before sealing flues, close their associated fuel valves and verify the associated pilot lights are extinguished. Prime all

plumbing traps located within the envelope full of water. In lieu of applying tape and/or plastic, typical temporary sealing materials include tape and sheet plastic or a self-adhesive grille wrap. Use and apply tape and plastic in a manner that does not deface or remove paint or mar the finish of permanent surfaces. Be especially aware of residue that remains from tape applied to stainless steel surfaces such as kitchen hoods or rollup doors. For painted surfaces, use tape types that do not remove finish paint when the tape is removed. If paint is removed from the finished surface, repaint to match existing surfaces. Secure dampers closed either manually or by using the building's HVAC system controls. Use the table below for further guidance in building preparation.

Building Component	Envelope Condition
Air handling units, duct fans	As found (open) or temporarily sealed as necessary
Clothes dryer	Off
Clothes dryer vents	Temporarily sealed
Dampers - intake, exhaust	Physically closed or closed using control power or temporarily sealed
Diffusers, registers, grilles within the envelope	Temporarily sealed
Doors, personnel type, at the envelope perimeter	Secured closed
Doors, personnel type, within the envelope	Secured (propped) open
Doors, roll-up type, at the envelope perimeter	Closed (no additional sealing)
Exhaust hoods	Closed* and temporarily sealed
Fireplace hearth	Temporarily sealed *
Kitchen hoods	Temporarily sealed *
Pilot light and associated fuel valve	Extinguished and closed, respectively
Vented combustion appliance	Temporarily sealed *
Vented combustion appliance exhaust flue	Off
Windows	Secured closed
* If the building component has an associated manual or automatic damper, consider securing the damper closed in lieu of temporarily sealing.	

3.5 CONDUCTING THE PRESSURE TEST

Notify the Contracting Officer at least 10 working days before conducting the pressure tests to provide the Government the opportunity to witness the tests and to monitor weather forecasts for conditions favorable for testing. Do not pressure test until verifying that the continuous air barrier is in place and installed without failures in accordance with installation instructions. During the pressure test periodically inspect

temporarily sealed items to ensure they are still sealed. Seals on temporarily sealed items tend to release more readily at higher pressures. Test data obtained after temporarily sealed items become unsealed cannot be used as input into the calculation program. Follow the Envelope Pressure Test Procedures in the paragraphs below. Submit detailed pressure test procedures indicating the test apparatus, the test methods and procedures, and the analysis methods to be employed for the building envelope pressure (air tightness) test. Submit these procedures not later than 60 days after Notice to Proceed.

3.5.1 Extend Pneumatic Tubes and Establish a Reference Differential Pressure

Confirm the various zones within the envelope have a relatively uniform interior pressure distribution by establishing a representative differential pressure between the envelope and the outdoors with blower door or trailer-mounted fans operating. The number of indoor pressure difference measurements (pneumatic hoses) required depends on the number of interior zones separated by bottle necks that could create significant pressure drops (e.g., doorways and stairwells). Extend at least four pneumatic hoses (differential pressure monitoring ports) to locations within the envelope that are physically opposite of each other. In multiple story buildings, especially those over three stories, extend hoses to multiple floors. Locate the hose ends away from the effects of air discharge from blower test equipment. Select one of the four (or more) interior hoses, one judged by the test agency to be the most unaffected by air velocity produced by blower test equipment, to serve as the interior reference pressure port. Extend at least one additional pneumatic hose to the outdoors (outdoor pressure port). To the end of this hose manifold at least four hoses together and terminate each hose on a different side of the building. With the envelope sealed and the blowers energized, measure the differential pressure using the interior reference pressure port and the four outdoor pressure ports. Then measure and record the differential pressure by individually using each of the remaining three interior hoses. Ensure each reading is within plus or minus 10 percent of the reference reading. Thus at an average 75 Pa maximum pressure difference across the envelope, the difference between the highest and lowest interior pressure difference measurements should be 15 Pa or less. If this condition cannot be met, attempt to create additional air pathways within the envelope to minimize pressure differences within the envelope. If necessary, move the interior hose ends. See step 2.13 of the Air Leakage Test Form in Appendix A.

3.5.2 Bias Pressure Readings

With the fan pressurization equipment de-energized and the envelope sealed, obtain the differential pressure between the outdoors and the envelope. Record 12 bias pressure readings before the pressure test and 12 bias pressure readings after the pressure test. Each reading is the average of ten or more 1-second measurements. Include positive and negative signs for each reading. To help dampen bias pressures that significantly contribute to test pressure, reduce temperature differences between indoor and outdoor air. Temperature differences can be reduced by operating test fan equipment for a few minutes to replace most of the indoor air with outdoor air.

3.5.3 Testing in Both Positive and Negative Directions

The preferred method for testing a building envelope is to test in both

the pressurized and depressurized directions. Testing in one direction is only allowed if opposite direction testing cannot logistically be performed due to test equipment limitations or restrictions. After obtaining the pre-test bias differential pressure readings, conduct the pressure test. Record the envelope pressures (in units of Pascals) from one interior pneumatic hose (monitoring port) and the outdoor pneumatic hose(s), averaged or manifolded, with corresponding flows (in units of cfm) for each fan. Record the flow rates at at least 10 to 12 positive and 10 to 12 negative building pressure readings. If conducting both positive and negative pressure tests the lowest allowable test pressure is 40 Pa and the highest test pressure is 85 Pa. Keep at least 25 Pa difference between the lowest and highest test pressure readings. Include the 75 Pa pressure value between the lowest and highest readings. The 10 to 12 readings in each direction are to be roughly evenly spaced along the range of pressures and flows. After testing is complete de-energize the equipment used to provide pressurization and obtain an additional 10 to 12 post-test bias pressure readings. None of the bias pressure readings are allowed to exceed 30 percent of the minimum test pressure. If these limits are exceeded the test fails and must be repeated.

3.5.4 Using a Building's Own Air Handling System to Pressure Test an Envelope

3.5.4.1 Test Setup

Temporarily seal the envelope in a manner similar to that for testing with blower door or trailer-mounted fans. To positively pressurize the envelope, de-energize all ventilation equipment and close all associated dampers, except those outside air intake dampers associated with supply fans that will be used to pressurize the building envelope. Fully open these dampers. For the negative pressure test, de-energize all ventilation equipment except for those fans that will be used to de-pressurize the envelope. All dampers associated with de-energized fans are to be closed and all exhaust dampers associated with fans used to de-pressurize the envelope will be fully opened.

3.5.4.2 Measuring Airflows

When using the building's own air handling system to pressure test the envelope, air flows can generally be measured using one of the following methods:

- a. When testing using the building's own air handling system, ensure flow readings obtained by anemometer comply with ASTM D3464. Pitot tube or hot wire anemometer traverse in accordance with ASTM D3464.
- b. Pressure compensated shrouds (especially recommended for rooftop exhaust fans)
- c. Tracer gas methods for measuring airflows in ducts in accordance with ASTM E2029. Do not use tracer gas decay, constant injection and constant concentration methods for estimating the total ventilation rate of the envelope.

3.5.4.3 Outdoor Air Flow Measuring Stations

Air flow stations may be used to measure outdoor airflows if one of the above methods is used to check accuracy of at least one air flow reading for each station or if the design of the HVAC system specifically placed

outdoor air flow stations in locations that will yield accurate results. Field verify the accuracy of readings at the air flow measuring stations before obtaining pressure test readings.

3.5.5 Pressure Testing - Special Cases

3.5.5.1 Pressure Testing a Multiple Isolated Zoned Building

Pressure test each exterior corner zone plus at least an additional 20 percent (as measured by floor area) of remaining zones. The Contracting Officer is responsible for selecting which of these additional zones to test. If all zones pass the pressure test it is assumed that all untested zones also pass and no further testing is required. If, however, any zone fails to pass the test's leakage requirements, re-seal and re-test until it passes in accordance with paragraph FAILED PRESSURE TEST. Test an additional 20 percent of previously untested zones. If all tested zones pass, no further testing is needed. If any zone in this group fails the test re-seal and re-test the zone until it passes. Continue this process until all the tested zones pass. When testing a zone, the doors to all adjacent zones that share a common surface with the tested zone are to have their doors opened to the outdoors. The resulting leakage from the test zoned is that through all 6 surfaces (4 walls, roof and floor, for a rectangular shaped zone).

3.5.5.2 Pressure Testing a Building Addition

If the existing building is occupied, coordinate the pressure test with building representatives. In preparation of the test, de-energize the air handling system serving that portion of the existing building that shares surfaces with the new building addition. Pressure testing a new building addition may also require pressurizing that part of the existing building that shares surfaces in common with the new building addition. If an air barrier is applied to the common surfaces separating the existing building from the new addition, prior to the test prop open a sufficient quantity of doors and/or windows to keep the existing building at the same pressure as the outdoors. If an air barrier is not applied to the common surfaces separating the existing building from the new addition, pressurize that part of the existing building that shares surfaces in common with the building addition to the same level as the as the addition using separate test pressurization equipment.

3.5.6 Failed Pressure Test

If the pressure test fails to meet the established criteria, use diagnostic test methods described in paragraph LOCATING LEAKS BY DIAGNOSTIC TESTING to discover the leak locations. Provide additional permanent sealing measures to reduce or eliminate leak sources discovered during diagnostic testing. Retest (perform another pressure test) after sealing has been completed. Repeat this sequence of documenting test results in the test report, performing diagnostic tests, documenting recommendations for additional sealing measures in the test report, sealing leak locations per recommendations, and re-testing as necessary until the building envelope passes the pressure test and is in compliance with the performance requirements.

3.5.7 Air Leakage Test Report

Report volumetric flow rates and corresponding differential pressures in cubic feet per minute (cfm) and Pascals (Pa), respectively, on the Air

Leakage Test Form sample form found in Appendix A. Populate the accompanying spreadsheet file entitled Pressure Test Data Analysis with information obtained during the test. The spreadsheet uses equations found in ASTM E779 as a basis for calculating the envelope leakage rate. Other similar leakage rate calculation programs cannot be used or submitted for review. Submit a printout of the data input and output in the report. Should any air tightness (pressure) test fail, the pressure test report is to include data and results from all previous failed tests along with the final successful test data and results. Indicate if the resulting leakage rate did or did not meet the goal leakage requirement. Identify and document deficiencies in the building construction upon failure of a test to meet the specified maximum leakage rate.

Include the Test Agency Qualification Sheet, Air Leakage Test Form and Air Leakage Test Results Form in the written report. Document every test set-up condition with diagrams and photos to ensure the tests can be made repeatable. Document all pneumatic hose termination locations. Record in detail how the building envelope was prepared for the tests. Also describe in detail which building items were temporarily sealed. Include photos of test equipment and sealing measures in the report. Include an electronic (pdf) version of all test reports on a CD. If the building envelope fails to meet the leakage rate goal, provide recommendations to further seal the envelope and document these recommendations in the test report.

3.6 LOCATING LEAKS BY DIAGNOSTIC TESTING

Use diagnostic test methods described herein to discover obvious leaks through the envelope. Perform diagnostic tests on the building envelope regardless of the envelope meeting or failing to meet the designated leakage rate goal. Use diagnostic test methods in accordance with ASTM E1186 and in conjunction with pressurization equipment as necessary. Use the thermography diagnostic test to establish a baseline for envelope leakage. Apply additional diagnostic tests (find, feel, fog or other tests) as necessary to further define leak locations and pathways discovered using thermography or to find additional leaks not readily detected by thermography. Using a variety of diagnostic tests may help locate leaks that would otherwise go undetected if only a single diagnostic test were used. Pay special attention to locating leaks at interfaces where there is a change in materials or a change in direction of like materials. These interfaces, at a minimum, include roof/wall, wall/wall, floor/wall, wall/window, wall/door, wall/louver, roof mounted equipment/roof curb interfaces and all utility penetrations (ducts, pipes, conduit, etc) through the envelope's architecture. Also use diagnostic tests to check for leakage between the air duct and duct damper, when the damper, under normal control power, is placed in the closed position. Should leaks be discovered during diagnostic tests, thoroughly document their exact locations on a floor plan so that sealing can be later applied, if required or as directed. If the envelope passes the leakage test, use the diagnostic test procedure described above to identify obvious leakage locations. Seal the leaks at the discretion of the COR based on the magnitude, location, potential for liquid moisture penetration or retention, potential for condensation, presence of daylight through an architectural surface or if the leakage location could potentially cause rapid deterioration or mold growth of, or in the building envelope materials and assemblies. Apply sealing measures after diagnostic testing is complete and all pressurization blowers are off. To verify that the applied sealing measures that are effective, re-test for leaks using the same diagnostic methods that discovered the leak. Reseal

and retest until the envelope meets the leakage rate goal and all obvious leaks through the envelope are sealed.

3.6.1 Find Test

Use visual observation to locate daylight and/or artificial light streaming from the opposite side of the envelope. Observe all interfaces identified above.

3.6.2 Feel Test

Use the building's air handling system or blower door equipment to negatively pressurize the building envelope, to at least 25 Pa but no greater than 85 Pa, with respect to the outdoors. The larger the pressure difference, the easier discovering leaks by feeling them becomes. While inside the envelope, hand feel roof/wall, wall/wall, and floor/wall interfaces and utility penetrations (ducts, pipes, conduit, etc) for leaks and note the leak locations on a floor plan. The "Feel" test may also be used to check for leaks between the ductwork and ductwork damper. To do this, positively pressurize the envelope and check for air movement from the envelope exterior.

3.6.3 Fog Test

Before using a theatrical fog generator, disable all building smoke detectors as they may alarm when fog is issued. Coordinate fog tests and the disabling of all smoke detectors with the Contracting Officer's representative and the local fire department as necessary. Use pressure test equipment or the buildings own air handling system to positively pressurize the building envelope to at least 25 Pa but not greater than 85 Pa over the outdoors. Using a theatrical fog generator within the envelope, direct fog at suspected leakage points such as at building interfaces. Test the following interfaces: Roof/wall, wall/wall, floor/wall, wall/window, roof/mounted mechanical equipment. From the vantage point immediately outside the envelope and opposite that of the interface being tested, observe the effect as the fog is issued. Detection may also be further enhanced by using a scented fog liquid or a fog liquid that produces a colored fog. Look for fog and smell for associated odor percolating through the interface. Also use smoke puffers and smoke sticks as necessary to locate leaks at these and other interface locations. If the Architectural Plus HVAC System pressure test will be/was performed introduce fog into ductwork to check for leakage between ductwork and associated dampers. After fog testing has ended, reactivate the building smoke detectors and notify the Contracting Officer and local fire department that the test has ended. After sealing has been completed retest these areas using fog. Seal additional leaks that are found.

3.6.4 Diagnostic Test Report

Once the diagnostic tests have been completed and the leakage locations identified and sealed, document these procedures, locations and recommendations in the diagnostic test report. Submit plan and/or profile drawings that thoroughly identify leak locations. Describe in detail all leak locations so that the seal-up crew knows where to apply sealing measures. After sealing measures have been applied, describe the methods used along with applicable photos of the final sealed condition.

3.6.4.1 Thermographic Investigation Report

Submit a report of each thermographic investigation identifying the thermal discontinuities in the thermal control layer. Indicate in the final report locations to which improvements for both the air control layer and the thermal control layer were made to reduce air leaks and correct discontinuities in the thermal control layer. Include in the report some selected radiometric images of suspected failure points in the air barrier envelope that indicate before and after conditions. Indicate in the final report improvements that were made to the envelope to reduce air leaks. Include the following items in the report:

- a. Brief description of the building construction
- b. Types of interior and exterior surface materials used in the building.
- c. Geographical orientation of the building with a description of the exterior surroundings including other buildings, vegetation, landscaping, and surface water drainage.
- d. Camera brand, model and serial number, and date of most recent calibration date; optional lenses with serial numbers (if applicable)
- e. Thermographer's and Government Inspector's names
- f. Date and time of tests
- g. Air temperature and humidity inside the air barrier envelope
- h. Outdoor air temperature and humidity
- i. General information for the last 12 hours on the solar radiation conditions in the geographic area where the test is being performed.
- j. Ambient conditions such as precipitation and wind direction and speed occurring with the last 24 hours, as applicable. Refer to specific requirements in each section of each thermographic inspection type for requirements in each specific area.
- k. Documentation of those portions of the building envelop which were not within test conditions when the scan was performed and which portions were obstructed by adjacent structures, interior furnishings, intervening cavities or reflective surfaces.
- l. Other relevant information, which may have influenced test results.
- m. Drawings, sketches, floor plans and/or photographs detailing the locations in the buildings where thermograms were taken detailing possible irregularities in the components being tested.
- n. Thermal images taken during the inspection with their relative locations and written or voiced recorded explanations of the anomaly listed along with visual and reference images.
- o. An identification of the aspects or components of the building being examined.
- p. Explanations for the type and the extent of each construction defect observed during the inspection.

- q. Any results from additional measurements and investigations. Identify additional equipment used and support with type, model number, serial number and date of most recent calibrated.

3.6.4.2 Fog Test Report

Document all turbulent air flow and dead air spaces within the envelope. Report fog behavior as it exits from and/or is entrained within the building. Include a floor plan in the report that documents the locations where fog passed through the envelope.

3.7 CALCULATION PROGRAM

To calculate the envelope leakage rate and other required outputs, input the data obtained during the pressure tests as documented in the Air Leakage Test Form (Appendix A) into the Air Leakage Rate by Fan Pressurization Excel spreadsheet. This spreadsheet can be found at the following web site:

<http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/forms-graphic>

3.8 AFTER COMPLETION OF THE PRESSURE AND/OR DIAGNOSTIC TEST

After all pressure and/or diagnostic testing has been completed unseal all temporarily sealed items. Unless otherwise directed by the Contracting Officer, return all dampers, doors, and windows to their pre-test condition. Remove tape and plastic from all temporarily sealed openings, being careful not to deface painted surfaces. If paint is removed from finished surfaces, repaint to match existing surfaces. Unless otherwise directed by the Contracting Officer's representative, return fuel (gas) valves to their pre-test position and relight pilot lights. Return all fans and air handling units to pre-test conditions.

3.9 REPAIR AND PROTECTION

Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for testing, inspection, and similar services. Upon completion of inspection, testing, or sample taking and similar services, repair damaged construction and restore substrates and finishes, protect construction exposed by or for quality control service activities, and protect repaired construction.

3.10 APPENDICES

The following forms are available for download as a MS Word file at

<http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/forms-graphic>

Appendix A - Air Leakage Test Form

Appendix B - Air Leakage Test Results Form

Appendix C - Test Agency Qualifications Sheet

-- End of Section --

SECTION 07 21 13

BOARD AND BLOCK INSULATION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C165	(2007; R 2017) Standard Test Method for Measuring Compressive Properties of Thermal Insulations
ASTM C553	(2013; R 2019) Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
ASTM C578	(2019) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM C612	(2014; R 2019) Standard Specification for Mineral Fiber Block and Board Thermal Insulation
ASTM C930	(2019) Standard Classification of Potential Health and Safety Concerns Associated with Thermal Insulation Materials and Accessories
ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E96/E96M	(2016) Standard Test Methods for Water Vapor Transmission of Materials

FM GLOBAL (FM)

FM 4880	(2007) American National Standard for Evaluating Insulated Wall or Wall & Roof/Ceiling Assemblies, Plastic Interior Finish Materials, Plastic Exterior Building Panels, Wall/Ceiling Coating Systems, and Interior or Exterior Finish Systems

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2018) International Building Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA 20-1; TIA 20-2; TIA 20-3; TIA 20-4) National Electrical Code
NFPA 286	(2024) Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.134	Respiratory Protection

UNDERWRITERS LABORATORIES (UL)

UL 1040	(2022) Fire Test of Insulated Wall Construction
UL 1715	(2022) Fire Test of Interior Finish Material
UL 2818	(2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Manufacturer's Standard Details

Block or Board Insulation

Protection Board or Coatings

Accessories including sealants

Recycled Content for Block or Board Insulation; S

SD-07 Certificates

Block or Board Insulation

Protection Board or Coating

Draft Special Warranties

Final Special Warranties

Indoor Air Quality For Block Or Board Insulation; S

SD-08 Manufacturer's Instructions

Block or Board Insulation

Adhesive

1.3 MANUFACTURER'S DETAILS

Submit manufacturer's standard details indicating methods of attachment and spacing, transition and termination details, and installation details. Include verification of existing conditions.

1.4 PRODUCT DATA

Include data for material descriptions, recommendations for product shelf life, requirements for protection board or coatings, and precautions for flammability and toxicity. Include data to verify compatibility of sealants with insulation.

1.5 CERTIFICATIONS

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification by other third-party programs. Provide current product certification documentation from certification body.

1.6 DELIVERY, STORAGE, AND HANDLING

1.6.1 Delivery

Deliver materials to the site in original sealed wrapping bearing manufacturer's name and brand designation, specification number, type, grade, R-value, and class. Store and handle to protect from damage. Do not allow insulation materials to become wet, soiled, crushed, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storing, and protecting of materials before and during installation.

1.6.2 Storage

Inspect materials delivered to the site for damage and store out of weather in manufacturer's original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling. Keep materials wrapped and separated from off-gassing materials (such as drying paints and adhesives). Do not use materials that have visible moisture or biological growth. Comply with manufacturer's recommendations for handling, storage, and protection of materials before and during installation.

1.7 SAFETY PRECAUTIONS

1.7.1 Respirators

Provide installers with dust/mist respirators, training in their use, and protective clothing, all approved by the National Institute for

Occupational Safety and Health (NIOSH)/Mine Safety and Health
Administration (MSHA) and in accordance with 29 CFR 1910.134.

1.7.2 Other Safety Considerations

Comply with the safety requirements of ASTM C930.

1.8 SPECIAL WARRANTIES

1.8.1 Guarantee

Guarantee insulation installation against failure due to ultraviolet light exposure for a period of three years from the date of Beneficial Occupancy or Substantial Completion. Submit draft and final guarantees in accordance with Sections 01 78 00 CLOSEOUT SUBMITTALS and 01 78 23 OPERATION AND MAINTENANCE DATA.

1.8.2 Warranty

Provide manufacturer's material warranty for all system components for a period of three years from the date of Beneficial Occupancy or Substantial Completion. Submit draft and final warranties in accordance with Sections 01 78 00 CLOSEOUT SUBMITTALS and 01 78 23 OPERATION AND MAINTENANCE DATA.

PART 2 PRODUCTS

2.1 BLOCK OR BOARD INSULATION

Provide thermal insulating materials as recommended by manufacturer for each type of application indicated. Provide insulation with the following physical properties and in accordance with the following standards:

- a. Mineral Fiber Block and Board: ASTM C612.

2.1.1 Thermal Resistance

Provide ceiling, wall, and floor R-values as indicated in drawings.

2.1.2 Fire Protection Requirements

- a. Flame spread index of 75 or less when tested in accordance with ASTM E84.
- b. Smoke developed index of 150 or less when tested in accordance with ASTM E84.
- c. Provide insulated assemblies in accordance ICC IBC Chapter Fire and Smoke Protection Features.
- d. For polyisocyanurate that does not have a thermal barrier, insulation must meet/pass testing requirements in accordance with NFPA 286, FM 4880, UL 1040, or UL 1715. Such testing must be performed on the finished manufactured foam plastic assembly in the maximum thickness intended for use.

2.1.3 Other Material Properties

Provide thermal insulating materials with the following properties:

- a. Mineral fiber board: Compressive strength: Minimum load required to produce a reduction in thickness of 10 percent pounds per square foot (lbf/sf): 25 when tested according to ASTM C165.
- b. Water Vapor Permeance: Not more than 1.1 Perms or less when measured according to ASTM E96/E96M, desiccant method, in the thickness required to provide the specified thermal resistance, including facings, if any.
- c. Water Adsorption: Not more than 1 percent by volume when measured in accordance with paragraph 14 of ASTM C553.

2.1.4 Premolded Concrete Masonry Insert

Provide in accordance with ASTM C578 REV A. Provide inserts in concrete masonry units that are installed at the masonry unit manufacturing plant. Provide insert with thickness of not less than 1 1/4 inches.

2.1.5 Recycled Materials

Provide thermal insulation containing recycled materials to the extent practicable, provided that the material meets all other requirements of this section. The minimum required recycled material contents (by weight, not volume) are:

Polyisocyanurate/Polyurethane:	9 percent
Phenolic Rigid Foam:	5 percent
Perlite Board:	75 percent post consumer paper

Provide data identifying percentage of recycled content for block or board insulation.

2.1.6 Indoor Air Quality

Provide certification of indoor air quality for block or board insulation.

2.1.7 Prohibited Materials

Do not provide materials containing asbestos.

2.2 PROTECTION BOARD OR COATING

As recommended by insulation manufacturer.

2.3 ACCESSORIES

2.3.1 Adhesive

As recommended by insulation manufacturer.

2.3.2 Mechanical Fasteners

Corrosion resistant fasteners as recommended by the insulation

manufacturer.

PART 3 EXECUTION

3.1 EXISTING CONDITIONS

Prior to installation, ensure all areas that are in contact with the insulation are dry and free of projections that could cause voids, compressed insulation, or punctured vapor retarders. For foundation perimeter or under slab applications, check that subsurface fill is flat, smooth, dry, and well tamped. Do not proceed with installation if moisture or other conditions are present, and notify the Contracting Officer of such conditions. Do not proceed with the work until conditions have been corrected and verified to be dry.

3.2 PREPARATION

3.2.1 Blocking Around Heat Producing Devices

Provide noncombustible blocking at all spaces between heat producing devices and the floors, ceilings and roofs through which they pass. Provide in accordance with ICC IBC Section 2111.12 Fireplace Blocking and with the following clearances:

- a. Recessed lighting fixtures, including wiring compartments, ballasts, and other heat producing devices, unless certified for installation surrounded by insulation: 3 inches from outside face of fixtures and devices or as required by NFPA 70 and, if insulation is placed above fixture or device, 24 inches above fixture.

3.3 INSTALLATION

3.3.1 Installation and Handling

Provide insulation in accordance with the manufacturer's printed installation instructions. Keep material dry and free of extraneous materials.

3.3.2 Electrical Wiring

Do not install insulation in a manner that would enclose electrical wiring between two layers of insulation.

3.3.3 Continuity of Insulation

Butt tightly against adjoining boards, studs, rafters, joists, sill plates, headers and obstructions. Provide continuity and integrity of insulation at corners, wall to ceiling joint, roof, and floor. Avoid creating thermal bridges and voids. Provide and verify continuity of insulative barrier throughout the building enclosure.

3.3.4 Coordination

Verify final installed insulation thicknesses comply with thicknesses indicated, R-values specified herein, and with the approved insulation submittal(s).

3.4 INSTALLATION ON WALLS

3.4.1 Installation on Masonry Walls

Apply board directly to masonry with adhesive or fasteners as recommended by the insulation manufacturer. Fit between obstructions without impaling board on ties or anchors. Apply in parallel courses with joints breaking midway over course below. Place boards in moderate contact with adjoining insulation without forcing and without gaps. Cut and shape as required to fit around wall penetrations, projections or openings to accommodate conduit or other utilities. Seal around cutouts with sealant. Install insulation in wall cavities so that it leaves at least a nominal 1 inch air space outside of the insulation to allow for cavity drainage.

3.4.2 Adhesive Attachment to Concrete and Masonry Walls

Apply adhesive to wall and completely cover wall with insulation.

As recommended by the insulation manufacturer.

Butt all edges of insulation and seal edges with tape.

3.4.3 Mechanical Attachment on Concrete and Masonry Walls

Cut insulation to cover walls. Apply adhesive to wall and set clip or other mechanical fastener in adhesive as recommended by manufacturer. After curing of adhesive, install insulation over fasteners and bend split prongs to provide a flush condition with the insulation. Butt all edges of insulation and seal with tape.

3.4.4 Protection Board or Coating

Install protection board or coating in accordance with manufacturer's printed instructions. Install protection over all exterior exposed insulation and to 1 foot below grade.

3.5 ACCESS PANELS AND DOORS

Attach insulation to all access panels greater than 1 square foot and all access doors in insulated floors and ceilings. Use insulation with same R-Value as that for the floor or ceiling in which each panel occurs.

-- End of Section --

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SECTION 07 21 16

MINERAL FIBER BLANKET INSULATION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C665	(2017) Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
ASTM C930	(2019) Standard Classification of Potential Health and Safety Concerns Associated with Thermal Insulation Materials and Accessories
ASTM D5359	(2015) Standard Specification for Glass Cullet Recovered from Waste for Use in Manufacture of Glass Fiber
ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E136	(2019a) Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

GREEN SEAL (GS)

GS-36	(2013) Adhesives for Commercial Use

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA 20-1; TIA 20-2; TIA 20-3; TIA 20-4) National Electrical Code

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168 (2017) Adhesive and Sealant Applications

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.134 Respiratory Protection

UNDERWRITERS LABORATORIES (UL)

UL 2818 (2013) GREENGUARD Certification Program
For Chemical Emissions For Building
Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Blanket Insulation

Recycled Content for Insulation Materials; S

Accessories

SD-07 Certificates

Indoor Air Quality for Insulation Materials; S

Indoor Air Quality for Adhesives; S

SD-08 Manufacturer's Instructions

Insulation

1.3 CERTIFICATIONS

Submit required indoor air quality certifications and validations in one submittal package.

1.3.1 Insulation Products

Provide product certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification by other third-party programs. Provide current product certification from certification body.

1.3.2 Adhesives and Sealants

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party programs that products meet the requirements of this Section. Provide current product

certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery

Deliver materials to site in original sealed wrapping bearing manufacturer's name and brand designation, specification number, type, grade, R-value, and class. Store and handle to protect from damage. Do not allow insulation materials to become wet, soiled, crushed, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storing, and protecting of materials before and during installation.

1.4.2 Storage

Inspect materials delivered to the site for damage; unload and store out of weather in manufacturer's original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling.

1.5 SAFETY PRECAUTIONS

1.5.1 Respirators

Provide installers with dust/mist respirators, training in their use, and protective clothing, all approved by National Institute for Occupational Safety and Health (NIOSH)/Mine Safety and Health Administration (MSHA) in accordance with 29 CFR 1910.134.

1.5.2 Other Safety Concerns

Consider other safety concerns and measures as outlined in ASTM C930.

PART 2 PRODUCTS

2.1 BLANKET INSULATION

ASTM C665, Type I, blankets without membrane coverings; Class A, membrane-faced surface with a flame spread of 25 or less and a smoke developed rating of 150 or less when tested in accordance with ASTM E84.

2.1.1 Thermal Resistance Value (R-VALUE)

The R-Value must be as indicated on drawings.

2.1.2 Recycled Materials

Provide insulation materials containing the following minimum percentage of recycled material content by weight:

Fiberglass: 20 percent glass cullet complying with ASTM D5359

Provide data identifying percentage of recycled content for insulation materials.

2.1.3 Prohibited Materials

Do not provide asbestos-containing materials.

2.1.4 Reduced Volatile Organic Compounds (VOC) for Insulation Materials

Provide certification of indoor air quality for insulation materials.

2.2 BLOCKING

Wood, metal, unfaced mineral fiber blankets in accordance with ASTM C665, Type I, or other approved materials. Use only non-combustible materials meeting the requirements of ASTM E136 for blocking around chimneys and heat producing devices.

2.3 ACCESSORIES

2.3.1 Adhesive

As recommended by the insulation manufacturer. Provide non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) that meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide aerosol adhesives used on the interior of the building that meet either emissions requirements of CDPH SECTION 01350 (use the office or classroom requirements, regardless of space type) or VOC content requirements of GS-36. Provide certification or validation of indoor air quality for adhesives.

2.3.2 Mechanical Fasteners

Corrosion resistant fasteners as recommended by the insulation manufacturer.

2.3.3 Wire Mesh

Corrosion resistant and as recommended by the insulation manufacturer.

PART 3 EXECUTION

3.1 EXISTING CONDITIONS

Before installing insulation, ensure that areas that will be in contact with the insulation are dry and free of projections which could cause voids, compressed insulation, or punctured vapor retarders. If moisture or other conditions are found that do not allow the workmanlike installation of the insulation, do not proceed but notify Contracting Officer of such conditions.

3.2 PREPARATION

3.2.1 Blocking at Access Doors

Prior to installation of insulation, install permanent blocking to prevent insulation from slipping over, clogging, or restricting air flow through soffit vents at eaves. Install permanent blocking to maintain accessibility to equipment or controls that require maintenance or adjustment.

3.2.2 Blocking Around Heat Producing Devices

Install non-combustible blocking around heat producing devices to provide the following clearances:

- a. Recessed lighting fixtures, including wiring compartments, ballasts, and other heat producing devices, unless these are certified by the manufacturer for installation surrounded by insulation: 3 inches from outside face of fixtures and devices or as required by NFPA 70 and, if insulation is to be placed above fixture or device, 24 inches above fixture.

3.3 INSTALLATION

3.3.1 Insulation

Install and handle insulation in accordance with manufacturer's instructions. Keep material dry and free of extraneous materials. Any materials that show visual evidence of biological growth due to presence of moisture must not be installed on the building project. Ensure personal protective clothing and respiratory equipment is used as required. Observe safe work practices.

3.3.1.1 Electrical wiring

Do not install insulation in a manner that would sandwich electrical wiring between two layers of insulation.

3.3.1.2 Continuity of Insulation

Install blanket insulation to butt tightly against adjoining blankets and to studs, rafters, joists, sill plates, headers and any obstructions. Provide continuity and integrity of insulation at corners, wall to ceiling joints, roof, and floor. Avoid creating thermal bridges.

3.3.1.3 Installation at Bridging and Cross Bracing

Insulate at bridging and cross bracing by splitting blanket vertically at center and packing one half into each opening. Butt insulation at bridging and cross bracing; fill in bridged area with loose or scrap insulation.

3.3.1.4 Sizing of Blankets

Provide only full width blankets when insulating between trusses, joists, or studs. Size width of blankets for a snug fit where trusses, joists or studs are irregularly spaced.

3.3.1.5 Special Requirements for Ceilings

Place insulation under electrical wiring occurring across joists. Pack insulation into narrowly spaced framing. Do not block flow of air through soffit vents.

-- End of Section --

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SECTION 07 22 00

ROOF AND DECK INSULATION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C208	(2012; R 2017; E 2017; E 2019) Standard Specification for Cellulosic Fiber Insulating Board
ASTM C726	(2017) Standard Specification for Mineral Wool Roof Insulation Board
ASTM C728	(2017a) Standard Specification for Perlite Thermal Insulation Board
ASTM C1177/C1177M	(2017) Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
ASTM C1289	(2021) Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building Materials

FM GLOBAL (FM)

FM 4450	(1989) Approval Standard for Class 1 Insulated Steel Deck Roofs
FM 4470	(2016) Single-Ply, Polymer-Modified Bitumen Sheet, Built-up Roof (BUR), and Liquid Applied Roof Assemblies for Use in Class 1 and Noncombustible Roof Deck Construction
FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2018) International Building Code

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

UNDERWRITERS LABORATORIES (UL)

UL 1256	(2002; Reprint Jul 2013) Fire Test of Roof Deck Constructions
UL 2818	(2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Insulation Board Layout and Attachment; G RO

Verification of Existing Conditions

SD-03 Product Data

Insulation; G RO

Cover Board

Fasteners

Recycled Content For Insulation; S

SD-06 Test Reports

Flame Spread Rating; G RO

SD-07 Certificates

Installer Qualifications; G RO

Certificates Of Compliance For Felt Materials

Indoor Air Quality For Insulation; S

SD-08 Manufacturer's Instructions

Nails and Fasteners

Roof Insulation

1.3 SHOP DRAWINGS

Submit insulation board layout and attachment indicating methods of attachment and spacing, transitions, tapered components, thicknesses of materials, and closure and termination conditions. Show locations of ridges, valleys, crickets, interface with, and slope to, roof drains. Base shop drawings on verified field measurements and include verification

of existing conditions.

1.4 PRODUCT DATA

Include data for material descriptions, recommendations for product shelf life, requirements for cover board or coatings, and precautions for flammability and toxicity. Include data to verify compatibility of sealants with insulation.

1.5 MANUFACTURER'S INSTRUCTIONS

Include field of roof and perimeter attachment requirements.

Provide a complete description of installation sequencing for each phase of the roofing system. Include weatherproofing procedures.

1.6 QUALITY CONTROL

Provide certification of installer qualifications from the insulation manufacturer confirming the specific installer has the required qualifications for installing the specific roof insulation system(s) indicated.

Provide certificates of compliance for felt materials.

1.7 FM APPROVAL REQUIREMENTS

Provide fastening patterns in accordance with FM 1-60, FM 1-90, or FM 1-120 as required for insulation on steel decks.

1.8 FIRE PERFORMANCE REQUIREMENTS

1.8.1 Insulation in Roof Systems

Comply with the requirements of ICC IBC or UL 1256 or FM 4450 or FM 4470. Roof insulation to have a flame spread rating of 75 or less when tested in accordance with ASTM E84. Additional documentation of compliance with flame spread rating is not required when insulation of the type used for this project as part of the specific roof assembly is listed and labeled as FM Class 1 approved.

1.8.2 Thermal Barrier Requirements

Separate insulation from steel deck with a thermal barrier of glass mat gypsum roof board or other approved barrier material in accordance with the requirements of the ICC IBC or FM 4450 or FM 4470 or UL 1256.

1.8.3 Fire Resistance Ratings for Roofs

Provide in accordance with ICC IBC Chapter 7 and Table 721.1(3) Min Protection For Floor and Roof Systems.

1.9 CERTIFICATIONS

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification by other third-party programs. Provide current product certification documentation from certification body.

1.10 DELIVERY, STORAGE, AND HANDLING

1.10.1 Delivery

Deliver materials to the project site in manufacturer's unopened and undamaged standard commercial containers bearing the following legible information:

- a. Name of manufacturer
- b. Brand designation
- c. Specification number, type, and class, as applicable, where materials are covered by a referenced specification

Deliver materials in sufficient quantity to allow continuity of the work.

1.10.2 Storage and Handling

Store and handle materials in accordance with manufacturer's printed instructions. Protect from damage, exposure to open flame or other ignition sources, wetting, condensation, and moisture absorption. Keep materials wrapped and separated from off-gassing materials (such as drying paints and adhesives). Do not use materials that have visible moisture or biological growth. Store in an enclosed building or trailer that provides a dry, adequately ventilated environment. Replace damaged material with new material.

1.11 ENVIRONMENTAL CONDITIONS

Do not install roof insulation during inclement weather or when air temperature is below 40 degrees F and interior humidity is 45 percent or greater, or when there is visible ice, frost, or moisture on the roof deck.

1.12 PROTECTION

1.12.1 Completed Work

Cover completed work with cover board for the duration of construction. Avoid traffic on completed work particularly when ambient temperature is above 80 degrees F. Replace crushed or damaged insulation prior to roof surface installation.

PART 2 PRODUCTS

2.1 INSULATION

2.1.1 Insulation Types

Provide one, or an assembly of a maximum of three, of the following roof insulation materials. Provide roof insulation that is compatible with attachment methods for the specified insulation and roof membrane.

- a. Expanded Perlite Board: Provide in accordance with ASTM C728. Minimum 3/4 inch thick when both top and bottom surfaces must be in contact with asphalt.
- b. Polyisocyanurate Board: Provide in accordance with ASTM C1289 REV A Type I, foil faced both sides, except minimum compressive strength of

20 pounds per square inch (psi).

2.1.2 Mineral Fiber Insulation Board

Provide in accordance with ASTM C726.

2.1.3 Recycled Materials

Provide thermal insulation materials containing recycled content. Unless specified otherwise, the minimum required recycled content for listed materials are:

Perlite Composition Board:	75 percent postconsumer paper
Polyisocyanurate/polyurethane:	9 percent recovered material
Wood Fiberboard:	100 percent recovered material
Cellular Glass Insulation:	75 percent recovered content
Structural Fiberboard:	100 percent recovered content
Fiberglass Insulation:	25 percent recovered content
Fiber (felt) or Fiber composite:	75 percent recovered content
Rubber:	90 percent recovered content
Plastic or Plastic/Rubber composite:	90 percent recovered content
Wood/Plastic Composite:	90 percent total recovered content

Provide data identifying percentage of recycled content for insulation.

2.1.4 Indoor Air Quality

Provide certification of indoor air quality for insulation.

2.1.5 Insulation Thickness

As necessary to provide the thermal resistance (R-value) indicated. Base calculation on the R-value for aged insulation. For insulation over steel decks, satisfy both specified R-value and minimum thickness for width of rib opening recommended in insulation manufacturer's published literature.

2.2 COVER BOARD

For use as a thermal barrier (underlayment), fire barrier (overlayment), or cover board for hot-mopped, torched-down, or adhesive-applied roofing membrane over roof insulation.

2.2.1 Glass Mat Gypsum Roof Board

ASTM C1177/C1177M, 0 Flame Spread and 0 Smoke Developed when tested in accordance with ASTM E84, 500 psi, Class A, non-combustible, 1/4 inch thick, 4 by 8 feet board size.

2.2.2 High Density Wood Fiber

Provide high density fiber board, Grade 2 in accordance with ASTM C208 with a transverse load of 12 lbf.

2.3 FASTENERS

Provide flush-driven fasteners through flat round or hexagonal steel or plastic plates. Provide zinc-coated steel plates, flat round not less than 1 3/8 inch diameter, hexagonal not less than 28 gauge. Provide high-density plastic plates, molded thermoplastic with smooth top surface, reinforcing ribs and not less than 3 inches in diameter. Fully recess fastener head into plastic plate after it is driven. Form plates to prevent dishing. Do not use bell or cup shaped plates. Provide fasteners in accordance with insulation manufacturer's recommendations for holding power when driven. Provide fasteners for steel or concrete decks in accordance with FM APP GUIDE (<http://www.approvalguide.com/>) for Class I roof deck construction, and spaced to withstand uplift pressure indicated in structural drawings.

2.3.1 Fasteners for Steel Decks

Approved hardened penetrating fasteners or screws in accordance with FM 4450 and listed in FM APP GUIDE for Class I roof deck construction. Quantity and placement to withstand a minimum uplift pressure as indicated in structural drawings and in accordance with FM APP GUIDE.

2.3.2 Fasteners for Poured Concrete Decks

Approved hardened fasteners or screws to penetrate deck at least 1 inch but not more than 1 1/2 inches, in accordance with FM 4470, and listed in FM APP GUIDE for Class I roof deck construction. Quantity and placement to withstand an uplift pressure as indicated in structural drawings and in accordance with FM APP GUIDE.

2.4 WOOD NAILERS

Pressure-preservative treated as specified in Section 06 10 00 ROUGH CARPENTRY.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

3.1.1 Surface Inspection

Ensure surfaces are clean, smooth, and dry prior to application. Check roof deck surfaces, including surfaces sloped to roof drains and outlets, for defects before starting work.

The Contractor must inspect and approve the surfaces immediately before starting installation. Prior to installing insulation, perform the following:

- a. Examine steel decks to ensure that panels are properly secured to structural members and to each other and that surfaces of top flanges are flat or slightly convex.

3.1.2 Surface Preparation

Correct defects and inaccuracies in roof deck surface to eliminate poor drainage from hollow or low spots, perform the following:

- a. Provide wood nailers of the same thickness as the insulation at eaves, edges, curbs, walls, and roof openings for securing of cant strips, gravel stops, gutters, and flashing flanges. On decks with slopes of one in 12 (1 inch per foot) or more, install wood nailers perpendicular to slope for securing insulation. Space nailers in accordance with approved shop drawings.
- b. Cover steel decks with a layer of insulation board of sufficient width to span the width of a deck rib opening, and in accordance with fire safety requirements. Secure with piercing or self-drilling, self-tapping fasteners of quantity and placement in accordance with FM APP GUIDE. Locate insulation joints parallel to ribs of deck on solid bearing surfaces only, not over open ribs.

3.2 INSULATION INSTALLATION

Apply insulation in two layers with staggered joints when total required thickness of insulation exceeds 1/2 inch. Lay insulation so that continuous longitudinal joints are perpendicular to direction of roofing, as specified in Section, and end joints of each course are staggered with those of adjoining courses. When using multiple layers of insulation, provide joints of each succeeding layer that are parallel and offset in both directions with respect to the layer below. Keep insulation 1/2 inch clear of vertical surfaces penetrating and projecting from roof surface. Verify required slopes to each roof drain.

3.2.1 Special Precautions for Installation of Foam Insulation

3.2.1.1 Polyisocyanurate Insulation

Where polyisocyanurate foam board insulation is provided, install 1/2 inch thick wood fiberboard, glass mat gypsum roof board, or 3/4 inch thick expanded perlite board insulation over top surface of foam board insulation. Stagger joints of insulation with respect to foam board insulation below.

3.3 PROTECTION

3.3.1 Protection of Applied Insulation

Completely cover each day's installation of insulation with finished roofing specified in drawings on same day. Phased construction is not permitted. Protect open spaces between insulation and parapets or other walls and spaces at curbs, scuttles, and expansion joints, until permanent roofing and flashing are applied. Storing, walking, wheeling, or trucking directly on insulation or on roofed surfaces is not permitted. Provide smooth, clean board or plank walkways, runways, and platforms near supports, as necessary, to distribute weight in accordance with indicated live load limits of roof construction. Protect exposed edges of insulation with cutoffs at the end of each work day or whenever precipitation is imminent. Cutoffs must be two layers of bituminous-saturated felt set in plastic bituminous cement or single ply or EPDM membrane set in roof cement. Fill all profile voids in cutoffs to prevent trapping moisture below the membrane. Remove cutoffs when work

resumes.

3.3.2 Damaged Work and Materials

Restore work and materials that become damaged during construction to original condition or replace with new materials.

3.4 INSPECTION

Establish and maintain inspection procedures to assure compliance of the installed roof insulation with contract requirements. Remove, replace, correct in an approved manner, any work found not in compliance. Quality control must include, but is not limited to, the following:

- a. Observation of environmental conditions; number and skill level of insulation workers; start and end time of work.
- b. Verification of certification, listing or label compliance with FM Data Sheets. (
<https://www.fmglobal.com/fmglobalregistration/Downloads.aspx>)
- c. Verification of proper storage and handling of insulation and vapor retarder materials before, during, and after installation.
- d. Inspection of mechanical fasteners; type, number, length, and spacing.
- e. Coordination with other materials, cants, sleepers, and nailing strips.
- f. Inspection of insulation joint orientation and laps between layers, joint width and bearing of edges of insulation on deck.
- g. Installation of cutoffs and proper joining of work on subsequent days.
- h. Continuation of complete roofing system installation to cover insulation installed same day.
- i. Verification of required slope to each roof drain.

-- End of Section --

SECTION 07 27 10.00 10

BUILDING AIR BARRIER SYSTEM

PART 1 GENERAL

1.1 SUMMARY

This Section specifies the construction and quality control of the installation of an air barrier system. Construct the air barrier system indicated, taking responsibility for the means, methods, and workmanship of the installation of the air barrier system. The air barrier must be contiguous and connected across all surfaces of the enclosed air barrier envelope indicated. The maximum leakage requirements of individual air barrier components and materials are specified in the other specification sections covering these items.

This section also defines the maximum allowable leakage of the final air barrier system. The workmanship must be adequate to meet the maximum allowable leakage requirements of this specification. Test the assembled air barrier system to demonstrate that the building envelope is properly sealed and insulated. Passing the air barrier system leakage test and thermography test will result in system acceptance. Conform air barrier system leakage and thermography testing and reporting to the requirements of Section 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referenced within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D4541	(2017) Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM E96/E96M	(2016) Standard Test Methods for Water Vapor Transmission of Materials
ASTM E2178	(2021a) Standard Test Method for Air Permeance of Building Materials
ASTM E2357	(2017) Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 285	(2012) Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

1.3 DEFINITIONS

The following terms as they apply to this section:

1.3.1 Air Barrier Accessory

Products designated to maintain air tightness between air barrier materials, air barrier assemblies and air barrier components, to fasten them to the structure of the building, or both (e.g., sealants, tapes, backer rods, transition membranes, fasteners, strapping, primers).

1.3.2 Air Barrier Assembly

The combination of air barrier materials and air barrier accessories that are designated and designed within the environmental separator to act as a continuous barrier to the movement of air through the environmental separator.

1.3.3 Air Barrier Component

Pre-manufactured elements such as windows, doors, dampers and service elements that are installed in the environmental separator.

1.3.4 Air Barrier Envelope

The combination of air barrier assemblies and air barrier components, connected by air barrier accessories that are designed to provide a continuous barrier to the movement of air through an environmental separator. There may be more than one air barrier envelope in a single building. Also known as Air Barrier System.

1.3.5 Air Barrier Material

A building material that is designed, tested and/or produced to provide the primary resistance to airflow through an air barrier assembly of a wall system.

1.3.6 Air Barrier System

Same as AIR BARRIER ENVELOPE.

1.3.7 Air Leakage Rate

The rate of airflow (CFM) driven through a unit surface area (sq.ft.) of an assembly or system by a unit static pressure difference (Pa) across the assembly. (example: 0.25 CFM/sq.ft. @ 75 Pa)

1.3.8 Air Leakage

The total airflow (CFM) driven through the air barrier system by a unit static pressure difference (Pa) across the air barrier envelope. (example: 6500 CFM @ 75 Pa)

1.3.9 Air Permeance

The tested rate of airflow (CFM) through a unit area (sq.ft.) of a material driven by unit static pressure difference (Pa) across the material (example: 0.004 CFM/sq.ft. @ 75 Pa) as established by ASTM E2178.

1.3.10 Environmental Separator

The parts of a building that separate the controlled interior environment from the uncontrolled exterior environment, or that separate spaces within a building that have dissimilar environments. Also known as the Control Layer.

1.3.11 Vapor Permeance

Vapor permeance is separated into three classes based on the water vapor permeance of a material as tested via ASTM E96/E96M

Class I Vapor Barrier/Retarder 0.1 perm or less

Class II Vapor Barrier/Retarder 0.1 perm to 1.0 perm

Class III Vapor Barrier/Retarder 1.0 perm to 10 perm

1.4 PREPARATORY PHASE OR PRECONSTRUCTION CONFERENCE

Organize pre-construction conferences between the air barrier inspector and the sub-contractors involved in the construction of or penetration of the air barrier system to discuss where the work of each sub-contractor begins and ends, the sequence of installation, and each sub-contractor's responsibility to ensure airtight joints, junctures, penetrations and transitions between materials. Discuss the products, and assemblies of products specified in the different sections to be installed by the different sub-contractors.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Air Barrier System Shop Drawings; G RO, Manufacturer produced warranted air barrier system

SD-03 Product Data

Air Barrier System Product Data; G RO

SD-04 Samples

Mock-Up; G RO

Material Samples for Air Barrier System

SD-05 Design Data

Design Data and Calculations For The Air Barrier System, Manufacturer produced warranted air barrier system

SD-06 Test Reports

Design Review Report

Testing and Inspection

SD-07 Certificates

Air Barrier Inspector; G, RO

1.6 AIR BARRIER ENVELOPE SURFACE AREA AND LEAKAGE REQUIREMENTS

The building air barrier systems must meet the following leakage requirements. The allowable leakage rate and the maximum leakage are at a differential test pressure of 75 Pa.

Air Barrier Envelope 1	
Surface Area	Refer to drawings
Architectural Only Test:	
Allowable leakage rate	0.25 CFM/sq.ft

1.7 AIR BARRIER INSPECTOR

Employ a designated Air Barrier Inspector on this project. The Air Barrier Inspector performs a Design Review, oversees quality control testing specified in these specifications, performs quality control air barrier inspection as specified, interfaces with the designer and product manufacturer's representatives to assure all installation requirements are met, reviews Construction Quality Control Manager's daily reports of quality control and inspections of air barrier as specified, and verifies that the constructed work is in accordance with both the manufacturer's recommendations for products used, the content of this specification and other contract drawings or documents. Qualification for the Air Barrier Inspector are as follows:

- a. Training and certification as an Air Barrier Auditor from the Air Barrier Association of America (ABAA) or other third party air barrier association.
- b. Or, provide documentation in resume format that demonstrates that the individual proposed has the experience, knowledge, skills and abilities to fulfill the above stated duties as the air barrier inspector.
- c. It is acceptable that this individual be employed by the firm who will be performing the building pressurization test or another independent third party entity, provided they meet the above requirements but shall not be a member of the installing contractor or firm.

Provide copies of Air Barrier Inspector qualifications 30 days after Notice to Proceed.

1.8 DESIGN REVIEW

Review the Contract Plans and Specifications and advise the Contracting Officer of any deficiencies that would prevent the construction of an effective air barrier system. Provide a Design Review Report individually listing each deficiency and the corresponding proposed corrective action necessary for proper air barrier system. Provide copies of the Design Review Report not later than 14 days after approval of the Air Barrier Inspector Qualifications. Submit design data and calculations for the Air Barrier System for a manufacturer produced warranted air barrier system.

PART 2 PRODUCTS

2.1 AIR BARRIER

Provide air barrier system of compatible parts from one or several manufacturers coordinated by the Contractor or provide a single warranted system provided by a primary manufacturer. The air barrier system as part of a tested exterior wall assembly must meet the conditions of acceptance as tested in accordance with NFPA 285. Materials used for roof assembly air barrier must conform to the appropriate UL and FM wind and fire requirements for the specified roof assemblies.

If a complete air barrier system from a single manufacturer is utilized, whether warranted or not warranted, the air barrier system must conform to ASTM E2357.

Materials in the following categories as used in the air barrier system or assembly of the exterior wall system are tested and are required to conform to ASTM E2178: Self-adhered sheet membranes, fluid applied membranes, spray polyurethane foam, mechanically fastened commercial building wrap, factory bonded membranes to sheathing, and adhesive backed commercial building wrap and accessory products.

Other materials used as an air barrier such as concrete, glass, wood, metal or gypsum board may or may not conform to ASTM E2178 but are acceptable provided that when integrated into the air barrier system or assemblies that they are not subject to material or environmental induced degradation in their final produced state and once incorporated in the permanent construction.

All materials used must be identifiable through manufacturer testing data and/or literature to be compatible with all the attached or adjoining materials or substrates used in the system.

Provide Air Barrier System Shop Drawings, Material Samples for Air Barrier System and Air Barrier System Product Data.

PART 3 EXECUTION

3.1 QUALITY CONTROL

3.1.1 Documentation and Reporting

Document the entire installation process on daily job site reports. These reports include information on the Installer, substrates, substrate preparation, products used, ambient and substrate temperature, the location of the air barrier installation, the results of the quality control procedures, and testing results. Provide project specific field

inspection checklist.

3.1.2 Construction Mock-Up

Build mock-up prior to building envelope construction.

- a. Prepare a construction mock-up to demonstrate proper installation of the air barrier assemblies and components. Include air barrier system connections between floor and wall, wall and window, wall and roof. Also, include the sealing method between membrane joints at transitions from one material or component to another, at pipe or conduit penetrations of the wall and roof, and at duct penetration of the wall and roof. Work will not begin until the mock-up is satisfactory to the Contracting Officer.
- b. Size the mock-up to approximately 8 feet long by 8 feet high. The mock-up must be representative of primary exterior wall assemblies and glazing components including backup wall and typical penetrations as acceptable to the Contracting Officer. A corner of the actual building may be used as the mock-up.
- c. Mock-Up Tests for Adhesion: Test the mock-up of materials for adhesion in accordance with manufacturer's recommendations. Perform the test after the curing period recommended by the manufacturer. Record the mode of failure and the area which failed in accordance with ASTM D4541. When the air barrier material manufacturer has established a minimum adhesion level for the product on the particular substrate, the inspection report must indicate whether this requirement has been met. Where the manufacturer has not declared a minimum adhesion value for their product/substrate combination, simply record the value.

3.1.3 Quality Control Testing and Inspection

Conduct the following tests and inspections as applicable in the presence of the Contracting Officer during installation of the air barrier system, and submit quality control reports as indicated below.

- a. Provide a Daily Report of Observations with a copy to the Contracting Officer.
- b. Inspect to assure continuity of the air barrier system throughout the building enclosure and that all gaps are covered, the covering is structurally sound, and all penetrations are sealed allowing for no infiltration or exfiltration through the air barrier system.
- c. Inspect to assure structural support of the air barrier system to withstand design air pressures.
- d. Inspect to assure masonry surfaces receiving air barrier materials are smooth, clean, and free of cavities, protrusions and mortar droppings, with mortar joints struck flush or as required by the manufacturer of the air barrier material.
- e. Inspect and test to assure site conditions for application temperature, and dryness of substrates are within guidelines.
- f. Inspect to assure substrate surfaces are properly primed if applicable and in accordance with manufacturer's instructions. Priming must

extend at least 2 inches beyond the air barrier material to make it obvious that the primer was applied to the substrate before the air barrier material.

- g. Inspect to assure laps in materials are at least a 2-inch minimum, shingled in the correct direction or mastic applied in accordance with manufacturer's recommendations, and with no fishmouths.
- h. Inspect to assure that a roller has been used to enhance adhesion. Identify any defects such as fishmouths, wrinkles, areas of lost adhesion, and improper curing. Note the intended remedy for the deficiencies.
- i. Measure application thickness of liquid applied materials to assure that manufacturer's specifications for the specific substrate are met.
- j. Inspect to assure that the correct materials are installed for compatibility.
- k. Inspect to assure proper transitions for change in direction and structural support at gaps.
- l. Inspect to assure proper connection between assemblies (membrane and sealants) for cleaning, preparation and priming of surfaces, structural support, integrity and continuity of seal.
- m. Perform adhesion tests for fluid-applied and self-adhered air barrier membranes to assure that the manufacturer's specified adhesion strength properties are met. Determine the bond strength of coatings to substrate in accordance with ASTM D4541.
- n. Provide cohesion tests for spray polyurethane foam (SPF). Perform the tests in accordance with the specification sections which specify these materials.
- o. Provide written test reports of all tests performed.

3.2 REPAIR AND PROTECTION

Upon completion of inspection, testing, sample removal and similar services, repair damaged construction and restore substrates, coatings and finishes. Protect construction exposed by or for quality control service activities, and protect repaired construction.

-- End of Section --

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SECTION 07 27 19.01

SELF-ADHERING AIR BARRIERS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AIR BARRIER ASSOCIATION OF AMERICA (ABAA)

ABAA Accreditation

Accreditation

ABAA QAP

Quality Assurance Program

ASTM INTERNATIONAL (ASTM)

ASTM D146/D146M

(2004; E 2012; R 2012) Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing

ASTM D412

(2016) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension

ASTM D570

(1998; E 2010; R 2010) Standard Test Method for Water Absorption of Plastics

ASTM D903

(1998; R 2017) Standard Test Method for Peel or Stripping Strength of Adhesive Bonds

ASTM D1876

(2008; R 2015; E 2015) Standard Test Method for Peel Resistance of Adhesives (T-Peel Test)

ASTM D4263

(1983; R 2018) Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method

ASTM D4541

(2017) Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

ASTM E84

(2020) Standard Test Method for Surface Burning Characteristics of Building Materials

ASTM E154/E154M

(2008a; R 2013; E 2013) Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

ASTM E283

(2019) Standard Test Method for

Determining the Rate of Air Leakage
Through Exterior Windows, Curtain Walls,
and Doors Under Specified Pressure
Differences Across the Specimen

ASTM E331 (2000; R 2016) Standard Test Method for
Water Penetration of Exterior Windows,
Skylights, Doors, and Curtain Walls by
Uniform Static Air Pressure Difference

ASTM E2178 (2021a) Standard Test Method for Air
Permeance of Building Materials

ASTM E2357 (2017) Standard Test Method for
Determining Air Leakage of Air Barrier
Assemblies

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 285 (2012) Standard Fire Test Method for
Evaluation of Fire Propagation
Characteristics of Exterior
Non-Load-Bearing Wall Assemblies
Containing Combustible Components

1.2 RELATED REQUIREMENTS

Coordinate the requirements of Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM, Section 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS and other building enclosure sections to provide a complete building air barrier system. Submit all materials, components, and assemblies of the air barrier system together as one complete submittal package.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Qualifications of Manufacturer; G RO

Qualifications of Installer; G RO

SD-02 Shop Drawings

Self-adhering Air Barrier; G RO

SD-03 Product Data

Self-adhering Air Barrier; G RO

Primers, Adhesives, and Mastics

Safety Data Sheets

SD-06 Test Reports

Field Peel Adhesion Test

Flame Propagation of Wall Assemblies

Flame Spread and Smoke Developed Index Ratings

Site Inspections and Testing

SD-07 Certificates

Self-adhering Air Barrier

SD-08 Manufacturer's Instructions

Self-adhering Air Barrier

Primers, Adhesives, and Mastics

1.4 MISCELLANEOUS REQUIREMENTS

For self-adhering air barrier provide the following:

1.4.1 Shop Drawings

Submit self-adhering air barrier shop drawings showing locations and extent of air barrier assemblies and details of all typical conditions, intersections with other building enclosure assemblies and materials, and membrane counterflashings. Show details for bridging of gaps in construction, treatment of inside and outside corners, expansion joints, methods of attachment of materials covering the self-adhered barrier without compromising the barrier. Indicate how miscellaneous penetrations such as conduit, pipes, electric boxes, brick ties, and similar items will be sealed.

1.4.2 Product Data

Submit manufacturer's technical data indicating compliance with performance and environmental requirements, manufacturer's printed instructions for evaluating, preparing, and treating substrates, temperature and other limitations of installation conditions, safety requirements for installation, and Safety Data Sheets. Indicate flame and smoke spread ratings for all products.

1.4.3 Test Reports

Submit test reports indicating that field peel-adhesion tests on all materials have been performed and the changes made, if required, in order to achieve successful and lasting adhesion. Submit test reports for flame propagation of wall assemblies tested in accordance with NFPA 285. Submit test reports for flame spread and smoke developed index ratings of barrier system materials tested in accordance with ASTM E84.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery

Deliver and store materials in sufficient quantity to allow for uninterrupted flow of work. Inspect materials delivered to the site for damage and store out of weather. Deliver materials to the job site in their original unopened packages, clearly marked with the manufacturer's name, brand designation, description of contents, and shelf life of containerized materials. Store and handle to protect from damage.

1.5.2 Storage

Inspect materials delivered to the site for damage; unload and store out of weather in manufacturer's original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling. Protect stored materials from direct sunlight. Keep materials sealed and separated from absorptive materials, such as wood and insulation.

1.6 FIELD PEEL ADHESION TEST

Perform a field peel-adhesion test on the construction mockup. Test the self-adhering air barrier for adhesion in accordance with ASTM D4541 using a Type II pull tester except use a disk that is 4 inches in diameter and cut through the membrane to separate the material attached to the dish from the surrounding material. Perform test after curing period in accordance with manufacturer's written recommendations. Record mode of failure and area which failed in accordance with ASTM D4541. Compare adhesion values with the manufacturer's established minimum values for the particular combination of material and substrate. Indicate on the inspection report whether the manufacturer's requirement has been met. Where the manufacturer has not declared a minimum adhesion value for their product and substrate combination, the inspector must record actual values.

1.7 AIR BARRIER TESTING

Perform air barrier testing in accordance with Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM.

1.8 QUALITY ASSURANCE

1.8.1 Qualifications of Manufacturer

Submit documentation verifying that the manufacturer of the self-adhering air barrier is currently accredited by Air Barrier Association of America (ABAA Accreditation <https://www.airbarrier.org/>).

1.8.2 Qualifications of Installer

Submit documentation verifying that installers of the self-adhering air barrier are currently certified in accordance with the ABAA QAP Quality Assurance Program (<https://www.airbarrier.org/qap/>).

1.9 PRECONSTRUCTION MEETING

Conduct a preconstruction meeting a minimum of two weeks prior to commencing work specified in this Section. Agenda must include, at a minimum, construction and testing of mockup, sequence of construction,

coordination with substrate preparation, materials approved for use, compatibility of materials, coordination with installation of adjacent and covering materials, and details of construction. Attendance is required by representatives of related trades including covering materials, substrate materials, adjacent materials, and materials and components of the air barrier system.

1.10 ENVIRONMENTAL CONDITIONS

1.10.1 Temperature

Install air barrier within the range of ambient and substrate temperatures as recommended in writing by the air barrier manufacturer. Verify that the surface to receive self-adhering air barrier is dry for a minimum of 48 hours prior to the installation of the barrier. Do not apply air barrier to damp or wet substrates. Do not apply during inclement weather or when ice, frost, surface moisture, or visible dampness is present on surfaces to be covered, or when precipitation is imminent.

1.10.2 Exposure to Weather and Ultraviolet Light

Protect air barrier products from direct exposure to rain, snow, sunlight, mist, and other extreme weather conditions. Replace, at no additional cost to the Government, barrier products that have been exposed to ultraviolet (sun)light longer than allowed by manufacturer's written requirements.

PART 2 PRODUCTS

2.1 SELF ADHERING AIR BARRIER

Provide minimum 0.040 inch thick self-adhering, air barrier membrane consisting of a cross-laminated high density polyethylene (HDPE) film, fully coated with rubberized asphalt adhesive. Provide membrane in rolls of various widths interleaved with disposable silicone release paper. Self-adhering air barrier must exhibit no visible water leakage when tested in accordance with ASTM E331 and must perform as a liquid water drainage plane flashed to discharge to the exterior any incidental condensation or water penetration. Use regular or low temperature formulation depending on site conditions, within temperature ranges specified by manufacturer.

2.1.1 Physical Properties

- a. Air Permeance (ASTM E2178): In accordance with Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM.
- b. Air Leakage (ASTM E2357, ASTM E283): In accordance with Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM.
- c. Tensile Strength (ASTM D412 die C modified): Not less than 400 psi.
- d. Tensile Elongation (ASTM D412 die C modified): Not less than 200 percent.
- e. Puncture Resistance (ASTM E154/E154M): Not less than 40 lbs.
- f. Pliability (ASTM D146/D146M): Unaffected at minus 25 degrees F, 0.063 inch mandrel.

- g. Lap Adhesion (ASTM D1876 modified): Not less than 4.0 lbs per inch.
- h. Peel Adhesion (ASTM D903): Not less than 5.0 lbs per inch.
- i. Water Absorption (ASTM D570): Not to exceed 0.12 percent by weight.
- j. Flame propagation of wall assemblies (NFPA 285): Pass
- k. Surface Burning Characteristics (ASTM E84):
 - (1) Flame Spread Index Rating not higher than 75.
 - (2) Smoke Developed Index Rating not higher than 150.

2.2 PRIMERS, ADHESIVES, AND MASTICS

Provide primers, adhesives, mastics and other accessory materials as recommended in writing by the manufacturer of the self-adhering air barrier for adequate bonding to each type of substrate.

2.3 SHEET METAL FLASHING

Provide as specified in Section 07 60 00 FLASHING AND SHEET METAL.

2.4 JOINT SEALANTS

Provide as specified in Section 07 92 00 JOINT SEALANTS. Verify compatibility with adjacent products that are or will be in contact with one another.

PART 3 EXECUTION

3.1 EXAMINATION

Before installing air barrier, examine substrates, areas, and conditions under which air barrier assemblies will be applied, with Installer present, for compliance with requirements. Ensure the following conditions are met:

- a. Surfaces are sound, dry, even, and free of oil, grease, dirt, excess mortar or other contaminants.
- b. Concrete surfaces are cured and dry, smooth without large voids, spalled areas or sharp protrusions.
- c. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method in accordance with ASTM D4263 and take suitable measures until substrate passes moisture test.
- d. Verify sealants used in sheathing are compatible with membrane proposed for use. Perform field peel adhesion test on materials to which sealants are adhered.

3.2 PREPARATION

Clean, prepare, and treat substrate in accordance with manufacturer's written instructions. Ensure clean, dust-free, and dry substrate for air

barrier application.

- a. Prime masonry and concrete substrates with conditioning primer.
- b. Prime gypsum sheathing an adequate number of coats to achieve required bond, with adequate drying time between coats.
- c. Prime wood, metal, and painted substrates with primer.
- d. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through air barrier and at protrusions.

3.3 INSTALLATION

3.3.1 Installation of Self-adhering Air Barrier

Install materials in accordance with manufacturer's recommendations and the following:

- a. Apply primer at rate recommended by manufacturer prior to membrane installation. Allow primer to dry completely before membrane application. Apply as many coats as necessary for proper adhesion.
- b. When membrane is properly positioned, press into place and roll membrane with roller immediately after placement.
- c. Apply membrane sheets to shed water naturally without interception by a sheet edge, unless that edge is sealed with permanently flexible termination mastic.
- d. Position subsequent sheets of membrane applied above so that membrane overlaps the membrane sheet below by a minimum of 2-1/2 inches, unless greater overlap is recommended by manufacturer. Roll into place with roller.
- e. Make all side laps a minimum of 2-1/2 inches and all end laps a minimum of 5 inches, unless greater overlap is recommended by manufacturer. Roll seams with roller.
- f. Roll membrane to adhere to substrate. Cover corners and joints with two layers of reinforcement by first applying a 12 inch width of membrane centered along the axis. Flash drains and projections with a second ply of membrane for a distance of 6 inches from the drain or projection.
- g. Seal around all penetrations through the air barrier resulting from pipes, vents, conduit, electrical fixtures, structural members, or other construction passing through it. Seal with termination mastic, extruded silicone sealant, membrane counterflashing or other sealing methods in accordance with manufacturer's written recommendations.
- h. Continuously connect the air barrier between walls, roof, floor and below grade assemblies to form a continuous integrated air barrier system around the entire building enclosure. Extend the air barrier membrane into rough openings such as doors, windows, louvers, and other exterior penetrations. Seal edges of barrier at junctures with rough openings.
- i. At changes in substrate plane, provide transition material (e.g., bead

of sealant, mastic, extruded silicone sealant, membrane counterflashing or other material recommended by manufacturer) under membrane to eliminate all sharp 90 degree inside corners and to make a smooth transition from one plane to another.

- j. Provide mechanically fastened non-corrosive metal sheet to span gaps in substrate plane and to make a smooth transition from one plane to the other. Continuously support membrane with substrate.
- k. At deflection and control joints, provide backup for the membrane to accommodate anticipated movement.
- l. At expansion and seismic joints provide transition to the joint assemblies.
- m. Apply a bead or trowel coat of mastic along membrane seams at reverse lapped seams, rough cuts, and as recommended by the manufacturer.
- n. At end of each working day, seal top edge of membrane to substrate with termination mastic.
- o. Do not allow materials to come in contact with chemically incompatible materials.
- p. Counterflash upper edge of thru-wall flashing and air barrier. Counter flashing and thru-wall flashing are specified in Section 07 60 00 FLASHING AND SHEET METAL.

3.4 FIELD QUALITY CONTROL

3.4.1 Site Inspections and Testing

Provide site inspections and testing in accordance with ABAA protocol to verify conformance with the manufacturer's instructions, the ABAA QAP Quality Assurance Program (<https://www.airbarrier.org/qap/>), Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM, Section 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS, and this section.

- a. Conduct inspections and testing at 5, 50, and 95 percent completion of this scope of work. Forward written site inspections and testing reports to the Contracting Officer within five working days of the inspection and test being performed.
- b. If inspections reveal any defects, promptly remove and replace defective work at no additional expense to the Government.

3.5 FIELD PEEL ADHESION TEST

Conduct in accordance with test protocol indicated in Part 1, paragraph FIELD PEEL ADHESION TEST.

3.6 PROTECTION AND CLEANING

3.6.1 Protection

3.6.1.1 Adjacent Surfaces

Protect exposed adjacent surfaces that could be damaged by primers and adhesives associated with air barrier membrane. Provide protection during

application and the remainder of construction in accordance with manufacturer's written instructions.

3.6.1.2 The Air Barrier Assembly

Protect finished portions of the air barrier assembly from damage during ongoing application and throughout the remainder of the construction period in accordance with manufacturer's written instructions. Coordinate timing of installation of materials that will cover the air barrier membrane to ensure the exposure period does not exceed that recommended by the air barrier manufacturer's written installation instructions. Remove and replace, at no additional cost to the Government, membrane products that exceed the manufacturer's allowed exposure limits.

3.6.2 Cleaning

Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction and as acceptable to the primary material manufacturer.

-- End of Section --

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SECTION 07 27 26

FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AIR BARRIER ASSOCIATION OF AMERICA (ABAA)

ABAA Accreditation

Accreditation

ABAA QAP

Quality Assurance Program

ASTM INTERNATIONAL (ASTM)

ASTM C836/C836M

(2015) High Solids Content, Cold
Liquid-Applied Elastomeric Waterproofing
Membrane for Use With Separate Wearing
Course

ASTM D412

(2016) Standard Test Methods for
Vulcanized Rubber and Thermoplastic
Elastomers - Tension

ASTM D4263

(1983; R 2018) Standard Test Method for
Indicating Moisture in Concrete by the
Plastic Sheet Method

ASTM D4541

(2017) Standard Test Method for Pull-Off
Strength of Coatings Using Portable
Adhesion Testers

ASTM D5590

(2000; R 2010; E 2012) Standard Test
Method for Determining the Resistance of
Paint Films and Related Coatings to Fungal
Defacement by Accelerated Four-Week Agar
Plate Assay

ASTM E84

(2020) Standard Test Method for Surface
Burning Characteristics of Building
Materials

ASTM E283

(2019) Standard Test Method for
Determining the Rate of Air Leakage
Through Exterior Windows, Curtain Walls,
and Doors Under Specified Pressure
Differences Across the Specimen

ASTM E331

(2000; R 2016) Standard Test Method for
Water Penetration of Exterior Windows,
Skylights, Doors, and Curtain Walls by
Uniform Static Air Pressure Difference

ASTM E2178	(2021a) Standard Test Method for Air Permeance of Building Materials
ASTM E2357	(2017) Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 285	(2012) Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

1.2 RELATED REQUIREMENTS

Coordinate the requirements of Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM, Section 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS, and other building enclosure sections to provide a complete building air barrier system. Submit all materials, components and assemblies of the air barrier system together as one complete submittal package.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Qualifications of Manufacturer

Qualifications of Installer

SD-02 Shop Drawings

Fluid-Applied Membrane Air Barrier; G RO

SD-03 Product Data

Fluid-Applied Membrane Air Barrier; G RO

Transition Membrane; G RO

Primers, Adhesives, and Mastics

Reinforcement

Safety Data Sheets

SD-06 Test Reports

Capillary Moisture Test

Field Peel Adhesion Test

Flame Propagation of Wall Assemblies

Flame Spread and Smoke Developed Index Ratings

Site Inspections Reports

SD-07 Certificates

Fluid-Applied Membrane Air Barrier

Transition Membrane

SD-08 Manufacturer's Instructions

Fluid-Applied Membrane Air Barrier

Transition Membrane

Primers, Adhesives, and Mastics

1.4 MISCELLANEOUS REQUIREMENTS

For fluid-applied membrane air barriers provide the following:

1.4.1 Shop Drawings

Submit fluid-applied membrane air barrier shop drawings showing locations and extent of barrier assemblies, transition membranes, details of all typical conditions, intersections with other envelope assemblies and materials, and membrane counterflashings. Show details for bridging of gaps in construction, treatment of inside and outside corners, expansion joints, methods of attachment of materials covering the self-adhered barrier without compromising the barrier. Indicate how miscellaneous penetrations such as conduit, pipes, electric boxes, brick ties, and similar items will be sealed.

1.4.2 Product Data

Submit manufacturer's technical data indicating compliance with performance and environmental requirements, manufacturer's printed instructions for evaluating, preparing, and treating substrates, temperature and other limitations of installation conditions, safety requirements for installation, and Safety Data Sheets. Indicate flame and smoke spread ratings for all products.

1.4.3 Test Reports

Submit test reports indicating that capillary moisture tests and field peel adhesion tests on all substrate materials have been performed and the changes made, if required, in order to achieve successful and lasting adhesion. Submit test reports for flame propagation of wall assemblies tested in accordance with NFPA 285. Submit test reports for flame spread and smoke developed index ratings of barrier materials tested in accordance with ASTM E84.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery

Deliver and store materials in sufficient quantity to allow for uninterrupted flow of work. Inspect materials delivered to the site for damage and store out of weather. Deliver materials to the job site in their original unopened packages, clearly marked with the manufacturer's name, brand designation, description of contents, and shelf life of containerized materials. Store and handle to protect from damage.

1.5.2 Storage

Inspect materials delivered to the site for damage; unload and store out of weather in manufacturer's original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling. Protect stored materials from direct sunlight.

1.6 CAPILLARY MOISTURE TEST

Perform a capillary moisture test by plastic sheet method in accordance with ASTM D4263 on the construction mockup and substrate materials. Perform test after curing period as recommended by the air barrier manufacturer. Record mode of failure and area which failed in accordance with ASTM D4263. Once the air barrier material manufacturer has established a minimum adhesion or moisture level for the product on the particular substrate, indicate on the inspection report whether this requirement has been met. Where the manufacturer has not declared a minimum adhesion or moisture value for their product and substrate combination, the inspector must record actual values.

1.7 FIELD PEEL ADHESION TEST

Perform a field peel adhesion test on a construction mockup. Test the applied product for adhesion in accordance with manufacturer's recommendations. Perform test after curing period recommended by the manufacturer. Record mode of failure and area which failed in accordance with ASTM D4541. When the manufacturer has established a minimum adhesion level for the product on the particular substrate, the inspection report must indicate whether this requirement has been met. Where the manufacturer has not declared a minimum adhesion value for their product/substrate combination, the inspector must record actual values.

1.8 AIR BARRIER TESTING

Perform air barrier testing in accordance with Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM.

1.9 QUALITY ASSURANCE

1.9.1 Qualifications of Manufacturer

Submit documentation verifying that manufacturer of fluid-applied membrane air barrier is currently accredited by the Air Barrier Association of America (ABAA Accreditation <https://www.airbarrier.org/>).

1.9.2 Qualifications of Installer

Submit documentation verifying that installers of the fluid-applied

membrane air barrier are currently certified in accordance with the ABAA QAP Quality Assurance Program (<https://www.airbarrier.org/qap/>).

1.10 PRECONSTRUCTION MEETING

Conduct a preconstruction meeting a minimum of two weeks prior to commencing work specified in this Section. Agenda must include, at a minimum, construction and testing of construction mock up, sequence of construction, coordination with substrate preparation, materials approved for use, compatibility of materials, coordination with installation of adjacent and covering materials, and details of construction. Attendance is required by representatives of related trades including covering materials, substrate materials, adjacent materials, and materials and components of the fluid-applied membrane air barrier.

1.11 ENVIRONMENTAL CONDITIONS

1.11.1 Temperature

Install fluid-applied membrane air barrier within the range of ambient and substrate temperatures as recommended in writing by the fluid-applied membrane air barrier manufacturer. Do not apply fluid-applied membrane air barrier to a damp or wet substrate. Do not apply during inclement weather or when ice, frost, surface moisture, or visible dampness is present on surfaces to be covered, or when precipitation is imminent.

1.11.2 Exposure to Weather

Protect fluid-applied membrane air barrier products from direct exposure to rain, snow, sunlight, mist, and other extreme weather conditions. Replace, at no additional cost to the Government, barrier products that have been exposed to ultraviolet (sun)light longer than allowed by manufacturer's written requirements.

PART 2 PRODUCTS

2.1 FLUID-APPLIED MEMBRANE AIR BARRIER

Provide a fluid-applied air barrier. This barrier must exhibit no visible water leakage when tested in accordance with ASTM E331 and must perform as a liquid water drainage plane with thru-wall flashing to discharge incidental condensation and water penetration to the exterior of the building enclosure. Provide products suitable for use within temperature ranges specified by manufacturer for the location of the project.

2.1.1 Physical Properties

- a. Air Permeance (ASTM E2178): In accordance with Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM.
- b. Air Leakage (ASTM E2357, ASTM E283): In accordance with Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM.
- c. Tensile Strength (ASTM D412): Not less than 138 psi.
- d. Elongation (ASTM D412): Not less than 300 percent.
- e. Low temperature Flexibility and Crack Bridging (ASTM C836/C836M): Pass at minus 15 degrees F.

- f. Solids by Volume: Minimum 50 percent.
- g. Flame propagation of wall assemblies (NFPA 285): Pass.
- h. Surface Burning Characteristics (ASTM E84):
 - (1) Flame Spread Index Rating not higher than 75.
 - (2) Smoke Developed Index Rating not higher than 150.
- i. Resistance to Mold, Mildew and Fungal Growth (ASTM D5590): 0, No growth.

2.2 PRIMERS, ADHESIVES, AND MASTICS

Provide primers, adhesives, mastics, sealants and other accessories as recommended by manufacturer of fluid-applied membrane air barrier for a complete installation.

2.3 TRANSITION MEMBRANE

Provide as specified in Section 07 27 19.01 SELF-ADHERING AIR BARRIERS.

2.4 SHEET METAL FLASHING

Provide as specified in Section 07 60 00 FLASHING AND SHEET METAL.

2.5 JOINT SEALANTS

Provide as specified in Section 07 92 00 JOINT SEALANTS.

2.6 REINFORCEMENT

Provide fiberglass mesh tape, or fluid-applied air barrier manufacturer's approved comparable equal product, reinforcement at seams, edges, projections and penetrations. Reinforce all joints exceeding 1/4 inch with fiberglass mesh.

PART 3 EXECUTION

3.1 EXAMINATION

Before installing fluid-applied membrane air barrier, examine substrates, areas, and conditions under which fluid-applied membrane air barrier assemblies will be applied, with installer present, for compliance with requirements. Ensure the following conditions are met:

- a. Surfaces are sound, dry, even, and free of oil, grease, dirt, excess mortar or other contaminants detrimental to the adhesion of the membranes.
- b. Concrete and masonry surfaces are cured and dry, smooth without large voids, spalled areas or sharp protrusions. Do not proceed with installation until after minimum concrete curing period recommended by fluid-applied membrane air barrier manufacturer.
- c. Fill voids, gaps and spalled areas in substrate to provide an even plane. Strike masonry joints full flush.

- d. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method in accordance with ASTM D4263 and take suitable measures until substrate passes moisture test.
- e. Verify sealants used in substrates, and in joints between substrates, are compatible with fluid-applied membrane air barrier.

3.2 PREPARATION

Clean, prepare, and treat substrate in accordance with manufacturer's written instructions. Ensure clean, dust-free, and dry substrate for fluid-applied membrane air barrier application.

- a. Remove dust, dirt and other contaminants from joints and cracks before coating surfaces.
- b. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through fluid-applied membrane air barrier.
- c. At changes in substrate plane, provide transition material (bead of sealant, mastic, extruded silicone sealant, membrane counterflashing or other material recommended by manufacturer) under transition membrane to eliminate all sharp 90 degree inside corners and to make a smooth transition from one plane to another.
- d. Provide mechanically fastened non-corrosive metal sheet to span gaps in substrate plane and to make a smooth transition from one plane to the other. Continuously support membrane with substrate.
- e. For exterior sheathing substrates, ensure that exterior sheathing is stabilized, with corners and edges fastened with appropriate screws. Treat all joints in accordance with the air barrier manufacturer's instructions prior to application of air barrier material. Allow sufficient time for joint treatments to fully cure before application of transition membranes and fluid-applied membrane air barrier.
- f. For concrete and masonry substrates, fill all voids and holes, particularly in mortar joints, with non-shrinking grout.
- g. Mask off and cover adjacent surfaces to protect from spillage and overspray.

3.3 INSTALLATION

3.3.1 Installation of Transition Membrane

Install transition membrane materials in accordance with the details on the drawings, Section 07 27 19.01 SELF-ADHERING AIR BARRIERS, and the following:

- a. Install transition membrane at all required locations prior to installation of the fluid-applied membrane air barrier.
- b. Verify transition membrane is fully adhered to substrate and that its surface is clean, dry and wrinkle free prior to installation of the fluid-applied membrane air barrier.

- c. Verify transition membrane completely covers all transition areas and will provide continuity of the finished fluid-applied membrane air barrier without gaps or cracks.

3.3.2 Installation of Flashing

Counterflash upper edge of thru-wall flashing and fluid-applied air barrier. Counter flashing and thru-wall flashing are specified in Section 07 60 00 FLASHING AND SHEET METAL.

3.3.3 Installation of Fluid-Applied Membrane Air Barrier

Install materials in accordance with manufacturer's recommendations and the following:

- a. Apply fluid-applied membrane air barrier in single or dual coat application by spray or roller. Apply fluid-applied membrane air barrier within manufacturer's recommended temperature range for application.
- b. Apply fluid-applied membrane air barrier in manner and at rate and wet film thickness recommended by manufacturer to yield a finished dry film thickness of not less than 60 mils or as otherwise required by the manufacturer for the application substrate material and surface roughness.
- c. Apply fluid-applied membrane air barrier around all penetrations ensuring a complete and continuous air barrier. Lap fluid-applied membrane air barrier a minimum of 3 inch over transition membrane to seal leading edge.
- d. Seal membrane terminations, heads of mechanical fasteners, masonry tie fasteners, around penetrations, HVAC assemblies, plumbing and electrical assemblies, doors, windows, louvers, and other assemblies penetrating the fluid-applied membrane air barrier with a termination sealant recommended by the fluid-applied membrane air barrier manufacturer.
- e. Notify the Contracting Officer and Testing Agency upon completion of fluid-applied membrane air barrier installation. Air barrier materials and assemblies must remain exposed until tested and inspected by the ABAA.
- f. Do not allow materials to come in contact with chemically incompatible materials.

3.3.4 Installation of Reinforcement

Install reinforcement at projections, corners, joints, and penetrations where applicable.

3.4 FIELD QUALITY CONTROL

3.4.1 Site Inspections and Testing

Provide site inspections and testing in accordance with ABAA protocol to verify conformance with the manufacturer's instructions, the ABAA QAP Quality Assurance Program (<https://www.airbarrier.org/qap/>), Section

07 27 10.00 10 BUILDING AIR BARRIER SYSTEM, Section 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS, and this section.

- a. Conduct inspections and testing at 5, 50, and 95 percent completion of this scope of work. Forward written inspection reports to the Contracting Officer within five working days of the inspection and test being performed.
- b. If the inspections reveal any defects, promptly remove and replace defective work at no additional expense to the Government.

3.5 PROTECTION AND CLEANING

3.5.1 Protection

Protect fluid-applied membrane air barrier assemblies from damage during application and remainder of construction in accordance with manufacturer's written instructions.

Coordinate installation, testing, and inspection procedures to ensure exposure period does not exceed that recommended by the product manufacturer. Remove and replace, at no additional cost to the Government, membrane products that exceed manufacturer's allowed exposure limits.

3.5.2 Cleaning of Adjacent Surfaces

Clean excess product from adjacent construction using cleaning agents and procedures as recommended in writing by the manufacturer of each type of affected construction and as acceptable to same.

3.6 CLEANUP OF SPILLS

Conduct cleanup of uncured product spillage in accordance with manufacturer's written safe handling instructions.

-- End of Section --

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SECTION 07 27 36

SPRAY FOAM AIR BARRIERS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AIR BARRIER ASSOCIATION OF AMERICA (ABAA)

ABAA Accreditation

Accreditation

ABAA QAP

Quality Assurance Program

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP Z9.2

(2018) Fundamentals Governing the Design and Operation of Local Exhaust Ventilation Systems

ASSP Z88.2

(2015) American National Standard Practices for Respiratory Protection

ASTM INTERNATIONAL (ASTM)

ASTM C518

(2021) Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

ASTM C1029

(2015) Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation

ASTM C1303/C1303M

(2015) Standard Test Method for Predicting Long-Term Thermal Resistance of Closed-Cell Foam Insulation

ASTM C1338

(2014) Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings

ASTM D1621

(2016) Standard Test Method for Compressive Properties of Rigid Cellular Plastics

ASTM D1622

(2014) Apparent Density of Rigid Cellular Plastics

ASTM D1623

(2017) Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics

ASTM D2126	(2009) Response of Rigid Cellular Plastics to Thermal and Humid Aging
ASTM D2842	(2012) Water Absorption of Rigid Cellular Plastics
ASTM D4541	(2017) Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM D6226	(2015) Standard Test Method for Open Cell Content of Rigid Cellular Plastics
ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E96/E96M	(2016) Standard Test Methods for Water Vapor Transmission of Materials
ASTM E119	(2020) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E283	(2019) Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E736	(2000; R 2011) Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
ASTM E2178	(2021a) Standard Test Method for Air Permeance of Building Materials
ASTM E2357	(2017) Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

ICC EVALUATION SERVICE, INC. (ICC-ES)

ICC-ES AC308	(2016) Acceptance Criteria for Spray-Applied Foam Plastic Insulation

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2018) International Building Code
ICC IECC	(2015) International Energy Conservation Code

INTERNATIONAL SAFETY EQUIPMENT ASSOCIATION (ISEA)

ANSI/ISEA Z87.1	(2020) Occupational and Educational Personal Eye and Face Protection Devices

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 10	(2018; ERTA 1-2 2018) Standard for Portable Fire Extinguishers
NFPA 275	(2017) Standard Method of Fire Tests for the Evaluation of Thermal Barriers
NFPA 285	(2012) Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

SPRAY POLYURETHANE FOAM ALLIANCE (SPFA)

SPFA TechDocs	(2015) SPFA Technical Documents Library, four categories: General, Insulation, Roofing, Specialty

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-600-01	(2016; with Change 6, 2021) Fire Protection Engineering for Facilities

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.132	Personal Protective Equipment
29 CFR 1910.133	Eye and Face Protection
29 CFR 1910.134	Respiratory Protection

1.2 RELATED REQUIREMENTS

Coordinate the requirements of Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM, Section 07 27 19.01 SELF-ADHERING AIR BARRIERS, Section 07 27 26 FLUID-APPLIED MEMBRANE AIR BARRIERS, and other building envelope sections to provide a complete air barrier system. Submit all materials, components, and assemblies of the air barrier system together as one complete submittal package.

1.3 DEFINITIONS

1.3.1 Long Term Thermal Resistance (LTTR)

The thermal resistance value of a closed cell foam insulation product measured using accelerated aging ASTM C1303/C1303M equivalent to the time-weighted average thermal resistance value over 15 years. Loss in thermal resistance is attributable to changes in cell gas composition caused by diffusion of air into and blowing agent out of the foam cells.

1.3.2 SPFA TechDocs

Reformatted documents, named SPFA TechDocs (<http://www.sprayfoam.org/technical/spfa-technical-documents>), places each document in one of four categories for easy reference and identification: Roofing, Insulation, Specialty and General.

Spray Polyurethane Foam: Thermal and air barrier system consisting of sprayed polyurethane foam (SPF).

1.4 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Qualification of Manufacturer; G RO

Qualification of Installer; G RO

Quality Control Plan

Safety Plan

Fire Prevention Plan

Respirator Plan

SD-02 Shop Drawings

Spray Foam Air Barrier System

Foam Air Barrier System; G RO

Fire-Rated Assemblies; G RO

SD-03 Product Data

Closed Cell SPF; G RO

Transition Membrane

Primers, Adhesives, and Mastics; G RO

Sealants; G RO

Safety Data Sheets; G RO

Thermal Barrier Materials; G RO

Ignition Barrier Coatings; G RO

Accessories

Recycled Content for Closed Cell Spray Foam Air Barrier; S

SD-04 Samples

Spray Foam Air Barrier Mockup; G RO

SD-06 Test Reports

Field Peel Adhesion Test; G RO

Air Barrier Test; G RO

Primers; G RO

Fire-Ratings Of Thermal and/or Ignition Barrier Materials; G RO

Flame Spread and Smoke Developed Index Ratings of SPF Products; G
RO

Flame Propagation of Wall Assemblies; G RO

Site Inspections Reports; G RO

SD-07 Certificates

Closed cell SPF; G RO

Transition Membrane; G RO

Indoor Air Quality for Spray Foam Air Barrier; S

SD-08 Manufacturer's Instructions

SPF Handling, Storage, and Spray Procedures; G RO

Substrate Preparation; G RO

Thermal Barrier; G RO

Ignition Barrier; G RO

Transition Membrane; G RO

Primers, Adhesives, and Mastics; G RO

SD-09 Manufacturer's Field Reports

Core Samples; G RO

Daily Work Record; G RO

1.5 MISCELLANEOUS REQUIREMENTS

For the spray foam air barrier system provide the following:

1.5.1 Shop Drawings

Submit spray foam air barrier shop drawings showing locations, detailing, and extent of spray foam air barrier assemblies. Provide details of all typical conditions, intersections with other envelope assemblies and materials, membrane counter-flashings. Provide details for fire-rated assemblies and indicate materials for thermal barriers and/or ignition barriers. Show details for bridging of gaps in construction, treatment of inside and outside corners, expansion joints, methods of attachment of materials covering the SPF without compromising the barrier. Indicate how miscellaneous penetrations such as conduit, pipes, electric boxes, brick

ties, and similar items will be sealed.

1.5.2 Product Data

Submit manufacturer's technical data indicating compliance with performance and environmental requirements, manufacturer's printed instructions for evaluating, preparing, and treating substrates, temperature and other limitations of installation conditions, safety requirements for installation, and Safety Data Sheets. Indicate flame and smoke spread ratings for all products. Submit thermal barrier and/or ignition barrier literature including material description, physical properties, and fire-ratings.

1.5.3 Mockup

Provide a mockup of each foam system specified. Apply foam in an area designated by the Contracting Officer. Apply an area of not less than 50 square feet. Include all components specified for the finished assembly including primers, support components, expansion and contraction joints, ignition barriers, thermal barriers, and other accessories as representative of the complete system. Isolate the area and protect workers as required by 29 CFR 1910.132, 29 CFR 1910.133 and 29 CFR 1910.134. Notify the Contracting Officer a minimum of 48 hours prior to the test application. Select a test area representative of conditions to be sprayed including window or door openings, wall to ceiling transitions, flashings, and penetrations, as applicable.

1.5.4 Test Reports

Submit test reports indicating that field peel adhesion tests on all materials have been performed and the changes made, if required, in order to achieve successful and lasting adhesion. Submit test reports for flame spread and smoke developed index ratings of SPF products tested in accordance with ASTM E84. Submit test reports for flame propagation of wall assemblies tested in accordance with NFPA 285. Submit test reports for fire-ratings of thermal and/or ignition barrier materials tested in accordance with ASTM E84.

1.6 DELIVERY, STORAGE, AND HANDLING

1.6.1 Delivery

Deliver and store materials in sufficient quantity to allow for uninterrupted flow of work. Inspect materials delivered to the site for damage; unload and store out of weather. Deliver materials to the job site in their original unopened packages, clearly marked with the manufacturer's name, brand designation, description of contents, and shelf life of containerized materials. Store and handle to protect from damage. Submit SPF Handling, Storage, and Spray Procedures in accordance with submittal procedures.

1.6.2 Storage

Store materials in clean, dry areas, away from excessive heat, sparks, and open flame. Maintain temperatures in the storage area below the materials' flash point(s) and within limits recommended by the manufacturer's printed instructions. Provide ventilation in accordance with ASSP Z9.2 to prevent build-up of flammable gases. Store MDI (A-side) drums in locations that limit the risk of contact with water, acids,

caustics (such as lye), alcohols, and strong oxidizing and reducing agents.

1.6.3 Handling

Handle materials and containers safely and in accordance with manufacturer's recommendations. Store liquids in airtight containers and keep containers closed except when removing materials. Do not use equipment or containers containing remains of dissimilar materials. Do not expose foam component containers to direct sunlight. Do not use materials from containers with content temperatures in excess of 80 degrees F.

Containers exposed to long periods of cold may also exhibit separation and poor performance. Do not use materials exposed to temperature ranges outside of manufacturer's instructions for exposure limits.

Mark and remove from job site materials which have been exposed to moisture, that exceed shelf life limits, or that have been exposed to temperature extremes.

1.6.3.1 Venting and Handling of Material Containers

Partially unscrew material container and drum caps to gradually vent the containers prior to opening. Do not inhale vapors. Decontaminate empty component containers by filling with water and allowing to stand for 48 hours with bung caps removed. Do not, under any circumstances seal, stop, or close containers which have been emptied of foam components.

1.7 FIELD PEEL ADHESION TEST

Perform a field peel adhesion test on the construction mockup. Test the SPF for adhesion in accordance with ASTM D4541 using a Type II pull tester except use a disk that is 4 inches in diameter and cut through the membrane to separate the material attached to the dish from the surrounding material. Perform test after curing period in accordance with manufacturer's written recommendations. Record mode of failure and area which failed in accordance with ASTM D4541. Compare adhesion values with the manufacturer's established minimum values for the particular combination of material and substrate. Indicate on the inspection report whether the manufacturer's requirement has been met. Where the manufacturer has not declared a minimum adhesion value for their product and substrate combination, the inspector must record actual values.

1.8 AIR BARRIER TESTING

Perform air barrier testing in accordance with Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM and Section 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS.

1.9 SAFETY PROVISIONS

1.9.1 Fire Prevention

Provide a written fire prevention plan for the SPF application. Address specific fire hazards such as spontaneous combustion from exothermic heat build-up of SPF components during curing. Provide a continuous fire watch during mixing and spraying of SPF and for a minimum of two hours after completion of work at the end of each day. Maintain fire watch for additional time as required to ensure no potential ignition conditions

exist.

1.9.1.1 Fire Extinguishers

Furnish two fire extinguishers of minimum 15 pounds capacity each, in accordance with NFPA 10, in the immediate vicinity of the work. CAUTION: Do not discharge high pressure carbon dioxide extinguishers where explosive vapors exist since the discharge can cause a spark which will ignite the vapors.

1.9.2 Respirator Plan

Provide a written respirator plan in accordance with OSHA regulations that protects installers during application and addresses separation of the area to prevent other workers from entering the work area during spraying.

1.9.3 Isolation

Isolate the work area as recommended by spray foam manufacturer's written requirements. Prevent workers without respiratory, skin, and eye Personal Protective Equipment (PPE) or training from entering the work area or otherwise being exposed to off-gassing of the insulation in excess of permissible exposure limits.

1.9.4 Respirators and Eye Protection

Respiratory protective devices (respirators) must meet the requirements of ASSP Z88.2. Eye and face protective equipment must meet the requirements of ANSI/ISEA Z87.1. Additionally, sprayers and workers in the immediate vicinity of the spray must wear NIOSH-approved, full-face, supplied air respirators (SAR) operated in positive pressure or continuous flow mode. Workers not in the immediate vicinity of the sprayer must wear air purifying respirators (APR) with an organic gas / P100 particulate cartridge. Instruct personnel in the use of devices. Maintain such equipment and inspect regularly. All workers are required to have undergone pulmonary function testing and fit testing and must provide certification that they have done so. Change APR cartridges in accordance with manufacturer's written recommendations.

1.9.5 Clothing and Gloves

Sprayers and workers must wear protective clothing and gloves in accordance with OSHA requirements during materials application. Disposable coveralls must be worn and must cover all exposed skin. Sprayers and workers must wear fabric gloves coated with nitrile, neoprene, butyl or PVC.

1.9.6 Additional Requirements

Require personnel to review the Health, Safety and Environmental Aspects of Spray Polyurethane Foam and Coverings published by the Spray Polyurethane Foam Alliance (SPFA). Verify compliance prior to allowing personnel on site for installation work. <http://www.sprayfoam.org>.

1.10 QUALITY ASSURANCE

1.10.1 Qualification of Manufacturer

Submit documentation verifying that the manufacturer of the SPF is

currently accredited by the Air Barrier Association of America (ABAA Accreditation <https://www.airbarrier.org/>) and by the Spray Polyurethane Foam Alliance (SPFA).

1.10.2 Qualification of Installer

Submit documentation verifying that installers of the spray foam air barrier are currently certified by ABAA/BPQI (Building Performance Quality Institute) or by the Spray Polyurethane Foam Alliance (SPFA) Professional Certification Program (PCP). Installers must provide photo identification certification cards for inspection upon request.

1.10.3 General Quality Requirements

Provide all products and installation in accordance with SPFA TechDocs requirements (<http://www.sprayfoam.org/technical/spfa-technical-documents>) and documented best practices.

1.11 PRECONSTRUCTION MEETING

Conduct a preconstruction meeting after approval of submittals and a minimum of two weeks prior to commencing work specified in this Section. Attendance is required by the Contracting Officer's designated personnel, Contractor, and representatives of related trades including covering materials, substrate materials, adjacent materials, and materials and components of the air/vapor/thermal barrier system. Agenda must include, at a minimum, the following items:

- a. Drawings, specifications and submittals related to the SPF work;
- b. Sequence of construction;
- c. Coordination with substrate preparation work and responsibility of repairing defects in substrates. Determine method of ensuring SPF work does not begin until substrates have been inspected and accepted;
- d. Compatibility of materials;
- e. Construction and testing of construction mockup;
- f. Application of self-adhering air barrier transitions strips and primer as required for sealing the spray foam air barrier system at openings including but not limited to windows, doors and louvers;
- g. Spray foam air barrier system installation; including methods to be used to provide a continuous barrier at thru-wall flashing, penetrations, and covering of embed items;
- h. Quality control plan including methods of applying the product so that a consistent thickness across the face of the substrate is achieved.
- i. Procedures for SPF manufacturer's technical representative's onsite inspection and acceptance of substrates, contact info for the representative, frequency of visits, and distribution of copies of inspection reports. Determine where core samples will be taken and review procedures for daily documentation of SPF application.
- j. Property protection measures and prevention of overspray and clean-up should overspray occur.

- k. Safety requirements, including review of PPE, fire prevention, safety plan, respirator plan, ventilation and separation of the work area, fall protection, and posting of warning signs. Provide a complete schedule and a detailed, written fire protection plan.

1.12 ENVIRONMENTAL CONDITIONS

1.12.1 Temperature and Weather

Install SPF within the range of ambient and substrate surface temperatures in accordance with manufacturer's written instructions. Do not apply SPF to damp or wet substrates. Do not apply SPF during inclement weather or when ice, frost, surface moisture, or visible dampness is present on surfaces to be covered, or when precipitation is imminent. Do not apply SPF to exterior building surfaces when wind speeds exceed 25 miles per hour. Use moisture measuring methods and equipment to verify that the moisture conditions of substrate surfaces are in accordance with SPF manufacturer requirements prior to application. Substrate temperatures must be within limits recommended by the manufacturer's printed instructions.

1.12.2 Conditions for Primers

Follow manufacturer's printed application and curing instructions. Do not apply primer when ambient temperature is below 40 degrees F or when ambient temperature is expected to fall below 35 degrees F for the duration of the drying or curing period.

1.12.3 Conditions for Ignition Barriers

Ensure that sprayed surfaces comply with manufacturer's written requirements for application coverage, thickness, and curing prior to application of ignition barrier coatings.

1.12.4 Temporary Ventilation

Provide temporary ventilation for work of this section in accordance with manufacturer's written instructions and with OSHA requirements for this type of application.

1.13 FOAM SPRAY EQUIPMENT

1.13.1 Applicator

Use an air purge foam spray gun.

1.13.2 Equipment Calibration

Fully calibrate the foam metering equipment to monitor each liquid component to within 2 percent of the SPF manufacturer's required metering ratio. Calibrate spray equipment each day at the start of operations, after each restart if spraying operations have been terminated for more than one hour, whenever there is a change in fan pattern or pressure, whenever slow curing areas are noticed, whenever a change is made in hose length or working height, and after changeover between materials. Calibration consists of demonstrating that the equipment is adjusted to deliver components in proper mix and proportion. Conduct calibration tests on cardboard or plywood on a wall adjacent to the area to be sprayed.

1.13.3 Metering Equipment Requirements

Use foam metering equipment capable of developing and maintaining the SPF manufacturer's required liquid component pressures and temperatures. Foam metering equipment must have gauges for visual monitoring. Equipment must provide temperature control of foam components to within the temperature ranges recommended by the foam manufacturer's printed instructions.

1.13.4 Moisture Protection

Protect surfaces of supply containers and tanks used to feed foam metering equipment from moisture.

1.13.5 Compressed Air

Supply compressed air that is in contact with SPF during mixing or atomization through moisture traps that are continuously bled.

1.13.6 Dispense Excess Materials

Do not deposit materials used for cleaning of equipment or materials dispensed for calibration purposes and establishment of spray gun pattern onto the ground. Dispense such materials into scrap containers or onto plastic film, or cardboard, and dispose of in accordance with safety requirements and job site regulations.

PART 2 PRODUCTS

2.1 SPRAY FOAM AIR BARRIER

2.1.1 General

Provide a closed cell, sprayed in place, SPF that forms a continuous air /thermal barrier at the building enclosure. Provide in accordance with ASTM C1029, with the requirements of UFC 3-600-01, ICC IBC Chapter 26, ICC-ES AC308, and NFPA 285. In the event of a conflict, the most stringent requirement applies. Provide all system components necessary for a complete, code compliant installation, whether indicated or not, including material support components, expansion and contraction joints, ignition barrier coatings, thermal barrier materials, and accessories.

2.1.2 Physical Properties

Provide a closed cell product with the following characteristics:

- a. Density (ASTM D1622): 2.0 lb per cf, nominal
- b. Thermal Resistance (ASTM C518)
 - (1) Initial R-value per inch thickness: 7 sf·degrees F h per Btu
 - (2) Aged R-value per inch thickness (180 days at 76 degrees F): 6.6 sf·degrees F·h per Btu
- c. Air Permeance (ASTM E2178): In accordance with Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM.
- d. Air Leakage (ASTM E2357, ASTM E283): In accordance with Section

07 27 10.00 10 BUILDING AIR BARRIER SYSTEM and Section 07 05 23
PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS.

- e. Compressive Strength (ASTM D1621): Minimum 28.3 psi
- f. Tensile Strength (ASTM D1623)
 - (1) Medium density: 15 psi
 - (2) Roofing: 40 psi
- g. Water Vapor Permeance (ASTM E96/E96M, water method): less than 1.2 US Perms at one inch thickness
- h. Vapor Retarder (ICC IBC, ICC IECC) Class III
- i. Surface Burning Characteristics (ASTM E84) 3 inch thickness:
 - (1) Flame Spread (FS) Index Rating less than 75.
 - (2) Smoke Developed (SD) Index Rating less than 150. SPF with an SD rating greater than 150 but less than 450 may be used when fully encapsulated. Approval of SPF product is contingent upon approval of encapsulation products and assemblies.
- j. Closed Cell Content (ASTM D6226): 90 percent
- k. Dimensional Stability (Humid Aging) (ASTM D2126): 15 percent at 28 days at 158 degrees F with 97 percent relative humidity.
- l. Water Absorption (ASTM D2842): Maximum 1.0 per volume
- m. Fungi Resistance (ASTM C1338): Pass, with no growth
- n. Recycled Content: Minimum 9 percent (pre- and post-consumer). Provide data identifying percentage of recycled content for closed cell spray foam air barrier.

2.1.3 Expansion and Contraction

Provide an assembly that allows for relative movement due to temperature, moisture, and air pressure changes. Provide expansion and contraction measures as required by the manufacturer's written recommendations.

2.1.4 Fire-ratings, Flame Spread and Smoke Developed Index Ratings

Where fire-rated materials are indicated, provide products with the appropriate markings of a qualified testing agency. Submit fire-rating test reports. Submit flame spread (FS) and smoke developed (SD) index data. Where FS and SD values of foam products do not meet requirements, provide corresponding ignition or thermal barrier products or assemblies and verify complete encapsulation of the spray foam air barrier through product data or on shop drawings. Submit for approval in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

2.1.5 Prohibited Materials

Products that contain hexabromocyclododecane (HBCD) flame retardants are prohibited. Products that contain hydrochlorofluorocarbons (HCFCs),

chlorofluorocarbons (CFCs), or other high ozone depleting blowing agents, are prohibited. For a list of acceptable substitute foam blowing agents see <https://www.epa.gov/snap/foam-blowing-agents>. Provide validation of indoor air quality for spray foam air barrier that no prohibited materials are used.

2.1.6 Thermal/Ignition Barrier

Provide a thermal barrier ignition barrier in locations where SPF is exposed to the interior of the building, including attics and plenum spaces. Provide thermal ignition barriers in accordance with ICC IBC Chapter 26 "Plastics," with ICC-ES AC308, ASTM E736, and NFPA 275. Choose one or more of the following methods of separation:

- a. Building interior, other than fire-rated enclosures: Separate the SPF from the occupied interior of a building by an intumescent thermal barrier coating or thermal barrier board identical to a third party tested thermal barrier to limit the average temperature rise of the surface of the SPF to not more than 250 degrees F after 15 minutes of fire exposure (using the standard time-temperature curve of ASTM E119). Provide in accordance with NFPA 275.
- b. Building interior, fire-rated enclosures: At walls, ceilings and floors that are required to be fire-rated, separate the SPF from the occupied interior of a building with an ignition barrier consisting of 5/8 inch, Type X, fire-rated GWB in the number of layers corresponding to required ratings. Include all accessories as necessary for complete fire-rated assemblies.

2.2 TRANSITION MEMBRANE

Provide as specified in Section 07 27 19.01 SELF-ADHERING AIR BARRIERS.

2.3 PRIMERS, ADHESIVES, AND MASTICS

Provide primers, adhesives, mastics and other accessory materials as recommended by spray foam manufacturer's printed literature.

2.4 FLASHING

As specified in Section 07 60 00 FLASHING AND SHEET METAL.

2.5 JOINT SEALANTS

As specified in Section 07 92 00 JOINT SEALANTS. Verify compatibility with other system products.

PART 3 EXECUTION

3.1 EXAMINATION

Before installing the spray foam air barrier and with the installer present, examine substrates, areas, and conditions under which SPF will be applied, for compliance with requirements. Ensure that surfaces are sound, dry, even, and free of oil, grease, dirt, excess mortar or other contaminants. Ensure that concrete surfaces are cured and dry, smooth without large voids, spalled areas or sharp protrusions. Correct defects that adversely affect the spray foam application or performance. Verify that work by other trades is in place and complete prior to application of

spray foam.

3.2 PREPARATION

3.2.1 Substrate Preparation

Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for spray foam application.

- a. Prepare surfaces by brushing, scrubbing, scraping, or grinding to remove loose mortar, dust, oil, grease, oxidation, mill scale and other contaminants which will affect adhesion of the SPF.
- b. Wipe down metal surfaces to remove release agents or other non-compatible coatings, using clean sponges or rags soaked in a solvent compatible with the SPF.

3.2.2 Protection

Protect adjacent areas and surfaces from spray applied materials in accordance with the following:

- a. Mask and cover adjacent areas to protect from over spray.
- b. Ensure required foam stops and back up materials are in place to achieve a complete seal.
- c. Seal off ventilation equipment. Install temporary ducting and fans to provide required exhaust of spray fumes. Provide make-up air as required.
- d. Erect barriers, isolate area, and post warning signs to notify non-protected personnel of the requirement to avoid the spray area.

3.2.3 Fire and Explosion Hazards

Prohibit open flames, sparks, welding, and smoking in the application area. Provide and maintain fire extinguishers of appropriate type, size and distance, as required by NFPA, in the application area. Mix batches in small enough quantities to avoid spontaneous combustion from exothermic heat build-up of SPF components during curing.

3.2.4 Warning Signs

Post warning signs at ground level adjacent to the work area and a minimum of 150 feet from the application area stating the area is off limits to unauthorized persons and warning of potential hazards. Place clearly visible and legible warning sign at entrance to primary road leading to the project facility warning of presence of flammable materials, irritating fumes, and potential of overspray damage.

3.2.5 Prime Substrate

Provide as recommended by the manufacturer for each substrate to be primed. Use primers at full strength. Do not dilute primers unless required and as recommended in writing by the manufacturer. Do not use cleaning solvents for thinning primers or other materials. Ensure that diluted primer(s) meet VOC requirements.

3.3 INSTALLATION

3.3.1 Sequencing and Coordination

Sequence the work so as to prevent access to the work area by other trades during foam application and curing. Limit access of non-essential workers during application. Notify the Contracting Officer 24 hours in advance of spraying operations. Sequence spray foam work with other trades to permit continuous self-flashing of the spray foam air barrier. Ensure expansion and control joints are provided as detailed on the manufacturer's shop drawings to accommodate the expansion of each layer of the air/thermal envelope. Provide temporary fire protection of uncured foam, and isolate the work area, until foam application is isolated with a permanent thermal or ignition barrier.

3.3.2 Installation of Transition Membrane

Install transition membrane materials in accordance with the details on the drawings, Section 07 27 19.01 SELF-ADHERING AIR BARRIERS, and the following:

- a. Install transition membrane at all required locations prior to installation of the fluid-applied membrane air barrier.
- b. Verify transition membrane is fully adhered to substrate and that its surface is clean, dry and wrinkle free prior to installation of the fluid-applied membrane air barrier.
- c. Verify transition membrane completely covers all transition areas and will provide continuity of the finished SPF air barrier without gaps or cracks.

3.3.3 Installation of Spray Foam Air Barrier

Install materials in accordance with paragraph SAFETY PROVISIONS, in accordance with manufacturer's recommendations, and in accordance with the following:

- a. Use spray equipment that complies with foam manufacturer's recommendations for the specific type of application, and as specified herein. Record equipment settings on the Daily Work Record. Each proportioned unit can supply only one spray gun.
- b. Apply only when surfaces and environmental conditions are within limits prescribed by the material manufacturer.
- c. Continuously connect the spray foam air barrier between walls, roof, floor, and below grade assemblies to form a continuous integrated air barrier system around the entire building enclosure. Extend the spray foam air barrier into rough openings such as doors, windows, louvers, and other exterior penetrations. Use self-adhering air barrier transition strips if necessary to achieve full extension and continuity of the barrier at these locations. Seal edges of barrier at junctures with rough openings.
- d. Install within manufacturer's tolerances, but not more than minus 1/4 inch or plus 1/2 inch.

- e. Sequence work so as to completely seal all penetrations resulting from pipes, vents, wires, conduit, electrical fixtures, structural members, or other construction. If penetrations through the spray foam air barrier are made after the initial SPF application, reapply in accordance with manufacturer's written instructions for such remedial work.
- f. Do not install SPF within 3 inches of heat emitting devices such as light fixtures and chimneys.
- g. Finished surface of SPF must be free of voids and embedded foreign objects.
- h. Remove masking materials and over spray from adjacent areas immediately after foam surface has hardened. Ensure cleaning methods do not damage work performed by other sections.
- i. Trim, as required, any excess thickness that would interfere with the application of cladding and covering system by other trades.
- j. Clean and restore surfaces soiled or damaged by work of other trades. Before cleaning and restoring damaged work, consult with other trades for appropriate and approved methods for cleaning and restoration to prevent further damage.
- k. Complete connections to other components and repair any gaps, holes or other damage using material approved by the manufacturer.
- l. Provide expansion joints in the SPF application aligned with expansion joints in the building enclosure, where substrate materials change, and in accordance with manufacturer's recommendations.
- m. Provide a continuous fire watch in accordance with paragraph SAFETY PROVISIONS.

3.4 FIELD QUALITY CONTROL

3.4.1 General Site Inspections and Testing

Provide site inspections and testing in accordance with ABAA protocol to verify conformance with the manufacturer's instructions, the ABAA QAP Quality Assurance Program (<https://www.airbarrier.org/qap/>), Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM, Section 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS, and this section.

- a. Conduct inspections and testing at 5, 50, and 95 percent of completion of this scope of work. Forward written inspection reports to the Contracting Officer within 5 working days of the inspection and test being performed.
- b. If inspections reveal any defects, promptly remove and replace defective work at no additional expense to the Government.

3.4.2 Manufacturer Site Inspections

Manufacturer's technical representative must visit the site during the installation process to ensure the SPF and accessories are being applied in compliance with requirements. At a minimum, manufacturer's technical representative must be present at work startup and perform field

inspection of the first day's completed application and at substantial completion, prior to demobilization. After each inspection, submit an inspection report signed by the manufacturer's technical representative, to the Contracting Officer within five working days. The inspection report must note overall quality of work, deficiencies, and recommended corrective actions in detail. Notify the Contracting Officer a minimum of two working days prior to site visits by manufacturer's technical representative.

3.4.3 Contractor's Site Inspections

Establish and maintain an inspection procedure to ensure compliance of the foam installation with contract requirements. Conduct inspections and testing at 5, 50, and 95 percent completion of application. Forward written inspection reports to the Contracting Officer within five working days of the inspection and test being performed. Work not in compliance must be promptly removed and replaced or corrected, in an approved manner, at no additional cost to the Government. Quality control must include, but is not limited to, the following:

- a. Observation of environmental conditions; number and skill level of insulation workers.
- b. Verification of certification, listing, or label.
- c. Verification of proper storage and handling of materials before, during, and after installation.
- d. Inspection of SPF, support structure, primer, expansion joints, ignition barrier, thermal barrier, and accessories.

3.4.4 Field Peel Adhesion Test

Conduct in accordance with test protocol indicated in Part 1 paragraph FIELD PEEL ADHESION TEST.

3.5 CORRECTION OF DEFICIENCIES

Upon completion of inspection, testing, or sample taking, repair damaged construction, restore substrates and finishes, and protect repaired construction. Deficiencies found during inspection must be corrected within 48 hours following notification.

3.6 CLEANUP OF SPILLS

Conduct cleanup of uncured product spillage in accordance with paragraph SAFETY PROVISIONS and the manufacturer's written safe handling instructions. In the event of a conflict, the most stringent requirement governs.

3.7 PROTECTION AND CLEANING

3.7.1 Protection of Installed Work

Protect SPF installation from damage during application and remainder of construction period in accordance with manufacturer's written instructions. Repair damaged areas to new condition.

3.7.2 Cleaning of Adjacent Surfaces

Clean overspray from adjacent construction using cleaning agents and procedures as recommended in writing by the manufacturer of each type of affected construction and as acceptable to same.

-- End of Section --

SECTION 07 42 13

METAL WALL PANELS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 501.1 (2017) Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure

AAMA 800 (2016) Voluntary Specifications and Test Methods for Sealants

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 341 (2016) Seismic Provisions for Structural Steel Buildings

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI S100 (2012) North American Specification for the Design of Cold-Formed Steel Structural Members

AISI SG03-3 (2002; Suppl 2001-2004; R 2008) Cold-Formed Steel Design Manual Set

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7-16 (2017; Errata 2018; Supp 1 2018) Minimum Design Loads and Associated Criteria for Buildings and Other Structures

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M (2019) Standard Specification for Carbon Structural Steel

ASTM A123/A123M (2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A606/A606M (2018) Standard Specification for Steel Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance

ASTM A653/A653M (2020) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or

Zinc-Iron Alloy-Coated (Galvannealed) by
the Hot-Dip Process

ASTM A1008/A1008M	(2021a) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
ASTM B117	(2019) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM D522/D522M	(2017) Mandrel Bend Test of Attached Organic Coatings
ASTM D523	(2014; R 2018) Standard Test Method for Specular Gloss
ASTM D610	(2008; R 2019) Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces
ASTM D714	(2002; R 2017) Standard Test Method for Evaluating Degree of Blistering of Paints
ASTM D822	(2013; R 2018) Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings
ASTM D968	(2017) Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D1056	(2020) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D1308	(2002; R 2013) Effect of Household Chemicals on Clear and Pigmented Organic Finishes
ASTM D1654	(2008; R 2016; E 2017) Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASTM D1667	(2017) Standard Specification for Flexible Cellular Materials - Poly (Vinyl Chloride) Foam (Closed-Cell)
ASTM D2244	(2016) Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
ASTM D2247	(2015) Testing Water Resistance of

Coatings in 100% Relative Humidity

ASTM D2794	(1993; R 2019) Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D3359	(2017) Standard Test Methods for Rating Adhesion by Tape Test
ASTM D3363	(2005; E 2011; R 2011; E 2012) Film Hardness by Pencil Test
ASTM D4214	(2007; R 2015) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films
ASTM D4587	(2011; R 2019; E 2019) Standard Practice for Fluorescent UV-Condensation Exposures of Paint and Related Coatings
ASTM D5894	(2016) Standard Practice for Cyclic Salt Fog/UV Exposure of Painted Metal, (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet)
ASTM E72	(2015) Conducting Strength Tests of Panels for Building Construction
ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E283	(2019) Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E331	(2000; R 2016) Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E1592	(2017) Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
ASTM G152	(2013; R 2021) Standard Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
ASTM G153	(2013; R 2021) Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)

MBMA MBSM (2018) Metal Building Systems Manual

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM AMP 500 (2006) Metal Finishes Manual

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION
(SMACNA)

SMACNA 1793 (2012) Architectural Sheet Metal Manual,
7th Edition

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED NC (2009) Leadership in Energy and
Environmental Design(tm) New Construction
Rating System

UNDERWRITERS LABORATORIES (UL)

UL Bld Mat Dir (updated continuously online) Building
Materials Directory

1.2 DEFINITIONS

Metal Wall Panel: Metal wall panels, attachment system components and accessories necessary for a complete weather-tight wall system.

1.3 DESCRIPTION OF WALL PANEL SYSTEM

Factory color finished, metal wall panel system with concealed fastening attachment. Panel profile must be as shown on drawings.

1.3.1 Metal Wall Panel General Performance

Comply with performance requirements, conforming to AISI S100, without failure due to defective manufacture, fabrication, installation, or other defects in construction. Wall panels and accessory components must conform to the following standards:

ASTM A1008/A1008M
ASTM A123/A123M
ASTM A36/A36M
ASTM A653/A653M
ASTM A606/A606M
ASTM D522/D522M for applied coatings
UL Bld Mat Dir

1.3.2 Structural Performance

Maximum calculated fiber stress must not exceed the allowable value in the AISI or AA manuals; a one third overstress for wind is allowed. Midspan deflection under maximum design loads is limited to L/180. Contract drawings show the design wind loads and the extent and general assembly details of the metal siding. Contractor must provide design for members and connections not shown on the drawings. Siding panels and accessories must be the products of the same manufacturer.

Provide metal wall panel assemblies complying with the load and stress requirements in accordance with ASTM E1592. Wind Load force due to wind action governs the design for panels.

Wall systems and attachments are to resist the wind loads as determined by ASTM E72 and ASCE 7-16 in the geographic area where the construction will take place, in pounds per square foot. Submit five copies of wind load tests and seismic tests to the Contracting Officer.

Provide metal wall panel assembly for seismic conditions complying with the applicable requirements of AISC 341.

1.3.3 Air Infiltration

Air leakage must conform to the limits through the wall assembly area when tested according to ASTM E283.

1.3.4 Water Penetration Under Static Pressure

No water penetration when tested according to ASTM E331.

1.3.5 Water Penetration Under Dynamic Pressure

No evidence of water leakage when tested according to AAMA 501.1.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Submit Documentation for the following items:

Qualification of Manufacturer
Qualification of Installation Contractor; G RO
Sample Warranty; G RO

SD-02 Shop Drawings

Installation Drawings ; G RO

SD-03 Product Data

Recycled Content; (LEED NC)

Submit Manufacturer's data indicating percentage of recycle material in wall panels to verify sustainable acquisition compliance.

Submit Manufacturer's catalog data for the following items:

Wall Panels; G RO

Factory Color Finish
Closure Materials
Pressure Sensitive Tape
Sealants and Caulking
Galvanizing Repair Paint
Enamel Repair Paint
Accessories

SD-04 Samples

Submit as required each of the following samples:

Wall Panels, 12 inches long by actual panel width
Fasteners

Metal Closure Strips, 10 inches long of each type

Color chart and chips; G RO

Submit manufacturer's color charts and chips, approximately 4 by 4 inches, showing full range of colors, textures and patterns available for wall panels with factory applied finishes.

SD-05 Design Data

Wind load design analysis; G RO

As applicable, submit the following wind load design analysis data, to include, but not limited to:

wind speed
exposure category,co-efficient,importance factor
type of facility
negative pressures for each zone
methods and requirements of attachment

SD-06 Test Reports

Submit test reports for the following in accordance with the referenced articles in this section.

Leakage Tests
Wind Load Tests
Coating Tests
Chalking Tests
Seismic Tests

SD-07 Certificates

Submit certificates for the following items showing conformance with referenced standards contained in this section:

Coil Stock
Fasteners
Enamel Repair Paint

SD-08 Manufacturer's Instructions

Include detailed application instructions and standard manufacturer drawings altered as required by these specifications.

Installation of Wall panels

SD-09 Manufacturer's Field Reports

Manufacturer's Field Reports

SD-11 Closeout Submittals

Warranty; G RO
Maintenance Instructions

20 year "No Dollar Limit" warranty for labor and material

1.5 QUALITY ASSURANCE

1.5.1 Pre-Installation Conference

Upon notification of submittal receipt and approval by the Contracting Officer; and prior to the commencement of the work, the Contractor must attend a pre-installation conference to review the following:

- a. Drawings and Specifications.
- b. Qualification of Installer.
- c. Sustainable acquisition.
- d. Approved Warranty.
- e. Sample wall panels, 12 inches long by actual panel width.
- f. Sample metal closure strips, 10 inches long of each type.
- g. Color charts and chips.
- h. Coatings and base metal tests, chalking tests.
- i. Construction schedule, availability of materials, Installer's personnel, equipment and facilities required to progress with the work without delay.
- j. Methods and procedures related to installation of wall panels, including manufacturer's written instructions. Explicitly identify in writing, differences between manufacturer's instructions and the specified requirements.
- k. Support conditions for compliance with requirements, including alignment between and attachment to structural members.
- l. Flashing, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
- m. Governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
- n. Temporary protection requirements for metal wall panel assembly during and after installation.

- o. Wall panel observation and repair procedures after metal wall panel installation. Provide detailed written instructions including copies of Safety Data Sheets for maintenance and repair materials, and manufacturer's maintenance instructions.

1.5.1.1 Installation Drawings

Installation shop drawings for wall panels, flashing, accessories, and anchorage systems must indicate completely dimensioned structural frame and erection layouts, openings in the wall, special framing details, and construction details at corners, building intersections and flashing, location and type of mastic and metal filler strips.

1.5.1.2 Wind Load Design Analysis

Wind design analysis must include wall plan delineating dimensions and attachment patterns for each zone. Wind design analysis must be prepared and sealed by Licensed Project Engineer in the geographic area where the construction will take place.

1.5.2 Manufacturer's Technical Representative

The representative must have authorization from manufacturer to approve field changes and be thoroughly familiar with the products and installations in the geographical area where construction will take place.

1.5.3 Qualification of Manufacturer

Certify that metal wall panel system manufacturer has a minimum of five (5) years experience in manufacturing metal wall system and accessory products.

Manufacturer must also provide engineering services by an authorized engineer; currently licensed in the geographical area where construction will take place, having a minimum of four (4) years experience as an engineer knowledgeable in wind load design analysis, protocols and procedures per MBMA MBSM, "Metal Building Systems Manual"; ASCE 7-16, and ASTM E1592 and seismic design conforming to AISC 341.

Provide certified engineering calculations, using the products submitted, for Wind load requirements in accordance with ASCE 7-16.

1.5.3.1 Manufacturer's Certificates

Also provide the following certifications from the manufacturer:

Coil Stock
Fasteners
Galvanizing Repair Paint
Enamel Repair Paint

Submit certification from coil stock manufacturer or supplier that the machinery used will form the provided coil stock without warping, waviness, or rippling that is not a part of the panel profile, and without damage, abrasion or marring of the finish coating.

Provide evidence that products used within this specification are manufactured in the United States.

1.5.4 Certified Qualification of Installation Contractor

The installation contractor must be approved and certified by the metal wall panel manufacturer prior to beginning the installation of the metal wall panel system. Subcontracting by Certified Contractor for the metal wall panel work is not permitted.

1.5.5 Single Source

Obtain each type of metal wall panels, clips, closure materials and other accessories from the standard products of the single source from a single manufacturer to operate as a complete system for the intended use.

1.5.6 Manufacturer's Maintenance Instructions

Provide manufacturer's detailed written instructions including copies of Safety Data Sheets for maintenance and repair materials.

1.6 DELIVERY, HANDLING, AND STORAGE

Deliver and protect package components, sheets, metal wall panels, and other manufactured items to prevent damage or deformation during transportation and handling.

Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.

Stack and store metal wall panels horizontally on platforms or pallets, covered with suitable weather-tight and ventilated covering to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.

Retain strippable protective covering on metal wall panel until actual installation.

1.7 PROJECT CONDITIONS

1.7.1 Field Measurements

Verify locations of wall framing and opening dimensions by field measurements before metal wall panel fabrication and indicate measurements on Shop Drawings.

1.7.2 Weather Limitations

Proceed with installation preparation only when existing and forecasted weather conditions permit Work to proceed without water entering into wall system or building.

1.8 WARRANTY

Warranty must conform to the Sample Warranty as reviewed and approved by the Contracting Officer.

1.8.1 20 Year "No Dollar Limit" Warranty for Labor and Material

Furnish manufacturer's no-dollar-limit warranty for the metal wall panel system. The warranty period is to be no less than twenty (20) years from

the date of Government acceptance of the work. The warranty is to be issued directly to the Government. The warranty is to provide that if within the warranty period the metal wall panel system shows evidence of corrosion, perforation, rupture or excess weathering due to deterioration of the wall panel system resulting from defective materials and correction of the defective workmanship is to be the responsibility of the metal wall panel system manufacturer. Repairs that become necessary because of defective materials and workmanship while metal wall panel system is under warranty are to be performed within 24 hours after notification, unless additional time is approved by the Contracting Officer. Failure to perform repairs within 24 hours of notification will constitute grounds for having emergency repairs performed by others and not void the warranty.

PART 2 PRODUCTS

2.1 FABRICATION

Unless approved otherwise, fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated and specified performance requirements. Comply with indicated profiles and with dimensional and structural requirements. See Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING for cumulative total recycled content requirements.

Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel. Fabricate metal wall panel side laps with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weather-tight and minimize noise from movements within panel assembly.

2.1.1 Sheet Metal Accessories

Fabricate flashing and trim to comply with recommendations in SMACNA 1793 that apply to the design, dimensions, metal, and other characteristics of item indicated:

- a. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
- b. End Seams: Fabricate nonmoving end seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
- c. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA 1793.
- d. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
- e. Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA 1793 or by metal wall panel manufacturer for application, but not less than thickness of metal being secured.

2.2 PANEL MATERIALS

2.2.1 Steel Sheet

Roll-form steel wall panels to the specified profile, with f_y = gauge and depth to meet wind load criteria identified in structural drawings. Material must be plumb and true, and within the tolerances listed:

- a. Galvanized Steel Sheet conforming to ASTM A653/A653M and AISI SG03-3.
- b. Individual panels must be continuous length to cover the entire length of any unbroken wall area with no joints or seams and formed without warping, waviness, or ripples that are not part of the panel profile and free of damage to the finish coating system.
- c. Provide panels with thermal expansion and contraction consistent with the type of system specified.
 - (1) Profile and coverage to be a minimum height and width from manufacturer's standard for the indicated wall area.
 - (2) Smooth, flat Surface Texture.

2.2.2 Factory Color Finish

Comply with NAAMM AMP 500 for recommendations for applying and designating finishes. Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

All panels are to receive a factory-applied polyvinylidene fluoride finish consisting of a baked-on top-coat with a manufacturer's recommended prime coat conforming to the following:

2.2.2.1 Metal Preparation

Carefully prepare all metal surface for painting on a continuous process coil coating line by alkali cleaning, hot water rinsing, application of chemical conversion coating, cold water rinsing, sealing with acid rinse, and thorough drying.

2.2.2.2 Prime Coating

Apply a base coat of epoxy paint, specifically formulated to interact with the top-coat, to the prepared surfaces by roll coating to a dry film thickness of 0.20 plus 0.05 mils. Prime coat must be oven cured prior to application of finish coat.

2.2.2.3 Exterior Finish Coating

Roll coat the finish coating over the primer by roll coating to dry film thickness of 0.80 plus 5 mils (3.80 plus 0.50 mils for Vinyl Plastisol) for a total dry film thickness of 1.00 plus 0.10 mils (4.00 plus 0.10 mils for Vinyl Plastisol). Oven-cure finish coat.

2.2.2.4 Interior Finish Coating

Apply a wash-coat on the reverse side over the primer by roll coating to a

dry film thickness of 0.30 plus 0.05 mils for a total dry film thickness of 0.50 plus 0.10 mils. Oven-cured the wash coat.

2.2.2.5 Color

Provide exterior finish color as specified in drawings. Color to match Pantone 4685u or equivalent per the installation guidelines, and must be submitted for approval.

2.2.2.6 Physical Properties

Coating must conform to the industry and manufacturer's standard performance criteria as listed by the following certified test reports:

General:	ASTM D5894 and ASTM D4587
Abrasion:	ASTM D968
Adhesion:	ASTM D3359
Chalking:	ASTM D4214
Chemical Pollution:	ASTM D1308
Color Change and Conformity:	ASTM D2244
Creepage:	ASTM D1654
Cyclic Corrosion Test:	ASTM D5894
Flame Spread:	ASTM E84
Flexibility:	ASTM D522/D522M
Formability:	ASTM D522/D522M
Gloss at 60 and 85 degrees:	ASTM D523
Humidity:	ASTM D2247 and ASTM D714
Oxidation:	ASTM D610
Pencil Hardness:	ASTM D3363
Reverse Impact:	ASTM D2794
Salt Spray:	ASTM B117
Weatherometer:	ASTM G152, ASTM G153 and ASTM D822

2.3 MISCELLANEOUS METAL FRAMING

Cold-formed metallic-coated steel sheet conforming to ASTM A653/A653M and

specified in Section 05 40 00 COLD-FORMED METAL FRAMING unless otherwise indicated.

2.3.1 Fasteners for Miscellaneous Metal Framing

Type, material, corrosion resistance, size and sufficient length to penetrate the supporting member a minimum of 1 inch with other properties required to fasten miscellaneous metal framing members to supporting members and substrates in accordance with the wall panel manufacturer's and ASCE 7-16 requirements.

2.4 FASTENERS

2.4.1 General

2.4.1.1 Exposed Fasteners

Provide corrosion resistant fasteners for wall panels, made of coated steel, aluminum, 305 - series corrosion resisting stainless steel, or nylon capped steel compatible with the sheet panel or flashing and of a type and size recommended by the manufacturer to meet the performance requirements and design loads.

Fasteners for accessories must be the manufacturer's standard. Provide an integral metal washer matching the color of attached material with compressible sealing EPDM gasket approximately 3/32 inch thick.

2.4.1.2 Hidden Fasteners

Provide corrosion resistant fasteners recommended by the manufacturer to meet the performance requirements and design loads.

2.4.1.3 Screws

Screws to be corrosion resistant coated steel, aluminum and/or 305 - series stainless steel being the type and size recommended by the manufacturer to meet the performance requirements.

2.4.1.4 Rivets

Rivets to be closed-end type, corrosion resistant coated steel, aluminum or stainless steel where watertight connections are required.

2.4.1.5 Attachment Clips

Fabricate clips from steel hot-dipped galvanized in accordance with ASTM A653/A653M, Z275 G 90 or Series 300 stainless steel. Size, shape, thickness and capacity as required meeting the insulation thickness and design load criteria specified.

2.5 ACCESSORIES

2.5.1 General

All accessories must be compatible with the metal wall panels. Sheet metal flashing, trim, metal closure strips, caps and similar metal accessories must not be less than the minimum thickness specified for the wall panels. Exposed metal accessories/finishes to match the panels furnished, except as otherwise indicated. Molded foam rib, ridge and

other closure strips must be non-absorbent closed-cell or solid-cell synthetic rubber or pre-molded neoprene to match configuration of the panels.

2.5.2 Rubber Closure Strips

Provide closed-cell, expanded cellular rubber conforming to ASTM D1056 and ASTM D1667; extruded or molded to the configuration of the specified wall panel and in lengths supplied by the wall panel manufacturer.

2.5.3 Metal Closure Strips

Provide factory fabricated steel closure strips to be the same gauge, thickness, color, finish and profile of the specified wall panel.

2.5.4 Joint Sealants

2.5.4.1 Sealants and Caulking

Provide approved gun type sealants for use in hand- or air-pressure caulking guns at temperatures above 40 degrees F (or frost-free application at temperatures above 10 degrees F with minimum solid content of 85 percent of the total volume. Sealants must dry with a tough, durable surface skin which permit remaining soft and pliable underneath, providing a weather-tight joint. No migratory staining is permitted on painted or unpainted metal, stone, glass, vinyl, or wood.

Prime all joints receiving sealants with a compatible one-component or two-component primer as recommended by the wall panel manufacturer.

2.5.4.2 Shop-Applied

Sealant for shop-applied caulking must be non-curing butyl compliant with AAMA 800 to ensure the sealant's plasticity at the time of field erection.

2.5.4.3 Field-Applied

Sealant for field-applied caulking must be an approved gun grade, non-sag one component polysulfide or two-component polyurethane with an initial maximum Shore A durometer hardness of 25, and conforming to ASTM C920, Type II. Color to match panel colors.

2.5.4.4 Pressure Sensitive Tape

Provide pressure sensitive tape sealant, 100 percent solid with a release paper backing; permanently elastic, non-sagging, non-toxic and non-staining as approved by the wall panel manufacturer.

2.6 SHEET METAL FLASHING AND TRIM

2.6.1 Fabrication

Shop fabricate sheet metal flashing and trim where practicable to comply with recommendations in SMACNA 1793 that apply to design, dimensions, metal, and other characteristics of item indicated. Obtain field measurements for accurate fit before shop fabrication.

Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with

exposed edges folded back to form hems.

2.7 REPAIR OF FINISH PROTECTION

Repair paint for color finish enameled wall panel must be compatible paint of the same formula and color as the specified finish furnished by the wall panel manufacturer. Provide repair paint matching the specified wall panels.

PART 3 EXECUTION

3.1 EXAMINATION

Prior to installation of panels, inspect and test the air and moisture control barrier to correct any leakages as specified in Sections 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM, 07 27 19.01 SELF-ADHERING AIR BARRIERS, 07 27 26 FLUID-APPLIED AIR BARRIERS, and 07 27 36 SPRAY FOAM AIR BARRIERS.

Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of the Work.

Examine primary and secondary wall framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal wall panel manufacturer, UL, ASTM, ASCE 7-16 and as required for the geographical area where construction will take place.

Examine solid wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.

Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.

Submit to the Contracting Officer a written report, endorsed by Installer, listing conditions detrimental to performance of the Work. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment. Miscellaneous framing installation, including sub-purlins, girts, angles, furring, and other miscellaneous wall panel support members and anchorage must be according to metal wall panel manufacturer's written instructions.

3.3 WALL PANEL INSTALLATION

Provide full length metal wall panels, from sill to eave as indicated, unless otherwise indicated or restricted by shipping limitations. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement in accordance with MBMA MBSM.

Erect wall panel system in accordance with the approved erection drawings, the printed instructions and safety precautions of the manufacturer.

Sheets are not to be subjected to overloading, abuse, or undue impact. Bent, chipped, or defective sheets shall not be applied.

Sheets must be erected true and plumb and in exact alignment with the horizontal and vertical edges of the building, securely anchored, and with the indicated eave, and sill.

Work is to allow for thermal movement of the wall panel, movement of the building structure, and to provide permanent freedom from noise due to wind pressure.

Field cutting metal wall panels by torch is not permitted.

3.3.1 Steel Wall Panels

Use stainless-steel fasteners for exterior surfaces and galvanized steel fasteners for interior surfaces.

3.3.2 Anchor Clips

Anchor metal wall panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

3.3.3 Metal Protection

Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal wall panel manufacturer.

3.3.4 Joint Sealers

Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.

3.4 FASTENER INSTALLATION

Anchor metal wall panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

3.5 FLASHING, TRIM AND CLOSURE INSTALLATION

3.5.1 General Requirements

Comply with performance requirements, manufacturer's written installation instructions, and SMACNA 1793. Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams to form permanently watertight and weather resistant.

Install sheet metal work is to form weather-tight construction without waves, warps, buckles, fastening stresses or distortion, and allow for expansion and contraction. Cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work

of other trades is to be performed by sheet metal mechanics.

3.5.2 Metal Flashing

Install exposed metal flashing at building corners, sills and eaves, junctions between metal siding and walling. Exposed metal flashing must be the same material, color, and finish as the specified metal wall panel.

Fasten flashing at a minimum of 8 inches on center, except where flashing is held in place by the same screws that secure covering sheets.

Flashing is to be furnished in at least 8 foot lengths. Exposed flashing is to have 1 inch locked and blind-soldered end joints, and expansion joints at intervals of not more than 16 feet.

Exposed flashing and flashing subject to rain penetration to be bedded in the specified joint sealant.

Isolate flashing which is in contact with dissimilar metals by means of the specified asphalt mastic material to prevent electrolytic deterioration.

Form drips to the profile indicated, with the edge folded back 1/2 inch to form a reinforced drip edge.

3.5.3 Closures

Install metal closure strips at open ends of corrugated or ribbed pattern walls, and at intersection of wall and wall unless open ends are concealed with formed eave flashing; and in other required areas.

Install mastic closure strips at intersection of the wall with metal walling; top and bottom of metal siding; heads of wall openings; and in other required locations.

3.6 WORKMANSHIP

Make lines, arises, and angles sharp and true. Free exposed surfaces from visible wave, warp, buckle, and tool marks. Fold back exposed edges neatly to form a 1/2 inch hem on the concealed side. Make sheet metal exposed to the weather watertight with provisions for expansion and contraction.

Make surfaces to receive sheet metal plumb and true, clean, even, smooth, dry, and free of defects and projections which might affect the application. For installation of items not shown in detail or not covered by specifications conform to the applicable requirements of SMACNA 1793. Provide sheet metal flashing in the angles formed where roof decks abut walls, curbs, ventilators, pipes, or other vertical surfaces and wherever indicated and necessary to make the work watertight.

3.7 ACCEPTANCE PROVISIONS

3.7.1 Erection Tolerances

Erect metal wall panels straight and true with plumb vertical lines correctly lapped and secured in accordance with the manufacturer's written instructions.

3.7.2 Leakage Tests

Finished application of metal wall panels are to be subject to inspection and test for leakage by request of the Contracting Officer, Architect/Engineer. Conduct inspection and tests at no cost to the Government.

Inspection and testing is to be made promptly after erection to permit correction of defects and the removal and replacement of defective materials.

3.7.3 Repairs to Finish

Scratches, abrasions, and minor surface defects of finish may be repaired with the specified repair materials. Finished repaired surfaces must be uniform and free from variations of color and surface texture.

Repaired metal surfaces that are not acceptable to the project requirements and/or Contracting Officer are to be immediately removed and replaced with new material.

3.7.4 Paint-Finish Metal Siding

Paint-finish metal siding will be tested for color stability by the Contracting Officer during the manufacturer's specified guarantee period.

Panels that indicate color changes, fading, or surface degradation, determined by visual examination, must be removed and replaced with new panels at no expense to the Government.

New panels will be subject to the specified tests for an additional year from the date of their installation.

3.8 FIELD QUALITY CONTROL

3.8.1 Construction Monitoring

Make visual inspections as necessary to ensure compliance with specified requirements. Additionally, verify the following:

- a. Materials comply with the specified requirements.
- b. All materials are properly stored, handled and protected from damage. Damaged materials are removed from the site.
- c. Framing and substrates are in acceptable condition, in compliance with specification, prior to application of wall panels.
- d. Panels are installed without buckles, ripples, or waves and in uniform alignment and modulus.
- e. Side laps are formed, sealed, fastened or seam locked as required.
- f. The proper number, type, and spacing of attachment clips and fasteners are installed.
- g. Installer adheres to specified and detailed application parameters.
- h. Associated flashing and sheet metal are installed in a timely manner

in accord with the specified requirements.

Provide five bound copies of Manufacturer's Field Reports to the Contracting Officer two weeks prior to project close-out.

3.9 CLEAN-UP AND DISPOSAL

Clean all exposed sheet metal work at completion of installation. Remove metal shavings, filings, nails, bolts, and wires from work area. Remove grease and oil films, excess sealants, handling marks, contamination from steel wool, fittings and drilling debris and scrub the work clean. Exposed metal surfaces must be free of dents, creases, waves, scratch marks, solder or weld marks, and damage to the finish coating.

Collect and place scrap/waste materials in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site; transport demolished materials from Government property and legally dispose of them.

-- End of Section --

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SECTION 07 42 63

FABRICATED WALL PANEL ASSEMBLIES
08/25

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 501.1 (2017) Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI S100 (2012) North American Specification for the Design of Cold-Formed Steel Structural Members

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7-22 (2022; Supp 1 2023; Supp 2 2023; Supp 3 2025) Minimum Design Loads and Associated Criteria for Buildings and Other Structures

AMERICAN WELDING SOCIETY (AWS)

AWS A5.1/A5.1M (2025) Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding

AWS D1.1/D1.1M (2020; Errata 1 2021) Structural Welding Code - Steel

AWS D1.2/D1.2M (2014; Errata 1 2014; Errata 2 2020) Structural Welding Code - Aluminum

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M (2019) Standard Specification for Carbon Structural Steel

ASTM A123/A123M (2024) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A463/A463M (2025b) Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process

ASTM A606/A606M (2025) Standard Specification for Steel

	Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance
ASTM A653/A653M	(2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A1008/A1008M	(2024) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
ASTM B117	(2019) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM C273/C273M	(2020) Standard Test Method for Shear Properties of Sandwich Core Materials
ASTM C920	(2018; R 2024) Standard Specification for Elastomeric Joint Sealants
ASTM D522/D522M	(2017) Mandrel Bend Test of Attached Organic Coatings
ASTM D523	(2014; R 2018) Standard Test Method for Specular Gloss
ASTM D714	(2002; R 2017) Standard Test Method for Evaluating Degree of Blistering of Paints
ASTM D822/D822M	(2013; R 2018) Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings
ASTM D968	(2022) Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D1056	(2020) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D1308	(2020) Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Coating Systems
ASTM D1621	(2016) Standard Test Method for Compressive Properties of Rigid Cellular Plastics
ASTM D1622	(2020) Apparent Density of Rigid Cellular Plastics
ASTM D1667	(2022) Standard Specification for Flexible Cellular Materials - Poly (Vinyl Chloride) Foam (Closed-Cell)

ASTM D2244	(2021) Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
ASTM D2247	(2015; R 2020) Standard Practice for Testing Water Resistance of Coatings in 100 Percent Relative Humidity
ASTM D2794	(1993; R 2019) Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D3363	(2022) Standard Test Method for Film Hardness by Pencil Test
ASTM D4214	(2007; R 2015) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films
ASTM D6226	(2021) Standard Test Method for Open Cell Content of Rigid Cellular Plastics
ASTM E84	(2024) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E119	(2024) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E136	(2024c) Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C
ASTM E283/E283M	(2019) Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E331	(2000; R 2023) Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E1592	(2017) Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
ASTM G152	(2013; R 2021) Standard Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
ASTM G153	(2013; R 2021) Standard Practice for Operating Enclosed Carbon Arc Light

Apparatus for Exposure of Nonmetallic
Materials

METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)

MBMA MBSM (2018) Metal Building Systems Manual

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM AMP 500 (2006) Metal Finishes Manual

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION
(SMACNA)

SMACNA 1793 (2012) Architectural Sheet Metal Manual,
7th Edition

UL SOLUTIONS (UL)

UL Bld Mat Dir (updated continuously online) Building
Materials Directory

1.2 DEFINITIONS

Fabricated Wall Panel Assembly: Metal wall and liner panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories shop fabricated for a complete weather-tight wall system.

1.3 DESCRIPTION OF FABRICATED WALL PANEL ASSEMBLY SYSTEM

Factory color finished, aluminum metal wall panel system with concealed fastening attachment. Panel profile must be embossed. Interior finish of panel assembly to be anodized aluminum (clear finish).

1.3.1 Metal Wall Panel General Performance

Comply with performance requirements, conforming to AISI S100, without failure due to defective manufacture, fabrication, installation, or other defects in construction. Provide wall panels and accessory components conforming to the following standards:

ASTM A1008/A1008M

ASTM A123/A123M

ASTM A36/A36M

ASTM A653/A653M

ASTM A463/A463M for aluminum coated steel sheet.

ASTM A606/A606M

ASTM C273/C273M

ASTM D522/D522M for applied coatings.

UL Bld Mat Dir

1.3.2 Structural Performance

Maximum calculated fiber stress must not exceed the allowable value in the AISI or AA manuals; a one third overstress for wind is allowed. Midspan deflection under maximum design loads is limited to $L/180$. Contract drawings show the design wind loads and the extent and general assembly details of the metal siding. Provide design for members and connections not shown on the drawings. Provide siding panels and accessories products by the same manufacturer.

Provide metal wall panel assemblies complying with the load and stress requirements in accordance with ASTM E1592. Wind Load force due to wind action governs the design for panels. Wall systems and attachments are to resist the wind loads as determined by ASCE 7-22 in the geographic area where the construction will take place, in pounds per square foot. Submit electronic copies of wind load tests and seismic tests to the Contracting Officer.

1.3.3 Air Infiltration

Conform to the air leakage limits through the wall assembly area when tested according to ASTM E283/E283M.

1.3.4 Water Penetration Under Static Pressure

No water penetration when tested according to ASTM E331.

1.3.5 Water Penetration Under Dynamic Pressure

No evidence of water leakage when tested according to AAMA 501.1.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

- Qualification of Manufacturer

- Qualification of Installer

- Qualifications for Welding Work

SD-02 Shop Drawings

- Fabrication and Installation Drawings

- Wall Panel Assemblies

- Flashing and Accessories

- Anchorage Systems

SD-03 Product Data

Certification

Manufacturer's Catalog Data

Closure Materials

Insulation

Tape Sealant

Sealants and Caulking

Accessories

SD-04 Samples

Wall Panel Assemblies

Fasteners

Metal Closure Strips

Insulation

Manufacturer's Color Charts and Chips

SD-05 Design Data

Wind Design Analysis

SD-06 Test Reports

Leakage Tests

Wind Load Tests

Seismic Tests

Factory Color Finish Performance Requirements

SD-07 Certificates

Fasteners

Enamel Repair Paint

Aluminized Steel Repair Paint

Wall System Assembly Wind Load and Fire Rating Classification
Listings

SD-08 Manufacturer's Instructions

Installation of Wall Panels

SD-09 Manufacturer's Field Reports

Manufacturer's Field Inspection Reports; G

SD-11 Closeout Submittals

Warranty

Safety Data Sheets

1.5 QUALITY ASSURANCE

1.5.1 Pre-Installation Conference

After submittals are received and approved but before wall panel and insulation work, including associated work, is performed, the Contracting Officer will hold a pre-siding conference to review the following:

- a. The drawings, including Fabrication and Installation drawings, showing complete Wall Panel Assemblies, and specifications. Drawings are to indicate completely dimensioned structural frame and erection layouts, openings in the wall, special framing details, and construction details at corners, building intersections and flashing, location and type of mastic and metal filler strips. Include details for the following for review:
 - (1) Flashing and accessories
 - (2) Anchorage systems
 - (3) Manufacturer's catalog data
 - (4) Factory Color Finish
 - (5) Manufacturer's color charts and chips
 - (6) Sub-girts and Formed Shapes
 - (7) Closure Materials, including metal closure strips
 - (8) Insulation
 - (9) Pressure Sensitive Tape
 - (10) Accessories
 - (11) Fasteners
- b. Include samples of the following for Government review and approval:
 - (1) Manufacturer's color charts and chips, approximately 4 by 4 inches, showing full range of colors, textures and patterns available for wall panels with factory applied finishes.
 - (2) Wall Panel Assemblies, 12 inches long by actual panel width.
 - (3) Closure Materials, including metal closure strips, provide sample closure strips 10 inches long of each type.
 - (4) Insulation, provide samples approximately 8 by 11 inches.

- c. Finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
- d. Methods and procedures related to metal wall panel installation, including manufacturer's written instructions for Installation of Wall panels, and verification of wall system assembly wind load and fire rating classification listings. Include detailed application instructions and standard manufacturer drawings altered as required by these specifications. Explicitly identify in writing, differences between manufacturer's instructions and the specified requirements.
- e. Support conditions for compliance with requirements, including alignment between and attachment to structural members. Provide details of wind design analysis including wind speed, exposure category, co-efficient, importance factor, designates type of facility, negative pressures for each zone, methods and requirements of attachment. Include wall plan delineating dimensions and attachment patterns for each zone. Wind design analysis to be prepared and sealed by a Licensed Engineer with demonstrated project design experience in the geographic area where the construction will take place.
- f. Flashing, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
- g. Governing regulations and requirements for insurance, certificates, tests and inspections. Safety plan review must include applicable Safety Data Sheets for maintenance/repair materials.
- h. Temporary protection requirements for metal wall panel assembly during and after installation.
- i. Wall panel observation and repair procedures after metal wall panel installation. Include review of sample Enamel Repair Paint and Aluminized Steel Repair Paint.
- j. Sample Warranty.

1.5.2 Manufacturer's Technical Representative

The representative must have authorization from manufacturer to approve field changes and be thoroughly familiar with the products and installations in the geographical area where construction will take place.

1.5.3 Qualification of Manufacturer

Metal wall panel system manufacturer must have:

- a. A minimum of 5 years experience in manufacturing metal wall system and accessory products.
- b. Provide engineering services by an engineer currently licensed with experience on projects in the geographical area where construction will take place, having a minimum of 4 years experience as an engineer knowledgeable in wind load design analysis, protocols, and procedures for the MBMA MBSM; ASCE 7-22, and ASTM E1592.
- c. Provide certified engineering calculations using the products

submitted for:

- (1) Wind load requirements in accordance with FM Wind Design Guide and ASCE 7-22.

1.5.4 Qualification of Installer

The installation Contractor must be approved and certified by the wall panel manufacturer prior to beginning the installation of the metal wall system.

1.5.4.1 Qualifications for Welding Work

Welding procedures must conform to AWS A5.1/A5.1M, AWS D1.1/D1.1M for steel or AWS D1.2/D1.2M for aluminum.

1.5.5 Single Source

Obtain each type of metal wall and liner panels, clips, closures and other accessories from the standard products of the single source from a single manufacturer to operate as a complete system for the intended use.

1.5.6 Surface-Burning Characteristics

Provide metal wall panels having insulation core material with the following surface-burning characteristics as determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

- a. Flame-Spread Index: 25 or less.
- b. Smoke-Developed Index: 450 or less.

1.5.7 Fire-Resistance Ratings

Where indicated, provide metal wall panels identical to those of assemblies tested for fire resistance in accordance with ASTM E119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
Combustion Characteristics: ASTM E136.

1.5.8 Fabrication

Fabricate and finish metal wall panels and accessories at the factory by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel. Fabricate metal wall panel side laps with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weather-tight and minimize noise from movements within panel assembly.

1.5.8.1 Sheet Metal Accessories

Fabricate flashing and trim to comply with recommendations in SMACNA 1793 that apply to the design, dimensions, metal, and other characteristics of item indicated:

- a. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
- b. End Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
- c. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
- d. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
- e. Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA or by metal wall panel manufacturer for application, but not less than thickness of metal being secured.

1.5.9 Finishes

Comply with NAAMM AMP 500 for recommendations for applying and designating finishes.

Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

1.6 DELIVERY, HANDLING, AND STORAGE

1.6.1 Metal Wall Panels

Deliver and package components, sheets, metal wall panels, and other manufactured items so as not to be damaged or deformed and protected during transportation and handling. Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.

Stack and store metal wall panels horizontally on platforms or pallets, covered with suitable weather-tight and ventilated covering to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage. Retain strippable protective covering on metal wall panel for period of metal wall panel installation.

1.6.2 Foam-Plastic Insulation

Protect foam-plastic insulation as follows:

- a. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
- b. Protect against ignition at all times. Do not deliver foam-plastic

insulation materials to Project site before installation time.

1.6.3 Plastic Materials

Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.7 PROJECT CONDITIONS

Weather Limitations: Proceed with installation preparation only when existing and forecasted weather conditions permit work to proceed without water entering existing walling system or building.

Field Measurements: Verify locations of wall framing and opening dimensions by field measurements before metal wall panel fabrication and indicate measurements on Shop Drawings.

1.8 WARRANTY

Provide manufacturer's no-dollar-limit warranty for the metal wall panel system. The warranty period is to be no less than 20 years from the date of Government acceptance of the work. Write warranty directly to the Government, commencing at time of Government's acceptance of wall panel work. The warranty is to provide that if within the warranty period the metal wall panel system shows evidence of corrosion, perforation, rupture or excess weathering due to deterioration of the wall panel system resulting from defective materials or workmanship, correction of the defective workmanship is to be the responsibility of the metal wall panel system manufacturer. Repairs that become necessary because of defective materials and workmanship while metal wall panel system is under warranty are to be performed within 72 hours after notification, unless additional time is approved by the Contracting Officer. Failure to perform repairs within 72 hours of notification will constitute grounds for having emergency repairs performed by others and not void the warranty.

PART 2 PRODUCTS

2.1 PANEL MATERIALS

2.1.1 Foam-Insulation Core Wall Panel

Provide factory-formed aluminum wall panel assembly fabricated from two sheets of metal with modified polyisocyanurate or polyurethane foam insulation core board during fabrication with joints between panels designed to form weather-tight seals. Include accessories required for weather-tight installation.

- a. Closed-Cell Content: 90 percent when tested according to ASTM D6226.
- b. Density: 2.0 to 2.6 lb/cu. ft. when tested according to ASTM D1622.
- c. Compressive Strength: Minimum 20 psi when tested according to ASTM D1621.
- d. Shear Strength: 26 psi when tested according to ASTM C273/C273M.

2.1.2 Finish

All panels are to receive a factory-applied 70 percent resin

polyvinylidene fluoride finish containing 100 percent inorganic pigments consisting of a baked-on top-coat with a manufacturer's recommended prime coat conforming to the following:

- a. Metal Preparation: All metal is to have the surfaces carefully prepared for painting on a continuous process coil coating line by alkali cleaning, hot water rinsing, application of chemical conversion coating, cold water rinsing, sealing with acid rinse, and thorough drying.
- b. Prime Coating: A base coat of epoxy paint, specifically formulated to interact with the top-coat, is to be applied to the prepared surfaces by roll coating to a dry film thickness of 1.00 mils. Oven cure the prime coat prior to application of finish coat.
- c. Exterior Finish Coating: Apply the finish coating over the primer by roll coating to dry film thickness of 0.80 mils. Oven cure this exterior finish coat.
- d. Interior Finish Coating: Apply a backer coat on the reverse side over 0.40 mils of primer by roll coating plus a backer coat to a dry film thickness of 0.40 mils for a total dry film thickness of 0.80 mils for the entire backer coat system. The backer coat must be oven-cured.
- e. Color: The exterior finish chosen from the manufacturer's standard color chart.
- f. Physical Properties: Coating is to conform to the industry and manufacturer's standard performance criteria as listed by the following certified test reports:

Chalking:	ASTM D4214
Color Change and Conformity:	ASTM D2244
Weatherometer:	ASTM G152, ASTM G153 and ASTM D822/D822M
Humidity:	ASTM D2247 and ASTM D714
Salt Spray:	ASTM B117
Chemical Pollution:	ASTM D1308
Gloss at 60:	ASTM D523
Pencil Hardness:	ASTM D3363
Reverse Impact:	ASTM D2794
Flexibility:	ASTM D522/D522M
Abrasion:	ASTM D968

Flame Spread:	ASTM E84

2.2 MISCELLANEOUS METAL FRAMING

2.2.1 General

Cold-formed metallic-coated steel sheet conforming to ASTM A653/A653M and specified in Section 05 40 00 COLD-FORMED METAL FRAMING unless otherwise indicated.

2.3 FASTENERS

2.3.1 General

Type, material, corrosion resistance, size and sufficient length to penetrate the supporting member a minimum of 1 inch with other properties required to fasten miscellaneous metal framing members to substrates in accordance with the wall panel manufacturer's and ASCE 7-22 requirements.

2.3.2 Exposed Fasteners

Fasteners for wall panels to be corrosion resistant Series 304 stainless cast head or Series 304 stainless bi-metal compatible with the sheet panel and flashing and of a type and size recommended by the manufacturer to meet the performance requirements and design loads. Fasteners for accessories to be the manufacturer's standard. Provide an integral metal washer that is compatible and matches the color of attached material with compressible sealing EPDM gasket approximately 3/32 inches thick.

2.3.3 Screws

Provide corrosion resistant Series 304 stainless steel screws being the type and size recommended by the manufacturer to meet the performance requirements.

2.3.4 Rivets

Rivets to be closed-end type, corrosion resistant Series 304 stainless steel where watertight connections are required.

2.3.5 Attachment Clips

Fabricate clips from Series 304 stainless steel. Size, shape, thickness and capacity as required meeting the insulation thickness and design load criteria specified.

2.4 ACCESSORIES

2.4.1 General

All accessories to be compatible with the metal wall panels. Do not provide sheet metal flashing, trim, metal closure strips, caps and similar metal accessories less than the minimum thickness specified for the wall panels. Exposed metal accessories/finishes to match the panels provided, except as otherwise indicated. Provide molded foam rib, ridge and other closure strips of non-absorbent closed-cell or solid-cell synthetic rubber or pre-molded neoprene to match configuration of the panels.

2.4.2 Closure Materials

2.4.2.1 Rubber Closure Strips

Closed-cell, expanded cellular rubber conforming to ASTM D1056 and ASTM D1667; extruded or molded to the configuration of the specified wall panel and in lengths supplied by the wall panel manufacturer.

2.4.2.2 Metal Closure Strips

Factory fabricated closure strips to be the same metal, gauge/ thickness, color, finish and profile of the specified wall panel.

2.4.3 Joint Sealants

2.4.3.1 Sealants and Caulking

Sealants are to be an approved gun type for use in hand- or air-pressure caulking guns at temperatures above 40 degrees F (or frost-free application at temperatures above 10 degrees F) with minimum solid content of 85 percent of the total volume. Sealant is to dry with a tough, durable surface skin which permits it to remain soft and pliable underneath, providing a weather-tight joint. No migratory staining is permitted on painted or unpainted metal, stone, glass, vinyl, or wood.

Prime all joints to receive sealants with a compatible one-component or two-component primer as recommended by the wall panel manufacturer.

2.4.3.2 Shop-Applied

Sealant for shop-applied caulking must be an approved gun grade, non-sag one-component polysulfide or silicone conforming to ASTM C920, and with a curing time to ensure the sealant's plasticity at the time of field erection.

2.4.3.3 Field-Applied

Sealant for field-applied caulking must be an approved gun grade, non-sag one-component polysulfide or two-component polyurethane with an initial maximum Shore A durometer hardness of 25, and conforming to ASTM C920. Color to match panel colors.

2.4.3.4 Tape Sealant

Pressure sensitive, 100 percent solid with a release paper backing; permanently elastic, non-sagging, non-toxic and non-staining as approved by the wall panel manufacturer.

2.5 SHEET METAL FLASHING AND TRIM

2.5.1 Fabrication

Shop fabricate sheet metal flashing and trim where practicable to comply with recommendations in SMACNA 1793 that apply to design, dimensions, metal, and other characteristics of item indicated. Obtain field measurements for accurate fit before shop fabrication.

Fabricate sheet metal flashing and trim without excessive oil canning,

buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

2.6 REPAIR OF FINISH PROTECTION

Repair paint for color finish enameled wall panel must be compatible paint of the same formula and color as the specified finish provided by the wall panel manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- a. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of the Work.
- b. Examine primary and secondary wall framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal wall panel manufacturer, UL, ASTM, ASCE 7-22 and as required for the geographical area where construction will take place.
- c. Examine solid wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
- d. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.
- e. Submit to the Contracting Officer a written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- f. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- a. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.
- b. Miscellaneous Framing: Install sub-purlins, girts, angles, furring, and other miscellaneous wall panel support members and anchorage according to metal wall panel manufacturer's written instructions.

3.3 WALL PANEL INSTALLATION

Provide metal wall panels of full length from sill to eave as indicated, unless otherwise indicated or restricted by shipping limitations. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement in accordance with MBMA Metal Building Systems Manual (MBMA MBSM).

- a. Aluminum Wall Panels: Use aluminum or stainless-steel fasteners for exterior surfaces and aluminum or galvanized steel fasteners for interior surfaces.
- b. Anchor Clips: Anchor metal wall panels and other components of the

Work securely in place, using manufacturer's approved fasteners according to manufacturer's written instructions.

- c. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal wall panel manufacturer.
- d. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.
- e. Erect wall panel system in accordance with the approved erection drawings, the printed instructions and safety precautions of the manufacturer.
- f. Sheets are not to be subjected to overloading, abuse, or undue impact. Do not apply bent, chipped, or defective sheets.
- g. Erect sheets true and plumb and in exact alignment with the horizontal and vertical edges of the building, securely anchored, and with the indicated eave, and sill.
- h. Work is to allow for thermal movement of the wall panel, movement of the building structure, and to provide permanent freedom from noise due to wind pressure.
- i. Field cutting metal wall panels by torch is not permitted.

3.4 FASTENER INSTALLATION

Anchor metal wall panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturer's written instructions.

3.5 FLASHING, TRIM AND CLOSURE INSTALLATION

3.5.1 General Requirements

Comply with performance requirements, manufacturer's written installation instructions, and SMACNA 1793. Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

Sheet metalwork is to be accomplished to form weather-tight construction without waves, warps, buckles, fastening stresses or distortion, and allow for expansion and contraction. Cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades is to be performed by sheet metal mechanics.

3.5.2 Metal Flashing

- a. Exposed metal flashing is to be installed at building corners, sills and eaves, junctions between metal siding and walling.

- b. Exposed metal flashing is to be the same material, color, and finish as the specified metal wall panel.
- c. Flashing is to be fastened at not more than 8 inches on center, except where flashing is held in place by the same screws that secure covering sheets.
- d. Provide flashing in minimum 8 foot lengths. Exposed flashing is to have 1 inch locked and blind-soldered end joints, and expansion joints at intervals of not more than 16 feet.
- e. Exposed flashing and flashing subject to rain penetration to be bedded in the specified joint sealant.
- f. Flashing which is in contact with dissimilar metals to be isolated by means of the specified asphalt mastic material to prevent electrolytic deterioration.
- g. Drips to be formed to the profile indicated, with the edge folded back 1/2 inch to form a reinforced drip edge.

3.5.3 Closures

Install metal closure strips at open ends of corrugated or ribbed pattern walls, and at intersection of wall and wall unless open ends are concealed with formed eave flashing; and in other required areas.

Install mastic closure strips at intersection of the wall with metal walling; top and bottom of metal siding; heads of wall openings; and in other required locations.

3.6 WORKMANSHIP

Make lines, arises, and angles sharp and true. Free exposed surfaces from visible wave, warp, buckle, and tool marks. Fold back exposed edges neatly to form a 1/2 inch hem on the concealed side. Make sheet metal exposed to the weather watertight with provisions for expansion and contraction.

Make surfaces to receive sheet metal plumb and true, clean, even, smooth, dry, and free of defects and projections which might affect the application. For installation of items not shown in detail or not covered by specifications conform to the applicable requirements of SMACNA 1793. Provide sheet metal flashing in the angles formed where roof decks abut walls, curbs, ventilators, pipes, or other vertical surfaces and wherever indicated and necessary to make the work watertight.

3.7 ACCEPTANCE PROVISIONS

3.7.1 Erection Tolerances

Erect metal wall panels straight and true with plumb vertical lines correctly lapped and secured in accordance with the manufacturer's written instructions. Horizontal lines must not vary more than 1/8 inch in 40 feet.

3.7.2 Leakage Tests

Inspect and test finished application of metal wall panels when directed

to do so by the Contracting Officer. Conduct inspections and tests at no additional cost to the Government.

Perform inspection and testing promptly after erection to permit correction of defects and the removal and replacement of defective materials.

3.7.3 Repairs to Finish

Scratches, abrasions, and minor surface defects of finish may be repaired with the specified repair materials. Finished repaired surfaces must be uniform and free from variations of color and surface texture.

Repaired metal surfaces that are not acceptable to the project requirements are to be immediately removed and replaced with new material.

3.7.4 Paint-Finish Metal Siding

Paint-finish metal siding will be tested for color stability by the Contracting Officer during the manufacturer's specified guarantee period.

Remove and replace panels that indicate color changes, fading, or surface degradation, determined by visual examination, with new panels at no expense to the Government. New panels will be subject to the specified tests for an additional year from the date of their installation.

3.8 MANUFACTURER'S INSPECTION

The metal wall panel manufacturer's technical representative must visit the work site to inspect ongoing work. Inspections are to include observing installation technique and verifying the quality of work-in-place for compliance with the manufacturer's instructions. Deficiencies identified by the manufacturer's technical representative must be corrected and re-inspected by the manufacturer's technical representative.

3.8.1 Frequency

The manufacturer's technical representative must visit the work site to inspect and document ongoing work a minimum of three separate occasions during the course of the installation. One visit must occur during the first 20 squares of installation, one at substantial completion of the metal panel work, and all others during different periods of installation. Notify the Contracting officer a minimum of 5 working days prior to each visit by the manufacturer's technical representative.

3.8.2 Field Inspection Report

Document inspection results in a report prepared and signed by the manufacturer's technical representative for each visit. Submit the report to the Contracting Officer with the Contractor's daily Quality Control report. The manufacturer's field inspection report must include a description of ongoing work observed and whether the inspected work was satisfactory or unsatisfactory. The final report must include certification by the manufacturer's technical representative that the work was performed in accordance with the manufacturer's instructions and contains no deficiencies. Submit the final manufacturer's field inspection reports to the Contracting Officer within 5 working days of the final visit.

3.9 CLEAN-UP AND DISPOSAL

Clean all exposed sheet metal work at completion of installation. Remove metal shavings, filings, nails, bolts, and wires from work area. Remove grease and oil films, excess sealants, handling marks, contamination from steel wool, fittings and drilling debris and scrub the work clean. Exposed metal surfaces to be free of dents, creases, waves, scratch marks, solder or weld marks, and damage to the finish coating.

Collect and place scrap/waste materials in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site; transport demolished materials from Government property and legally dispose of them.

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SECTION 07 60 00

FLASHING AND SHEET METAL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WELDING SOCIETY (AWS)

AWS D1.2/D1.2M (2014; Errata 1 2014; Errata 2 2020)
Structural Welding Code - Aluminum

ASTM INTERNATIONAL (ASTM)

ASTM A308/A308M	(2010) Standard Specification for Steel Sheet, Terne (Lead-Tin Alloy) Coated by the Hot Dip Process
ASTM A480/A480M	(2020a) Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
ASTM A653/A653M	(2020) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B32	(2020) Standard Specification for Solder Metal
ASTM B69	(2020) Standard Specification for Rolled Zinc
ASTM B101	(2012; R 2019) Standard Specification for Lead-Coated Copper Sheet and Strip for Building Construction
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B221	(2021) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B370	(2012; R 2019) Standard Specification for Copper Sheet and Strip for Building Construction
ASTM D41/D41M	(2011; R 2016) Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing

ASTM D1784 (2020) Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

ASTM D4586/D4586M (2007; E 2012; R 2012) Asphalt Roof Cement, Asbestos-Free

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1793 (2012) Architectural Sheet Metal Manual, 7th Edition

SINGLE PLY ROOFING INDUSTRY (SPRI)

ANSI/SPRI RD-1 (2014) Performance Standard for Retrofit Drains

1.2 GENERAL REQUIREMENTS

Finished sheet metal assemblies must form a weathertight enclosure without waves, warps, buckles, fastening stresses or distortion, while allowing for expansion and contraction without damage to the system. The sheet metal installer is responsible for cutting, fitting, drilling, and other operations in connection with sheet metal modifications required to accommodate the work of other trades. Coordinate installation of sheet metal items used in conjunction with roofing with roofing work to permit continuous, uninterrupted roofing operations.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Exposed Sheet Metal Coverings

Gutters

Downspouts

Expansion Joints

Gravel Stops and fascia

Base Flashing

Counterflashing

Reglets

Drip Edges

Eave Flashing

Recycled Content; S

SD-04 Samples

Finish Samples

SD-08 Manufacturer's Instructions

Instructions for Installation

Quality Control Plan

SD-10 Operation and Maintenance Data

Cleaning and Maintenance

1.4 MISCELLANEOUS REQUIREMENTS

1.4.1 Product Data

Indicate thicknesses, dimensions, fastenings, anchoring methods, expansion joints, and other provisions necessary for thermal expansion and contraction. Scaled manufacturer's catalog data may be submitted for factory fabricated items.

1.4.2 Finish Samples

Submit two color charts and two finish sample chips from manufacturer's standard color and finish options for each type of finish indicated.

1.4.3 Operation and Maintenance Data

Submit detailed instructions for installation and quality control during installation, cleaning and maintenance, for each type of assembly indicated.

1.5 DELIVERY, HANDLING, AND STORAGE

Package and protect materials during shipment. Uncrate and inspect materials for damage, dampness, and wet-storage stains upon delivery to the job site. Remove from the site and replace damaged materials that cannot be restored to like-new condition. Handle sheet metal items to avoid damage to surfaces, edges, and ends. Store materials in dry, weather-tight, ventilated areas until installation.

PART 2 PRODUCTS

2.1 RECYCLED CONTENT

Provide products with recycled content. Provide data for each product with recycled content, identifying percentage of recycled content.

2.2 MATERIALS

Do not use lead, lead-coated metal, or galvanized steel. Use any metal listed by SMACNA 1793 for a particular item, unless otherwise indicated.

Provide materials, thicknesses, and configurations in accordance with SMACNA 1793 for each material. Different items need not be of the same metal, except that contact between dissimilar metals must be avoided.

Furnish sheet metal items in 8 to 10 foot lengths. Single pieces less than 8 feet long may be used to connect to factory-fabricated inside and outside corners, and at ends of runs. Factory fabricate corner pieces with minimum 12 inch legs. Provide accessories and other items essential to complete the sheet metal installation. Provide accessories made of the same or compatible materials as the items to which they are applied. Fabricate sheet metal items of the materials specified below and to the gauge, thickness, or weight shown in Table I at the end of this section. Provide sheet metal items with mill finish unless specified otherwise. Where more than one material is listed for a particular item in Table I, each is acceptable and may be used, except as follows:

2.2.1 Exposed Sheet Metal Items

Must be of the same material. Consider the following as exposed sheet metal: Gutters, including hangers; downspouts; gravel stops and fascia; cap, valley, steeped, base, and eave flashings and related accessories.

2.2.2 Drainage

Do not use copper for an exposed item if drainage from that item will pass over exposed masonry, stonework or other metal surfaces. In addition to the metals listed in Table I, lead-coated copper may be used for such items.

2.2.3 Copper, Sheet and Strip

Provide in accordance with ASTM B370, cold-rolled temper, H 00 (standard).

2.2.4 Lead-Coated Copper Sheet

Provide in accordance with ASTM B101.

2.2.5 Lead Sheet

Provide in a minimum weight of 4 pounds per square foot.

2.2.6 Steel Sheet, Zinc-Coated (Galvanized)

Provide in accordance with ASTM A653/A653M.

2.2.7 Zinc Sheet and Strip

Provide in accordance with ASTM B69, Type I, a minimum of 0.024 inch thick.

2.2.8 Stainless Steel

Provide in accordance with ASTM A480/A480M, Type 302 or 304, 2D Finish, fully annealed, dead-soft temper.

2.2.9 Terne-Coated Steel

Provide in accordance with ASTM A308/A308M, a minimum of 14 by 20 inch with minimum of 40 pound coating per double base box. ASTM A308/A308M.

2.2.10 Aluminum Alloy Sheet and Plate

Provide in accordance with ASTM B209 anodized clear form alloy, and temper appropriate for use. Provide material not less than 0.065-in in thickness.

2.2.11 Finishes

Provide exposed exterior sheet metal and aluminum with a baked on, factory applied color coating of polyvinylidene fluoride (PVF2) or approved equal fluorocarbon coating. Dry film thickness of coatings must be 0.8 to 1.3 mils. Color to be selected from as indicated on the Drawings. Field applications of color coatings are prohibited and will be rejected.

2.2.12 Aluminum Alloy, Extruded Bars, Rods, Shapes, and Tubes

ASTM B221.

2.2.13 Solder

Provide in accordance with ASTM B32, 95-5 tin-antimony.

2.2.14 Reglets

2.2.14.1 Polyvinyl Chloride Reglets

Provide in accordance with ASTM D1784, Type II, Grade 1, Class 14333-D, 0.075 inch minimum thickness.

2.2.14.2 Metal Reglets

Provide factory fabricated caulked type or friction type reglets with a minimum opening of 1/4 inch and a depth of 1-1/4 inch, as approved.

2.2.14.2.1 Caulked Reglets

Provide with rounded edges, temporary reinforcing cores, and accessories as required for securing to adjacent construction. Provide built-up mitered corner pieces for inside and outside corners.

2.2.14.2.2 Friction Reglets

Provide with flashing receiving slots not less than 5/8 inch deep, one inch jointing tongues, and upper and lower anchoring flanges installed at 24 inch maximum snap-lock type receiver.

2.2.15 Bituminous Plastic Cement

Provide in accordance with ASTM D4586/D4586M, Type I.

2.2.16 Asphalt Primer

Provide in accordance with ASTM D41/D41M.

2.2.17 Fasteners

Use the same metal as, or a metal compatible with the item fastened. Use stainless steel fasteners to fasten. Confirm compatibility of fasteners and items to be fastened to avoid galvanic corrosion due to dissimilar materials.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Metal Roofing

3.1.1.1 Standing-seam Method

Make standing seams parallel with slope of roof. Fabricate sheets into long lengths at shop by locking short dimensions together and thoroughly soldering joints thus formed. In applying metal, turn up one edge of course at each side seam at right angles 1.5 inch. Then install 2 by 3 inch cleats spaced 12 inches apart by fastening one end of each cleat to roof with two one inch long nails and folding roof end back over nail heads. Turn end adjoining turned-up side seam up over upstanding edge of course. Turn up adjoining edge of next course 1.75 inches and abutting upstanding edges locked, turned over, and flattened against one side of standing seam. Make standing seams straight, rounded neatly at the top edges, and stand about one inch above roof deck. All sheets must be same length, except as required to complete run or maintain pattern. Locate transverse joints of each panel half way between joints in adjacent sheets. Align joints of alternate sheets horizontally to produce uniform pattern, as shown in SMACNA 1793.

3.1.2 Workmanship

Make lines and angles sharp and true. Free exposed surfaces from visible wave, warp, buckle, and tool marks. Fold back exposed edges neatly to form a 1/2 inch hem on the concealed side. Make sheet metal exposed to the weather watertight with provisions for expansion and contraction.

Make surfaces to receive sheet metal plumb and true, clean, even, smooth, dry, and free of defects and projections. For installation of items not shown in detail or not covered by specifications conform to the applicable requirements of SMACNA 1793, Architectural Sheet Metal Manual. Provide sheet metal flashing in the angles formed where roof decks abut walls, curbs, ventilators, pipes, or other vertical surfaces and wherever indicated and necessary to make the work watertight. Join sheet metal items together as shown in Table II.

3.1.3 Nailing

Confine nailing of sheet metal generally to sheet metal having a maximum width of 18 inches. Confine nailing of flashing to one edge only. Space nails evenly not over 3 inch on center and approximately 1/2 inch from edge unless otherwise specified or indicated. Face nailing will not be permitted. Where sheet metal is applied to other than wood surfaces, include in shop drawings, the locations for sleepers and nailing strips required to secure the work.

3.1.4 Cleats

Provide cleats for sheet metal 18 inches and over in width. Space cleats evenly not over 12 inches on center unless otherwise specified or indicated. Unless otherwise specified, provide cleats of 2 inches wide by 3 inches long and of the same material and thickness as the sheet metal being installed. Secure one end of the cleat with two nails and the cleat folded back over the nailheads. Lock the other end into the seam. Where

the fastening is to be made to concrete or masonry, use screws and drive in expansion shields set in concrete or masonry. Pre-tin cleats for soldered seams.

3.1.5 Bolts, Rivets, and Screws

Install bolts, rivets, and screws where indicated or required. Provide compatible washers where required to protect surface of sheet metal and to provide a watertight connection. Provide mechanically formed joints in aluminum sheets 0.040 inches or less in thickness.

3.1.6 Seams

Straight and uniform in width and height with no solder showing on the face.

3.1.6.1 Flat-lock Seams

Finish not less than 3/4 inch wide.

3.1.6.2 Lap Seams

Finish soldered seams not less than one inch wide. Overlap seams not soldered, not less than 3 inches.

3.1.6.3 Loose-Lock Expansion Seams

Not less than 3 inches wide; provide minimum one inch movement within the joint. Completely fill the joints with the specified sealant, applied at not less than 1/8 inch thick bed.

3.1.6.4 Standing Seams

Not less than one inch high, double locked without solder.

3.1.6.5 Flat Seams

Make seams in the direction of the flow.

3.1.7 Soldering

Where soldering is specified, apply to copper, terne-coated stainless steel, zinc-coated steel, and stainless steel items. Pre-tin edges of sheet metal before soldering is begun. Seal the joints in aluminum sheets of 0.040 inch or less in thickness with specified sealants. Do not solder aluminum.

3.1.7.1 Edges

Scrape or wire-brush the edges of lead-coated material to be soldered to produce a bright surface. Flux brush the seams in before soldering. Treat with soldering acid flux the edges of stainless steel to be pre-tinned. Seal the joints in aluminum sheets of 0.040 inch or less in thickness with specified sealants. Do not solder aluminum.

3.1.8 Welding and Mechanical Fastening

Use welding for aluminum of thickness greater than 0.040 inch. Aluminum 0.040 inch or less in thickness must be butted and the space backed with

formed flashing plate; or lock joined, mechanically fastened, and filled with sealant as recommended by the aluminum manufacturer.

3.1.8.1 Welding of Aluminum

Use welding of the inert gas, shield-arc type. For procedures, appearance and quality of welds, and the methods used in correcting welding work, conform to AWS D1.2/D1.2M.

3.1.8.2 Mechanical Fastening of Aluminum

Use No. 12, aluminum alloy, sheet metal screws or other suitable aluminum alloy or stainless steel fasteners. Drive fasteners in holes made with a No. 26 drill in securing side laps, end laps, and flashings. Space fasteners 12 inches maximum on center. Where end lap fasteners are required to improve closure, locate the end lap fasteners not more than 2 inches from the end of the overlapping sheet.

3.1.9 Protection from Contact with Dissimilar Materials

3.1.9.1 Copper or Copper-bearing Alloys

Paint with heavy-bodied bituminous paint surfaces in contact with dissimilar metal, or separate the surfaces by means of moistureproof building felts.

3.1.9.2 Aluminum

Do not allow aluminum surfaces in direct contact with other metals except stainless steel, zinc, or zinc coating. Where aluminum contacts another metal, paint the dissimilar metal with a primer followed by two coats of aluminum paint. Where drainage from a dissimilar metal passes over aluminum, paint the dissimilar metal with a non-lead pigmented paint.

3.1.9.3 Metal Surfaces

Paint surfaces in contact with mortar, concrete, or other masonry materials with alkali-resistant coatings such as heavy-bodied bituminous paint.

3.1.9.4 Wood or Other Absorptive Materials

Paint surfaces that may become repeatedly wet and in contact with metal with two coats of aluminum paint or a coat of heavy-bodied bituminous paint.

3.1.10 Expansion and Contraction

Provide expansion and contraction joints at not more than 32 foot intervals for aluminum and at not more than 40 foot intervals for other metals. Provide an additional joint where the distance between the last expansion joint and the end of the continuous run is more than half the required interval. Space joints evenly. Join extruded aluminum gravel stops and fascia by expansion and contraction joints spaced not more than 12 feet apart.

3.1.11 Base Flashing

Extend up vertical surfaces of the flashing not less than 8 inches and not

less than 4 inches under the roof covering. Where finish wall coverings form a counterflashing, extend the vertical leg of the flashing up behind the applied wall covering not less than 6 inches. Overlap the flashing strips with the previously laid flashing not less than 3 inches. Fasten the strips at their upper edge to the deck. Horizontal flashing at vertical surfaces must extend vertically above the roof surface and fastened at their upper edge to the deck a minimum of 6 inches on center with hex headed, galvanized shielded screws a minimum of 2 inch lap of any surface. Solder end laps and provide for expansion and contraction. Extend the metal flashing over crickets at the up-slope side of vertical surfaces extending through sloping roofs, the metal flashings. Extend the metal flashings onto the roof covering not less than 4.5 inches at the lower side of vertical surfaces extending through the roof decks. Install and fit the flashings so as to be completely weathertight. Provide factory-fabricated base flashing for interior and exterior corners. Do not use metal base flashing on built-up roofing.

3.1.12 Counterflashing

Except where indicated or specified otherwise, insert counterflashing in reglets located from 9 to 10 inches above roof decks, extend down vertical surfaces over upturned vertical leg of base flashings not less than 3 inches. Fold the exposed edges of counterflashings 1/2 inch. Where stepped counterflashings are required, they may be installed in short lengths a minimum 8 inches by 8 inches or may be of the preformed single piece type. Provide end laps in counterflashings not less than 3 inches and make it weathertight with plastic cement. Do not make lengths of metal counterflashings exceed 10 feet. Form flashings to the required shapes before installation. Factory form corners not less than 12 inches from the angle. Secure the flashings in the reglets with lead wedges and space not more than 18 inches apart; on short runs, place wedges closer together. Fill caulked-type reglets or raked joints which receive counterflashing with caulking compound. Turn up the concealed edge of counterflashings built into masonry or concrete walls not less than 1/4 inch and extend not less than 2 inches into the walls. Install counterflashing to provide a spring action against base flashing.

3.1.13 Metal Reglets

Keep temporary cores in place during installation. Ensure factory fabricated caulked type or friction type, reglets have a minimum opening of 1/4 inch and a minimum depth of 1-1/4 inch, when installed.

3.1.13.1 Caulked Reglets

Wedge flashing in reglets with lead wedges every 18 inches, caulked full and solid with an approved compound.

3.1.13.2 Friction Reglets

Install flashing snap lock receivers at 24 inches on center maximum. When flashing has been inserted the full depth of the slot, caulk the slot, lock with wedges, and fill with sealant.

3.1.14 Polyvinyl Chloride Reglets for Temporary Construction

Rigid polyvinyl chloride reglets may be provided in lieu of metal reglets for temporary construction.

3.1.15 Gravel Stops and fascia

Prefabricate in the shapes and sizes indicated and in lengths not less than 8 feet. Extend flange at least 4 inches onto roofing. Provide prefabricated, mitered corners internal and external corners. Install gravel stops and fascia after all plies of the roofing membrane have been applied, but before the flood coat of bitumen is applied. Prime roof flange of gravel stops and fascia on both sides with an asphalt primer. After primer has dried, set flange on roofing membrane and strip-in. Nail flange securely to wood nailer with large-head, barbed-shank roofing nails 1.5 inch long spaced not more than 3 inches on center, in two staggered rows.

3.1.15.1 Edge Strip

Hook the lower edge of fascia at least 3/4 inch over a continuous strip of the same material bent outward at an angle not more than 45 degrees to form a drip. Nail hook strip to a wood nailer at 6 inches maximum on center. Where fastening is made to concrete or masonry, use screws spaced 12 inches on center driven in expansion shields set in the concrete or masonry. Where horizontal wood nailers are slotted to provide for insulation venting, install strips to prevent obstruction of vent slots. Where necessary, install strips over 1/16 inch thick compatible spacer or washers.

3.1.15.2 Joints

Leave open the section ends of gravel stops and fascia 1/4 inch and backed with a formed flashing plate, mechanically fastened in place and lapping each section end a minimum of 4 inches set laps in plastic cement. Face nailing will not be permitted. Install prefabricated aluminum gravel stops and fascia in accordance with the manufacturer's printed instructions and details.

3.1.16 Metal Drip Edges

Provide a metal drip edge, designed to allow water run-off to drip free of underlying construction, at eaves and rakes prior to the application of roofing shingles. Apply directly on the wood deck at the eaves and over the underlay along the rakes. Extend back from the edge of the deck not more than 3 inches and secure with compatible nails spaced not more than 10 inches on center along upper edge.

3.1.17 Gutters

The hung type of shape indicated and supported on underside by brackets that permit free thermal movement of the gutter. Provide gutters in sizes indicated complete with mitered corners, end caps, outlets, brackets, and other accessories necessary for installation. Bead with hemmed edge or reinforce the outer edge of gutter with a stiffening bar not less than 3/4 by 3/16 inch of material compatible with gutter. Fabricate gutters in sections not less than 8 feet. Lap the sections a minimum of one inch in the direction of flow or provide with concealed splice plate 6 inches minimum. Join the gutters, other than aluminum, by riveted and soldered joints. Join aluminum gutters with riveted sealed joints. Provide expansion-type slip joints midway between outlets. Install gutters below slope line of the roof so that snow and ice can slide clear. Support gutters by continuous cleats and/or by cleats spaced not less than 36 inches apart. Adjust gutters to slope uniformly to outlets, with high

points occurring midway between outlets. Fabricate hangers and fastenings from compatible metals.

3.1.18 Downspouts

Space supports for downspouts according to the manufacturer's recommendation for the substrate. Types, shapes and sizes are indicated. Provide complete including elbows and offsets. Provide downspouts in approximately 10 foot lengths. Provide end joints to telescope not less than 1/2 inch and lock longitudinal joints. Provide gutter outlets with wire ball strainers for each outlet. Provide strainers to fit tightly into outlets and be of the same material used for gutters. Keep downspouts not less than one inch away from walls. Fasten to the walls at top, bottom, and at an intermediate point not to exceed 5 feet on center with leader straps or concealed rack-and-pin type fasteners. Form straps and fasteners of metal compatible with the downspouts.

3.1.18.1 Terminations

Neatly fit into the drainage connection the downspouts terminating in drainage lines and fill the joints with a Portland cement mortar cap sloped away from the downspout. Provide downspouts terminating in splash blocks with elbow-type fittings. Provide splash pans as specified.

3.1.19 Flashing for Roof Drains

Provide a 30 inches square sheet indicated. Taper insulation to drain from 24 inches out. Set flashing on finished felts in a full bed of asphalt roof cement, ASTM D4586/D4586M. Heavily coat the drain flashing ring with asphalt roof cement. Clamp the roof membrane, flashing sheet, and stripping felt in the drain clamping ring. Secure clamps so that felts and drain flashing are free of wrinkles and folds. Retrofit roof drains must conform to ANSI/SPRI RD-1.

3.1.20 Scuppers

Extend the scupper liner through and project outside of, the wall it penetrates to form a bottom drip edge against the face of the wall. Fold outside edges under 1/2 inch on all sides. Join the top and sides of the lining on the roof deck side to a closure flange by a locked and soldered joint. Join the bottom edge by a locked and soldered joint to the closure flange, where required, form with a ridge to act as a gravel stop around the scupper inlet. Provide surfaces to receive the scupper lining and coat with bituminous plastic cement.

3.1.21 Conductor Heads

Set the depth of the top opening equal to two-thirds of the width or the conductor head. Flat-lock solder seams. Where conductor heads are used in conjunction with scuppers, set the conductor a minimum of 2 inches wider than the scupper. Attach conductor heads to the wall with masonry fasteners. Securely fasten screens to heads.

3.1.22 Eave Flashing

One piece in width, applied in 8 to 10 foot lengths with expansion joints spaced as specified in paragraph EXPANSION AND CONTRACTION. Provide a 3/4 inch continuous fold in the upper edge of the sheet to engage cleats spaced not more than 10 inches on center. Locate the upper edge of

flashing not less than 18 inches from the outside face of the building, measured along the roof slope. Fold lower edge of the flashing over and loose-lock into a continuous edge strip on the fascia. Where eave flashing intersects metal valley flashing, secure with one inch flat locked joints with cleats that are 10 inches on center.

3.1.23 Sheet Metal Covering on Flat, Sloped, or Curved Surfaces

Except as specified or indicated otherwise, cover and flash all minor flat, sloped, or curved surfaces such as crickets, bulkheads, dormers and small decks with metal sheets of the material used for flashing; maximum size of sheets, 16 by 18 inches. Fasten sheets to sheathing with metal cleats. Lock seams and solder. Lock aluminum seams as recommended by aluminum manufacturer. Provide an underlayment of roofing felt for all sheet metal covering.

3.1.24 Expansion Joints

Provide expansion joints for roofs, walls, and floors as indicated in drawings. Provide expansion joints in continuous sheet metal at 40 foot intervals for copper and stainless steel and at 32 foot intervals for aluminum, aluminum gravel stops and fascia which must have expansion joints at not more than 12 foot spacing. Provide evenly spaced joints. Provide an additional joint where the distance between the last expansion joint and the end of the continuous run is more than half the required interval spacing. Conform to the requirements of Table I.

3.1.24.1 Roof Expansion Joints

Consist of curb with wood nailing members on each side of joint, bituminous base flashing, metal counterflashing, and metal joint cover. Bituminous base flashing is specified in Roofing Section. Provide counterflashing as specified in paragraph COUNTERFLASHING, except as follows: Provide counterflashing with vertical leg of suitable depth to enable forming into a horizontal continuous cleat. Secure the inner edge to the nailing member. Make the outer edge projection not less than one inch for flashing on one side of the expansion joint and be less than the width of the expansion joint plus one inch for flashing on the other side of the joint. Hook the expansion joint cover over the projecting outer edges of counterflashing. Provide roof joint with a joint cover of the width indicated. Hook and lock one edge of the joint cover over the shorter projecting flange of the continuous cleat, and the other edge hooked over and loose locked with the longer projecting flange. Joints are specified in Table II.

3.1.24.2 Floor and Wall Expansion Joints

Provide U-shape with extended flanges for expansion joints in concrete and masonry walls and in floor slabs.

3.1.25 Flashing at Roof Penetrations and Equipment Supports

Provide metal flashing for all pipes, ducts, and conduits projecting through the roof surface and for equipment supports, guy wire anchors, and similar items supported by or attached to the roof deck.

3.1.26 Single Pipe Vents

See Table I, footnote (d). Set flange of sleeve in bituminous plastic

cement and nail 3 inches on center. Bend the top of sleeve over and extend down into the vent pipe a minimum of 2 inches. For long runs or long rises above the deck, where it is impractical to cover the vent pipe with lead, use a two-piece formed metal housing. Set metal housing with a metal sleeve having a 4 inches roof flange in bituminous plastic cement and nailed 3 inches on center. Extend sleeve a minimum of 8 inches above the roof deck and lapped a minimum of 3 inches by a metal hood secured to the vent pipe by a draw band. Seal the area of hood in contact with vent pipe with an approved sealant.

3.1.27 Stepped Flashing

Provide stepped flashing where sloping roofs surfaced with shingles abut vertical surfaces. Place separate pieces of base flashing in alternate shingle courses.

3.2 PAINTING

Touch ups in the field may be applied only after metal substrates have been cleaned and pretreated in accordance with manufacturer's written instructions and products.

Field-paint sheet metal for separation of dissimilar materials.

3.3 CLEANING

Clean exposed sheet metal work at completion of installation. Remove grease and oil films, handling marks, contamination from steel wool, fittings and drilling debris, and scrub-clean. Free the exposed metal surfaces of dents, creases, waves, scratch marks, and solder or weld marks.

3.4 REPAIRS TO FINISH

Scratches, abrasions, and minor surface defects of finish may be repaired in accordance with the manufacturer's printed instructions and as approved. Repair damaged surfaces caused by scratches, blemishes, and variations of color and surface texture. Replace items which cannot be repaired.

3.5 FIELD QUALITY CONTROL

Establish and maintain a Quality Control Plan for sheet metal used in conjunction with roofing to assure compliance of the installed sheet metalwork with the contract requirements. Remove work that is not in compliance with the contract and replace or correct. Include quality control, but not be limited to, the following:

- a. Observation of environmental conditions; number and skill level of sheet metal workers; condition of substrate.
- b. Verification that specified material is provided and installed.
- c. Inspection of sheet metalwork, for proper size(s) and thickness(es), fastening and joining, and proper installation.

3.5.1 Procedure

Submit for approval prior to start of roofing work. Include a checklist of points to be observed. Document the actual quality control

observations and inspections. Furnish a copy of the documentation to the Contracting Officer at the end of each day.

TABLE I. SHEET METAL WEIGHTS, THICKNESSES, AND GAUGES		
Sheet Metal Items	Aluminum, inch	Stainless Steel, inch
Building Expansion Joints		
Cover	.032	.015
Waterstop-bellows or flanged, U-type.	-	.015
Covering on minor flat, pitched or curved surfaces	.040	.018
Downspouts and leaders	.032	.015
Downspout clips and anchors	.040 clip .125 anchor	-
Downspout straps, 2-inch	.060	.050
Flashings:		
Base	.040	.018
Cap (Counter-flashing)	.032	.015
Eave	-	.015
Spandrel beam	-	.010
Bond barrier	-	.015
Stepped	.032	.015
Pipe vent sleeve (d)		
Coping	-	-
Gravel stops and fascia:		

TABLE I. SHEET METAL WEIGHTS, THICKNESSES, AND GAUGES		
Sheet Metal Items	Aluminum, inch	Stainless Steel, inch
Extrusions	.075	-
Sheets, corrugated	.032	.015
Sheets, smooth	.050	.018
Edge strip	.050	.025
Gutters:		
Gutter section	.032	.015
Continuous cleat	.032	.015
Joint Cover plates (See Table II)	.032	.015
Reglets (c)	-	.010
(a) Brass.		
(b) May be lead weighing 4 pounds per square foot.		
(c) May be polyvinyl chloride.		
(d) 2.5 pound minimum lead sleeve with 4 inch flange. Where lead sleeve is impractical, refer to paragraph SINGLE PIPE VENTS for optional material.		

TABLE II. SHEET METAL JOINTS			
TYPE OF JOINT			
Item Designation	Copper, Terne-Coated Stainless Steel, Zinc-Coated Steel and Stainless Steel	Aluminum	Remarks
Joint cap for building expansion seam, cleated joint at roof	1.25 inch single lock, standing seam, cleated	1.25 inch single lock, standing	--
Flashings			
Base	One inch 3 inch lap for expansion joint	One inch flat locked, soldered; sealed; 3 inch lap for expansion joint	Aluminum manufacturer's recommended hard setting sealant for locked aluminum joints. Fill each metal expansion joint with a joint sealing compound.
Cap-in reglet	3 inch lap	3 inch lap	Seal groove with joint sealing compound.
Reglets	Butt joint	--	Seal reglet groove with joint sealing compound.
Eave	One inch flat locked, cleated. One inch loose locked, sealed expansion joint, cleated.	One inch flat locked, locked, cleated one inch loose locked, sealed expansion joints, cleated	Same as base flashing.
Stepped	3 inch lap	3 inch lap	--
Valley	6 inch lap cleated	6 inch lap cleated	--
Edge strip	Butt	Butt	--
Gravel stops:			

TABLE II. SHEET METAL JOINTS			
TYPE OF JOINT			
Item Designation	Copper, Terne-Coated Stainless Steel, Zinc-Coated Steel and Stainless Steel	Aluminum	Remarks
Extrusions	--	Butt with 1/2 inch space	Use sheet flashing beneath and a cover plate
Sheet, smooth	Butt with 1/4 inch space	Butt with 1/4 inch space	Use sheet flashing backup plate.
Sheet, corrugated	Butt with 1/4 inch space	Butt with 1/4 inch space	Use sheet flashing beneath and a cover plate or a combination unit
Gutters	1.5 inch lap, riveted and soldered	One inch flat locked riveted and sealed	Aluminum producers recommended hard setting sealant for locked aluminum joints.
(a) Provide a 3 inch lap elastomeric flashing with manufacturer's recommended sealant.			
(b) Seal Polyvinyl chloride reglet with manufacturer's recommended sealant.			

-- End of Section --

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SECTION 07 61 14.00 20

STEEL STANDING SEAM ROOFING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI SG03-3 (2002; Suppl 2001-2004; R 2008)
Cold-Formed Steel Design Manual Set

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A653/A653M	(2020) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A792/A792M	(2021a) Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
ASTM A1008/A1008M	(2021a) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
ASTM A1011/A1011M	(2018a) Standard Specification for Steel Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
ASTM B117	(2019) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM D522/D522M	(2017) Mandrel Bend Test of Attached Organic Coatings
ASTM D523	(2014; R 2018) Standard Test Method for Specular Gloss
ASTM D714	(2002; R 2017) Standard Test Method for Evaluating Degree of Blistering of Paints
ASTM D968	(2017) Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling

Abrasive

ASTM D1654	(2008; R 2016; E 2017) Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASTM D2244	(2016) Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
ASTM D2247	(2015) Testing Water Resistance of Coatings in 100% Relative Humidity
ASTM D4214	(2007; R 2015) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films
ASTM E1592	(2017) Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
ASTM G152	(2013; R 2021) Standard Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
ASTM G153	(2013; R 2021) Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION
(SMACNA)

SMACNA 1793	(2012) Architectural Sheet Metal Manual, 7th Edition

U.S. DEPARTMENT OF ENERGY (DOE)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)

1.2 DEFINITIONS

1.2.1 Field-Formed Seam

Seams of panels so configured that when adjacent sheets are installed the seam is sealed utilizing mechanical or hand seamers. Crimped (45 degree bend), roll formed (180 degree bend), double roll formed (2 - 180 degree bends), and roll and lock systems are types of field-formed seam systems.

1.2.2 Snap Together Seam

Panels so configured that the male and female portions of the seam interlock through the application of foot pressure or tamping with a mallet. Snap-on cap configurations are a type of snap together system.

1.2.3 Pre-Formed

Formed to the final, less field-formed seam, profile and configuration in the factory.

1.2.4 Field-Formed

Formed to the final, less field-formed seam, profile and configuration at the site of work prior to installation.

1.2.5 Roofing System

The roofing system is defined as the assembly of roofing components, including roofing panels, flashing, fasteners, and accessories which, when assembled properly result in a watertight installation.

1.2.6 SSMRS

Standing Seam Metal Roof System (SSMRS) is abbreviation of the entire roof system specified herein with all components and parts coming from a single manufacturer's system.

1.3 SYSTEM DESCRIPTION

1.3.1 Design Requirements

- a. Panels must be continuous lengths up to manufacturer's standard longest lengths, with no joints or seams, except where indicated or specified. Ribs of adjoining sheets must be in continuous contact from eave to ridge. Individual panels of snap together type systems must be removable for replacement of damaged material.
- b. There must be no exposed or penetrating fasteners except where shown on approved shop drawings. Fasteners into steel must be stainless steel, zinc cast head, or cadmium plated steel screws inserted into predrilled holes. There must be a minimum of two fasteners per clip. Single fasteners will be allowed when supporting structural members are prepunched or predrilled.
- c. Snap together type systems must have a capillary break and a positive side lap locking device. Field-formed seam type systems must be mechanically locked closed by the manufacturer's locking tool. The seam must include a continuous factory applied sealant when required by the manufacturer to withstand the wind loads specified.
- d. Roof panel anchor clips must be concealed and designed to allow for longitudinal thermal movement of the panels, except where specific fixed points are indicated. Provide for lateral thermal movement in panel configuration or with clips designed for lateral and longitudinal movement.

1.3.2 Design Conditions

Design the system to resist positive and negative loads specified herein in accordance with the AISI SG03-3. Panels must support walking loads without permanent distortion or telegraphing of the structural supports.

1.3.2.1 Wind Uplift

Compute and apply the design uplift pressures for the roof system as indicated on structural drawings. Roof system and attachments must resist the following wind loads, in pounds per square foot (psf):

The design uplift force for each connection assembly must be that pressure given for the area under consideration, multiplied by the tributary load area of the connection assembly, and multiplied by the appropriate factor of safety, as follows:

- a. Single fastener in a connection: 3.0
- b. Two or more fasteners in each connection: 2.25

1.3.2.2 Roof Live Loads

Loads must be applied on the horizontal projection of the roof structure. The minimum roof design live load must be 20 psf.

1.3.2.3 Thermal Movement

System must be capable of withstanding thermal movement based on a temperature range of 10 degrees F below and 140 degrees F.

1.3.2.4 Deflection

Panels must be capable of supporting design loads between unsupported spans with deflection of not greater than $L/180$ of the span.

1.3.3 Structural Performance

The structural performance test methods and requirements of the Standing Seam Roofing Systems (SSRS) must be in accordance with ASTM E1592.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Roofing; G RO

SD-03 Product Data

Roofing Panels; G RO

Energy Star Label for Steel Roofing Product; S

Recycled Content for Steel Roofing Product; S

Attachment Clips

Closures

Accessories

Fasteners

Sealants

Sample Warranty Certificate; G RO

Submit for materials to be provided. Submit data sufficient to indicate conformance to specified requirements.

SD-04 Samples

Roofing Panel

Submit a 12 inch long by full width section of typical panel.

For color selection, submit 2 by 4 inch metal samples in color, finish and texture specified. When colors are not indicated, submit samples of not less than six different manufacturer's standard colors for selection.

Accessories

Submit each type of accessory item used in the project including, but not limited to each type of anchor clip, closure, fastener, and leg clamp.

Sealants

Intermediate Support Section

Submit full size samples of each intermediate support section, 12 inches long.

SD-05 Design Data

Design Calculations

SD-06 Test Reports

Field Inspection; G RO

Submit manufacturer's technical representative's field inspection reports as specified in paragraph MANUFACTURER'S FIELD INSPECTION.

Structural Performance Tests

Finish Tests

SD-07 Certificates

Manufacturer's Technical Representative's Qualifications

Statement of Installer's Qualifications

Submit documentation from roofing manufacturer proving the

manufacturer's technical representative meets below specified requirements. Include name, address, telephone number, and experience record.

Submit documentation proving the installer is factory-trained, has the specified experience, and authorized by the manufacturer to install the products specified.

SD-08 Manufacturer's Instructions

Installation Manual

Submit manufacturers printed installation manual, instructions, and standard details.

SD-11 Closeout Submittals

Information Card

For each roofing installation, submit a typewritten card or photoengraved aluminum card containing the information listed on Form 1 located at the end of this section.

Warranty

1.5 DESIGN CALCULATIONS

Provide design calculations prepared by a professional engineer specializing in structural engineering verifying that system supplied and any additional framing meets design load criteria indicated. Coordinate calculations with manufacturer's test results. Include calculations for:

Wind load uplift design pressure at roof locations specified in paragraph WIND UPLIFT.

Clip spacing and allowable load per clip.

Fastening of clips to structure or intermediate supports.

Intermediate support spacing and framing and fastening to structure when required.

Allowable panel span at anchorage spacing indicated.

Safety factor used in design loading.

Governing code requirements or criteria.

Edge and termination details.

1.6 QUALITY ASSURANCE

1.6.1 Preroofing Conference

After submittals are received and approved but before roofing and insulation work, including associated work, is preformed, the Contractor must hold a preroofing conference to review the following:

- a. The drawings and specifications

- b. Procedure for on site inspection and acceptance of the roofing substrate and pertinent structural details relating to the roofing system
- c. Contractor's plan for coordination of the work of the various trades involved in providing the roofing system and other components secured to the roofing
- d. Safety requirements

The prerooting conference must be attended by the Contractor and personnel directly responsible for the roofing and insulation installation, mechanical and electrical work, and the roofing manufacturer's technical representative. Conflicts among those attending the prerooting conference must be resolved and confirmed in writing before roofing work, including associated work, is begun. Prepare written minutes of the prerooting conference and submit to the Contracting Officer.

1.6.2 Manufacturer

The SSMRS must be the product of a metal roofing industry - recognized manufacturer who has been in the practice of manufacturing SSMRS for a period of not less than 5 years and who has been involved in at least 5 projects similar in size and complexity to this project.

1.6.3 Manufacturer's Technical Representative

The representative must have authorization from manufacturer to approve field changes and be thoroughly familiar with the products and with installations in the geographical area where construction will take place. The manufacturer's representative must be an employee of the manufacturer with at least 5 years experience in installing the roof system. The representative must be available to perform field inspections and attend meetings as required herein, and as requested by the Contracting Officer.

1.6.4 Installer's Qualifications

The roofing system installer must be factory-trained, approved by the steel roofing system manufacturer to install the system, and must have a minimum of three years experience as an approved applicator with that manufacturer. The applicator must have applied five installations of similar size and scope as this project within the previous 3 years.

1.6.5 Single Source

Roofing panels, clips, closures, and other accessories must be standard products of the same manufacturer; must be the latest design by the manufacturer; and must have been designed by the manufacturer to operate as a complete system for the intended use.

1.6.6 Laboratory Tests For Panel Finish

The term "appearance of base metal" refers to the metal coating on steel. Panels must meet the following test requirements:

- a. Formability Test: When subjected to a 180 degree bend over a 1/8 inch diameter mandrel in accordance with ASTM D522/D522M, exterior coating

film may show only slight microchecking and no loss of adhesion.

- b. Accelerated Weathering Test: Withstand a weathering test for a minimum of 2000 hours in accordance with ASTM G152 and ASTM G153, Method 1 without cracking, peeling, blistering, loss of adhesion of the protective coating, or corrosion of the base metal. Protective coating that can be readily removed from the base metal with a penknife blade or similar instrument will be considered to indicate loss of adhesion.
- c. Chalking Resistance: After the 2000-hour weatherometer test, exterior coating may not chalk greater than No. 8 rating when measured in accordance with ASTM D4214 test procedures.
- d. Color Change Test:

After the 2000-hour weatherometer test, exterior coating color change must not exceed 2 NBS units when measured in accordance with ASTM D2244 test procedure.
- e. Salt Spray Test: Withstand a salt spray test for a minimum of 1000 hours in accordance with ASTM B117, including the scribe requirement in the test. Immediately upon removal of the panel from the test, the coating must receive a rating of 8, few blisters in field as determined by ASTM D714; and an average rating of 6, 1/8 inch failure at scribe, as determined by ASTM D1654. Rating Schedule No. 1.
- f. Abrasion Resistance Test for Color Coating: When subjected to the falling sand test in accordance with ASTM D968, coating system must withstand a minimum of 100 liters of sand per mil thickness before appearance of base metal.
- g. Humidity Test: When subjected to a humidity cabinet test in accordance with ASTM D2247 for 1000 hours, a scored panel must show no signs of blistering, cracking, creepage, or corrosion.
- h. Gloss Test: The gloss of the finish must be 30 plus or minus 5 at an angle of 60 degrees, when measured in accordance with ASTM D523.

1.6.7 Shop Drawing Requirements

Submit roofing drawings to supplement the instructions and diagrams. Include design and erection drawings containing an isometric view of the roof showing the design uplift pressures and dimensions of edge, ridge and corner zones; and show typical and special conditions including flashings, materials and thickness, dimensions, fixing lines, anchoring methods, sealant locations, sealant tape locations, fastener layout, sizes, and spacing, terminations, penetrations, attachments, and provisions for thermal movement. Details of installation must be in accordance with the manufacturer's Standard Instructions and details or the SMACNA 1793. Prior to submitting shop drawings, have drawings reviewed and approved by the manufacturer's technical engineering department.

1.7 WARRANTY

Furnish manufacturer's no-dollar-limit materials and workmanship warranty for the roofing system. The warranty period must be not less than 20 years from the date of Government acceptance of the work. The warranty must be issued directly to the Government. The warranty must provide that

if within the warranty period the metal roofing system becomes non-watertight or shows evidence of corrosion, perforation, rupture or excess weathering due to deterioration of the roofing system resulting from defective materials or installed workmanship the repair or replacement of the defective materials and correction of the defective workmanship must be the responsibility of the roofing system manufacturer. Repairs that become necessary because of defective materials and workmanship while roofing is under warranty must be performed within 7 days after notification, unless additional time is approved by the Contracting Officer. Failure to perform repairs within the specified period of time will constitute grounds for having the repairs performed by others and the cost billed to the manufacturer. In addition, provide a 2 year contractor installation warranty.

1.8 DELIVERY, STORAGE AND HANDLING

Deliver, store, and handle preformed panels, bulk roofing products and other manufactured items in a manner to prevent damage or deformation.

1.8.1 Delivery

Provide adequate packaging to protect materials during shipment. Crated materials must not be uncrated until ready for use, except for inspection. Immediately upon arrival of materials at the job site, inspect materials for damage, dampness, and staining. Replace damaged or permanently stained materials that cannot be restored to like-new condition with satisfactory material. If materials are wet, remove the moisture and re-stack and protect the panels until used.

1.8.2 Storage

Stack materials on platforms or pallets and cover with tarpaulins or other suitable weathertight covering which prevents water trapping or condensation. Store materials so that water which might have accumulated during transit or storage will drain off. Do not store the panels in contact with materials that might cause staining, such as mud, lime, cement, fresh concrete or chemicals. Protect stored panels from wind damage.

1.8.3 Handling

Handle material carefully to avoid damage to surfaces, edges and ends.

PART 2 PRODUCTS

2.1 ROOFING PANELS

Provide panels with interlocking ribs for securing adjacent sheets and with concealed clip fastening system for securing the roof covering to structural framing members. Fasteners must not penetrate the panels except at the ridge, eave, rakes, penetrations, and end laps. Backing plates and ends of panels at end laps must be predrilled or prepunched. Factory prepare ends of panels to be lapped by trimming part of seam, die-setting, or swaging ends of panels. Individual sheets must be sufficiently long to cover the entire length of any unbroken roof slope when such slope is 30 feet or less. Provide panels that extend over two or more spans when length of run exceeds 30 feet. Obtain Contracting Officer (KO) approval for sheets longer than 30 feet before submitting shop drawings. Sheets must provide not less than 12 inches of coverage

(width) in place. Provide panels with a minimum corrugation height of 3.0 inches (nominal). Make provisions for expansion and contraction at either ridge or eave, consistent with the type of system to be used. Form panels from coil stock without warping, waviness or ripples not part of the panel profile, and free of damage to the finish coating system.

Provide steel roofing product that is Energy Star labeled. Provide data identifying Energy Star label for steel roofing product. Provide solar reflectance product with an initial solar reflectance greater than or equal to 0.39 and a solar reflectance index greater than or equal to 35 three years after installation under normal conditions. Provide emittance and reflectance percentages, solar reflectance index values, and slopes, to meet sustainable third party certification requirements for Heat Island Reduction. Solar reflectance index value of roof must be 41 or greater.

2.1.1 Material

Zinc-coated steel conforming to ASTM A653/A653M, G90 coating designation or aluminum-zinc alloy coated steel conforming to ASTM A792/A792M, AZ 55 coating. Provide material with a minimum thickness of 0.023 inch thick (24 gauge) minimum except when mid field of roof is subject to design wind uplift pressures of 60 psf or greater, entire roof system must have a minimum thickness of 0.030 inch (22 gauge). Steel roofing materials must contain a minimum of 30 percent total recycled content. Provide data identifying percentage of recycled content for steel roofing product.

2.1.2 Texture

Smooth with raised intermediate ribs for added stiffness.

2.1.3 Finish

Factory color finish. Color is as indicated in the drawings. The color must match Pantone 471c or equivalent per the base installation guidelines, and must be submitted for approval.

2.1.3.1 Factory Color Finish

Provide factory applied, thermally cured coating to exterior and interior of metal roof and wall panels and metal accessories. Provide exterior finish top coat of 70 percent resin polyvinylidene fluoride with not less than 0.2 mil dry film thickness. Provide exterior primer standard with panel manufacturer with not less than 0.2 mil dry film thickness. Interior finish must consist of 0.2 mil dry film thickness prime coat 0.5 mil dry film thickness backer coat. Provide exterior and interior coating meeting test requirements specified below. Tests must have been performed on the same factory finish and thickness provided. Provide clear factory edge coating on all factory cut or unfinished edges.

2.2 INTERMEDIATE SUPPORTS

Fabricate panel subgirts, subpurlins, T-bars, Z-bars and tracks from galvanized steel conforming to ASTM A653/A653M, G90, Grade D (16 gauge and heavier), Grade A (18 gauge and lighter); or steel conforming to ASTM A36/A36M, ASTM A1011/A1011M, or ASTM A1008/A1008M prime painted with zinc-rich primer. Size, shape, thickness and capacity as required to meet the load, insulation thickness and deflection criteria specified.

2.3 ATTACHMENT CLIPS

Fabricate clips from ASTM A1011/A1011M, or ASTM A1008/A1008M steel hot-dip galvanized in accordance with ASTM A653/A653M, G 90, or Series 300 stainless steel. Size, shape, thickness and capacity as required to meet the load, insulation thickness and deflection criteria specified.

2.4 ACCESSORIES

Sheet metal flashings, gutters, downspouts, trim, moldings, closure strips, pre-formed crickets, caps, equipment curbs, and other similar sheet metal accessories used in conjunction with preformed metal panels must be of the same material as used for the panels. Provide metal accessories with a factory color finish to match the roofing panels, except that such items which will be concealed after installation may be provided without the finish if they are stainless steel. Metal must be of a thickness not less than that used for the panels. Thermal spacer blocks and other thermal barriers at concealed clip fasteners must be as recommended by the manufacturer except that wood spacer blocks are not allowed.

2.4.1 Closures

2.4.1.1 Rib Closures

Corrosion resisting steel, closed-cell or solid-cell synthetic rubber, neoprene or polyvinyl chloride pre-molded to match configuration of rib opening. Material for closures must not absorb water.

2.4.1.2 Ridge Closures

Metal-clad foam or metal closure with foam secondary closure matching panel configuration for installation on surface of roof panel between panel ribs at ridge and headwall roof panel flashing conditions and terminations. Foam material must not absorb water.

2.4.2 Fasteners

Zinc-coated steel, corrosion resisting steel, zinc cast head, or nylon capped steel, type and size specified below or as otherwise approved for the applicable requirements. Design the fastening system to withstand the design loads specified. Exposed fasteners must be gasketed or have gasketed washers on the exterior side of the covering to waterproof the penetration. Washer material must be compatible with the covering; have a minimum diameter of 3/8 inch for structural connections; and gasketed portion of fasteners or washers must be neoprene or other equally durable elastomeric material approximately 1/8 inch thick.

2.4.2.1 Screws

Not smaller than No. 14 diameter if self-tapping type and not smaller than No. 12 diameter if self-drilling and self-tapping.

2.4.2.2 Bolts

Not smaller than 1/4 inch diameter, shouldered or plain shank as required, with proper nuts.

2.4.2.3 Automatic End-Welded Studs

Automatic end-welded studs must be shouldered type with a shank diameter of not smaller than 3/16 inch and cap or nut for holding covering against the shoulder.

2.4.2.4 Explosive Driven Fasteners

Fasteners for use with explosive actuated tools must have a shank diameter of not smaller than 0.145 inch with a shank length of not smaller than 1/2 inch for fastening to steel and not smaller than 1 inch for fastening to concrete.

2.4.2.5 Rivets

Blind rivets must be stainless steel with 1/8 inch nominal diameter shank. Rivets must be threaded stem type if used for other than the fastening of trim. Rivets with hollow stems must have closed ends.

2.4.3 Sealants

Elastomeric type containing no oil or asphalt. Exposed sealant must cure to a rubberlike consistency. Concealed sealant must be the non-hardening type. Seam sealant must be factory-applied, non-skinning, non-drying, and must conform to the roofing manufacturer's recommendations. Silicone-based sealants must not be used in contact with finished metal panels and components unless approved otherwise by the Contracting Officer.

2.4.4 GASKETS AND INSULATING COMPOUNDS

Nonabsorptive and suitable for insulating contact points of incompatible materials. Insulating compounds must be nonrunning after drying.

2.5 LINER PANELS

Fabricate liner panels of the same material as roof panels, and formed or patterned to prevent waviness and distortion. Liner panels must have a factory applied, one mil thick minimum painted coating on the inside face and a prime coat on the liner side.

PART 3 EXECUTION

Do not install building construction materials that show visible evidence of biological growth.

3.1 EXAMINATION

Examine surfaces to receive standing seam metal roofing and flashing. Ensure that surfaces are plumb and true, clean, even, smooth, as dry and free from defects and projections which might affect the installation.

3.2 PROTECTION FROM CONTACT WITH DISSIMILAR MATERIALS

3.2.1 Cementitious Materials

Paint metal surfaces which will be in contact with mortar, concrete, or other masonry materials with one coat of alkali-resistant coating such as heavy-bodied bituminous paint.

3.2.2 Contact with Wood

Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.3 INSTALLATION

Install in accordance with the approved manufacturer's erection instructions, shop drawings, and diagrams. Panels must be in full and firm contact with attachment clips. Where prefabricated panels are cut in the field, or where any of the factory applied coverings or coatings are abraded or damaged in handling or installation, they must, after necessary repairs have been made with material of the same color as the weather coating, be approved before being installed. Seal completely openings through panels. Correct defects or errors in the materials. Replace materials which cannot be corrected in an approved manner with nondefective materials. Provide molded closure strips where indicated and where necessary to provide weathertight construction. Use shims as required to ensure attachment clip line is true. Use a spacing gauge at each row of panels to ensure that panel width is not stretched or shortened.

3.3.1 Roof Panels

Apply roofing panels with the standing seams parallel to the slope of the roof. Provide roofing panels in longest practical lengths from ridge to eaves (top to eaves on shed roofs), with no transverse joints except at the junction of ventilators, curbs, skylights, chimneys, and similar openings. Install flashing to assure positive water drainage away from roof penetrations. Locate panel end laps such that fasteners do not engage supports or otherwise restrain the longitudinal thermal movement of panels. Form field-formed seam type system seams in the field with an automatic mechanical seamer approved by the manufacturer. Attach panels to the structure with concealed clips incorporated into panel seams. Clip attachment must allow roof to move independently of the structure, except at fixed points as indicated.

3.3.2 Flashings

Provide flashing, related closures and accessories as indicated and as necessary to provide a weathertight installation. Install flashing to ensure positive water drainage away from roof penetrations. Flash and seal the roof at the ridge, eaves and rakes, and projections through the roof. Place closure strips, flashing, and sealing material in an approved manner that will assure complete weathertightness. Details of installation which are not indicated must be in accordance with the SMACNA 1793, panel manufacturer's approved printed instructions and details, or the approved shop drawings. Allow for expansion and contraction of flashing.

3.3.3 Flashing Fasteners

Fastener spacings must be in accordance with the panel manufacturer's recommendations and as necessary to withstand the design loads indicated. Install fasteners in roof valleys as recommended by the manufacturer of the panels. Install fasteners in straight lines within a tolerance of 1/2 inch in the length of a bay. Drive exposed penetrating type fasteners normal to the surface and to a uniform depth to seat gasketed washers

properly and drive so as not to damage factory applied coating. Exercise extreme care in drilling pilot holes for fastenings to keep drills perpendicular and centered. Do not drill through sealant tape. After drilling, remove metal filings and burrs from holes prior to installing fasteners and washers. Torque used in applying fasteners must not exceed that recommended by the manufacturer. Remove panels deformed or otherwise damaged by over-torqued fastenings, and provide new panels.

3.3.4 Rib and Ridge Closure/Closure Strips

Set closure/closure strips in joint sealant material and apply sealant to mating surfaces prior to adding panel.

3.4 PROTECTION OF APPLIED ROOFING

Do not permit storing, walking, wheeling, and trucking directly on applied roofing materials. Provide temporary walkways, runways, and platforms of smooth clean boards or planks as necessary to avoid damage to applied roofing materials, and to distribute weight to conform to indicated live load limits of roof construction.

3.5 CLEANING

Clean exposed sheet metal work at completion of installation. Remove metal shavings, filings, nails, bolts, and wires from roofs. Remove grease and oil films, excess sealants, handling marks, contamination from steel wool, fittings and drilling debris and scrub the work clean. Exposed metal surfaces must be free of dents, creases, waves, scratch marks, solder or weld marks and damage to the finish coating.

3.6 MANUFACTURER'S FIELD INSPECTION

Manufacturer's technical representative must visit the site as necessary during the installation process to assure panels, flashings, and other components are being installed in a satisfactory manner. Manufacturer's technical representative must perform a field inspection during the first 20 squares of roof panel installation and at substantial completion prior to issuance of warranty, as a minimum, and as otherwise requested by the Contracting Officer. Additional inspections must not exceed one for 100 squares of total roof area with the exception that follow-up inspections of previously noted deficiencies or application errors must be performed as requested by the Contracting Officer. Each inspection visit must include a review of the entire installation to date. After each inspection, submit a report, signed by the manufacturer's technical representative, to the Contracting Officer noting the overall quality of work, deficiencies and any other concerns, and recommended corrective actions in detail. Notify Contracting Officer a minimum of 2 working days prior to site visit by manufacturer's technical representative.

3.7 COMPLETED WORK

Completed work must be plumb and true without oil canning, dents, ripples, abrasion, rust, staining, or other damage detrimental to the performance or aesthetics of the completed roof assembly.

3.8 INFORMATION CARD

For each roof, provide a typewritten card, laminated in plastic and framed for interior display or a photoengraved 0.032 inch thick aluminum card for

exterior display. Card to be 8 1/2 by 11 inches minimum and contain the information listed on Form 1 at end of this section. Install card near point of access to roof, or where indicated.

3.9 FORM ONE

FORM 1 - PREFORMED STEEL STANDING SEAM ROOFING SYSTEM COMPONENTS

1. Contract Number:
2. Building Number & Location:
3. NAVFAC Specification Number:
4. Deck/Substrate Type:
5. Slopes of Deck/Roof Structure:
6. Insulation Type & Thickness:
7. Insulation Manufacturer:
8. Vapor Retarder: () Yes () No
9. Vapor Retarder Type:
10. Preformed Steel Standing Seam Roofing Description:
 - a. Manufacturer (Name, Address, & Phone No.):
 - b. Product Name:
 - c. Width:
 - d. Gauge:
 - e. Base Metal:
 - f. Method of Attachment:
11. Repair of Color Coating:
 - a. Coating Manufacturer (Name, Address & Phone No.):
 - b. Product Name:
 - c. Surface Preparation:
 - d. Recoating Formula:
 - e. Application Method:
12. Statement of Compliance or Exception: _____

13. Date Roof Completed:
14. Warranty Period: From _____ To _____
15. Roofing Contractor (Name & Address):
16. Prime Contractor (Name & Address):

Contractor's Signature _____ Date:

Inspector's Signature _____ Date:

-- End of Section --

SECTION 07 84 00

FIRESTOPPING

PART 1 GENERAL

1.1 SUMMARY

Furnish and install tested and listed firestopping systems, combination of materials, or devices to form an effective barrier against the spread of flame, smoke and gases, and maintain the integrity of fire resistance rated walls, partitions, floors, and ceiling-floor assemblies, including through-penetrations and construction joints and gaps.

- a. Through-penetrations include the annular space around pipes, tubes, conduit, wires, cables and vents.
- b. Construction joints include those used to accommodate expansion, contraction, wind, or seismic movement; firestopping material shall not interfere with the required movement of the joint.
- c. Gaps requiring firestopping include gaps between the curtain wall and the floor slab and between the top of the fire-rated walls and the roof or floor deck above and at the intersection of shaft assemblies and adjoining fire resistance rated assemblies.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E119	(2020) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E699	(2009) Standard Practice for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating of Building Components
ASTM E814	(2013a; R 2017) Standard Test Method for Fire Tests of Penetration Firestop Systems
ASTM E1399/E1399M	(1997; R 2017) Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems
ASTM E1966	(2015; R 2019) Standard Test Method for

Fire-Resistive Joint Systems

ASTM E2174	(2020a) Standard Practice for On-Site Inspection of Installed Firestop Systems
ASTM E2307	(2020) Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus
ASTM E2393	(2020a) Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers

FM GLOBAL (FM)

FM 4991	(2013) Approval of Firestop Contractors
FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2018) International Building Code

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA Method 24	(2000) Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings

UNDERWRITERS LABORATORIES (UL)

UL 723	(2018) UL Standard for Safety Test for Surface Burning Characteristics of Building Materials
UL 1479	(2015; Reprint May 2021) Fire Tests of Through-Penetration Firestops
UL 2079	(2015; Reprint Jul 2020) Tests for Fire Resistance of Building Joint Systems
UL Fire Resistance	(2014) Fire Resistance Directory

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA Method 24	(2000) Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings

1.3 SEQUENCING

Coordinate the specified work with other trades. Apply firestopping materials, at penetrations of pipes and ducts, prior to insulating, unless insulation meets requirements specified for firestopping. Apply

firestopping materials. at building joints and construction gaps, prior to completion of enclosing walls or assemblies. Cast-in-place firestop devices shall be located and installed in place before concrete placement. Pipe, conduit or cable bundles shall be installed through cast-in-place device after concrete placement but before area is concealed or made inaccessible. Firestop material shall be inspected and approved prior to final completion and enclosing of any assemblies that may conceal installed firestop.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Firestopping System; G RO

SD-03 Product Data

Firestopping Materials; G RO

SD-06 Test Reports

Inspection

SD-07 Certificates

Inspector Qualifications
Firestopping Materials
Installer Qualifications

1.5 QUALITY ASSURANCE

1.5.1 Installer

Engage an experienced Installer who is:

- a. FM Research approved in accordance with FM 4991, operating as a UL Certified Firestop Contractor, or
- b. Certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary staff, training, and a minimum of 3 years experience in the installation of manufacturer's products in accordance with specified requirements. Submit documentation of this experience. A manufacturer's willingness to sell its firestopping products to the Contractor or to an installer engaged by the Contractor does not in itself confer installer qualifications on the buyer. The Installer shall have been trained by a direct representative of the manufacturer (not distributor or agent) in the proper selection and installation procedures. The installer shall obtain from the manufacturer and submit written certification of training, and retain proof of certification for duration of firestop installation.

1.5.2 Inspector Qualifications

The inspector shall meet the criteria contained in ASTM E699 for agencies involved in quality assurance and shall have a minimum of two years experience in construction field inspections of firestopping systems, products, and assemblies. The inspector shall be completely independent of, and divested from, the installer, the manufacturer, and the supplier of any material or item being inspected. The inspector shall not be a competitor of the installer, the contractor, the manufacturer, or supplier of any material or item being inspected. Include in the qualifications submittal a notarized statement assuring compliance with the requirements stated herein.

1.6 DELIVERY, STORAGE, AND HANDLING

Deliver materials in the original unopened packages or containers showing name of the manufacturer and the brand name. Store materials off the ground, protected from damage and exposure to elements and temperatures in accordance with manufacturer requirements. Remove damaged or deteriorated materials from the site. Use materials within their indicated shelf life.

PART 2 PRODUCTS

2.1 FIRESTOPPING SYSTEM

Submit detail drawings including manufacturer's descriptive data, typical details conforming to UL Fire Resistance or other details certified by another nationally recognized testing laboratory, installation instructions or UL listing details for a firestopping assembly in lieu of fire-test data or report. For those firestop applications for which no UL tested system is available through a manufacturer, a manufacturer's engineering judgment, derived from similar UL system designs or other tests, shall be submitted for review and approval prior to installation. Submittal must indicate the firestopping material to be provided for each type of application. When more than a total of 5 penetrations and/or construction joints are to receive firestopping, provide drawings that indicate location, "F" "T" and "L" ratings, and type of application.

Also, submit a written report indicating locations of and types of penetrations and types of firestopping used at each location; record type by UL list printed numbers.

2.2 FIRESTOPPING MATERIALS

Provide firestopping materials, supplied from a single domestic manufacturer, consisting of commercially manufactured, asbestos-free, nontoxic products FM APP GUIDE approved, or UL listed, for use with applicable construction and penetrating items, complying with the following minimum requirements:

VOC content of firestop materials installed on project is limited to < 250 g/l as calculated by EPA Method 24.

2.2.1 Fire Hazard Classification

Material shall have a flame spread of 25 or less, and a smoke developed rating of 50 or less, when tested in accordance with ASTM E84 or UL 723. Material shall be an approved firestopping material as listed in UL Fire Resistance or by a nationally recognized testing laboratory.

2.2.2 Toxicity

Material shall be nontoxic and carcinogen free to humans at all stages of application or during fire conditions and shall not contain hazardous chemicals or require harmful chemicals to clean material or equipment.

2.2.3 Fire Resistance Rating

Firestop systems shall be UL Fire Resistance listed or FM APP GUIDE approved with "F" rating at least equal to fire-rating of fire wall or floor in which penetrated openings are to be protected. Where required, firestop systems shall also have "T" rating at least equal to the fire-rated floor in which the openings are to be protected.

2.2.3.1 Through-Penetrations

Firestopping materials for through-penetrations, as described in paragraph SUMMARY, shall provide "F", "T" and "L" fire resistance ratings in accordance with ASTM E814 or UL 1479. Fire resistance ratings shall be as follows:

2.2.3.1.1 Penetrations of Fire Resistance Rated Walls and Partitions

F Rating = Rating of wall or partition being penetrated.

2.2.3.1.2 Penetrations of Fire Resistance Rated Floors, Floor-Ceiling Assemblies and the Ceiling Membrane of Roof-Ceiling Assemblies

F Rating = Where the penetrating item is outside of a wall cavity the F rating must be equal to the fire resistance rating of the floor penetrated, and the T rating shall be in accordance with the requirements of ICC IBC.

2.2.3.1.3 Penetrations of Fire and Smoke Resistance Rated Walls, Floors, Floor-Ceiling Assemblies, and the ceiling membrane of Roof-Ceiling Assemblies

F Rating = Rating of wall or partition being penetrated.

2.2.3.2 Construction Joints and Gaps

Fire resistance ratings of construction joints, as described in paragraph SUMMARY, and gaps such as those between floor slabs and curtain walls shall be the same as the construction in which they occur. Construction joints and gaps shall be provided with firestopping materials and systems that have been tested in accordance with ASTM E119, ASTM E1966 or UL 2079 to meet the required fire resistance rating. Curtain wall joints shall be provided with firestopping materials and systems that have been tested in accordance with ASTM E2307 to meet the required fire resistance rating. Systems installed at construction joints shall meet the cycling requirements of ASTM E1399/E1399M or UL 2079. All joints at the intersection of the top of a fire resistance rated wall and the underside of a fire-rated floor, floor ceiling, or roof ceiling assembly shall provide a minimum class II movement capability.

2.2.4 Material Certification

Submit certificates attesting that firestopping material complies with the specified requirements. For all intumescent firestop materials used in

through penetration systems, manufacturer shall provide certification of compliance with UL 1479.

PART 3 EXECUTION

3.1 PREPARATION

Areas to receive firestopping must be free of dirt, grease, oil, or loose materials which may affect the fitting or fire resistance of the firestopping system. For cast-in-place firestop devices, formwork or metal deck to receive device prior to concrete placement must be sound and capable of supporting device. Prepare surfaces as recommended by the manufacturer.

3.2 INSTALLATION

Completely fill void spaces with firestopping material regardless of geometric configuration, subject to tolerance established by the manufacturer. Firestopping systems for filling floor voids 4 inches or more in any direction must be capable of supporting the same load as the floor is designed to support or be protected by a permanent barrier to prevent loading or traffic in the firestopped area. Install firestopping in accordance with manufacturer's written instructions. Provide tested and listed firestop systems in the following locations, except in floor slabs on grade:

- a. Penetrations of duct, conduit, tubing, cable and pipe through floors and through fire-resistance rated walls, partitions, and ceiling-floor assemblies.
- b. Penetrations of vertical shafts such as pipe chases, elevator shafts, and utility chutes.
- c. Gaps at the intersection of floor slabs and curtain walls, including inside of hollow curtain walls at the floor slab.
- d. Gaps at perimeter of fire-resistance rated walls and partitions, such as between the top of the walls and the bottom of roof decks.
- e. Construction joints in floors and fire rated walls and partitions.
- f. Other locations where required to maintain fire resistance rating of the construction.

3.2.1 Insulated Pipes and Ducts

Thermal insulation shall be cut and removed where pipes or ducts pass through firestopping, unless insulation meets requirements specified for firestopping. Replace thermal insulation with a material having equal thermal insulating and firestopping characteristics.

3.2.2 Fire Dampers

Install and firestop fire dampers in accordance with Section 23 30 00 HVAC AIR DISTRIBUTION. Firestop installed with fire damper must be tested and approved for use in fire damper system. Firestop installed with fire damper must be tested and approved for use in fire damper system.

3.2.3 Data and Communication Cabling

Cabling for data and communication applications shall be sealed with re-enterable firestopping products and devices as indicated.

3.2.3.1 Re-Enterable Devices

Firestopping devices shall be pre-manufactured modular devices, containing built-in self-sealing intumescent inserts. Firestopping devices shall allow for cable moves, additions or changes without the need to remove or replace any firestop materials. Devices must be capable of maintaining the fire resistance rating of the penetrated membrane at 0 percent to 100 percent visual fill of penetrants; while maintaining "L" rating of <10 cfm/sf at 0 percent to 100 percent visual fill.

3.2.3.2 Re-Sealable Products

Provide firestopping pre-manufactured modular products, containing self-sealing intumescent inserts. Firestopping products shall allow for cable moves, additions or changes. Devices shall be capable of maintaining the fire resistance rating of the penetrated membrane at 0 percent to 100 percent visual fill of penetrants.

3.3 INSPECTION

For all projects, the firestopped areas shall not be covered or enclosed until inspection is complete and approved by the Contracting Officer. Inspect the applications initially to ensure adequate preparations (clean surfaces suitable for application, etc.) and periodically during the work to assure that the completed work has been accomplished according to the manufacturer's written instructions and the specified requirements. Submit written reports indicating locations of and types of penetrations and types of firestopping used at each location; type shall be recorded by UL listed printed numbers.

3.3.1 Inspection Standards

Inspect all firestopping in accordance with ASTM E2393 and ASTM E2174 for firestop inspection, and document inspection results to be submitted.

3.3.2 Inspection Reports

Submit inspection report stating that firestopping work has been inspected and found to be applied according to the manufacturer's recommendations and the specified requirements.

-- End of Section --

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SECTION 07 92 00

JOINT SEALANTS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C509	(2006; R 2021) Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM C734	(2015; R 2019) Low-Temperature Flexibility of Latex Sealants After Artificial Weathering
ASTM C919	(2012; R 2017) Standard Practice for Use of Sealants in Acoustical Applications
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM C1193	(2013) Standard Guide for Use of Joint Sealants
ASTM C1311	(2014) Standard Specification for Solvent Release Agents
ASTM C1521	(2013) Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints
ASTM D217	(2019b) Standard Test Methods for Cone Penetration of Lubricating Grease
ASTM D1056	(2020) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D1667	(2017) Standard Specification for Flexible Cellular Materials - Poly (Vinyl Chloride) Foam (Closed-Cell)
ASTM D2452	(2015; R 2019) Standard Test Method for Extrudability of Oil- and Resin-Base Caulking Compounds
ASTM D2453	(2015; R 2020; E 2020) Standard Test Method for Shrinkage and Tenacity of Oil- and Resin-Base Caulking Compounds

ASTM E84 (2020) Standard Test Method for Surface
Burning Characteristics of Building
Materials

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350 (2010; Version 1.1) Standard Method for
the Testing and Evaluation of Volatile
Organic Chemical Emissions from Indoor
Sources using Environmental Chambers

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168 (2017) Adhesive and Sealant Applications

UNDERWRITERS LABORATORIES (UL)

UL 2818 (2013) GREENGUARD Certification Program
For Chemical Emissions For Building
Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Sealants

Primers

Bond Breakers

Backstops

SD-06 Test Reports

Field Adhesion

SD-07 Certificates

Indoor Air Quality For Interior Sealants; S

Indoor Air Quality For Interior Floor Joint Sealants; S

Indoor Air Quality For Interior Acoustical Sealants; S

Indoor Air Quality For Interior Caulking; S

1.3 PRODUCT DATA

Include storage requirements, shelf life, curing time, instructions for mixing and application, and accessories. Provide manufacturer's Safety Data Sheets (SDS) for each solvent, primer and sealant material proposed.

1.4 CERTIFICATIONS

1.4.1 Indoor Air Quality Certifications

Submit required indoor air quality certifications in one submittal package.

1.4.1.1 Adhesives and Sealants

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party program that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

1.5 ENVIRONMENTAL CONDITIONS

Apply sealant when the ambient temperature is between 40 and 90 degrees F.

1.6 DELIVERY AND STORAGE

Deliver materials to the job site in unopened manufacturers' sealed shipping containers, with brand name, date of manufacture, color, and material designation clearly marked thereon. Label elastomeric sealant containers to identify type, class, grade, and use. Handle and store materials in accordance with manufacturer's printed instructions. Prevent exposure to foreign materials or subjection to sustained temperatures exceeding 90 degrees F or lower than 0 degrees F. Keep materials and containers closed and separated from absorptive materials such as wood and insulation.

1.7 QUALITY ASSURANCE

1.7.1 Compatibility with Substrate

Verify that each sealant is compatible for use with each joint substrate in accordance with sealant manufacturer's printed recommendations for each application.

Perform a pre-construction test on project specific substrates to confirm compatibility.

1.7.2 Joint Tolerance

Provide joint tolerances in accordance with manufacturer's printed instructions.

1.7.3 Mock-Up

Provide a mock-up of each type of sealant using materials, colors, and techniques approved for use on the project. Approved mock-ups may be incorporated into the Work.

1.7.4 Adhesion

Provide in accordance with ASTM C1193 or ASTM C1521.

PART 2 PRODUCTS

2.1 SEALANTS

Provide sealant products that have been tested, found suitable, and documented as such by the manufacturer for the particular substrates to which they will be applied.

In areas with ambient temperatures that exceed 110 degrees F, do not use polybutene, bituminous, acrylic-latex, polyvinyl acetate latex sealants, polychloroprene (neoprene), polyvinyl chloride (PVC), and polyurethane foams, and neoprene, PVC, and styrene butadiene rubber extruded seals and closure strips due to these materials having maximum recommended surface temperature ranges from 130 to 180 degrees F.

2.1.1 Interior Sealants

Provide ASTM C920, Type S or M, Grade NS, Class 12.5, Use NT. Provide sealant products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide certification or validation of indoor air quality for interior sealants. Location(s) and color(s) of sealant for the following. Note, color "as selected" refers to manufacturer's full range of color options

LOCATION	COLOR
a. Small voids between walls or partitions and adjacent lockers, casework, shelving, door frames, built-in or surface mounted equipment and fixtures, and similar items.	As selected
b. Perimeter of frames at doors, windows, and access panels which adjoin exposed interior concrete and masonry surfaces.	As Selected
c. Joints of interior masonry walls and partitions which adjoin columns, pilasters, concrete walls, and exterior walls unless otherwise detailed.	As Selected
d. Joints between edge members for acoustical tile and adjoining vertical surfaces.	As Selected
e. Interior locations, not otherwise indicated or specified, where small voids exist between materials specified to be painted.	As Selected

LOCATION	COLOR
f. Joints between bathtubs and ceramic tile; joints between shower receptors and ceramic tile; joints formed where non-planar tile surfaces meet.	As Selected
g. Joints formed between tile floors and tile base cove; joints between tile and dissimilar materials; joints occurring where substrates change.	As Selected
h. Behind escutcheon plates at valve pipe penetrations and showerheads in showers.	As Selected

2.1.2 Exterior Sealants

For joints in vertical surfaces, provide ASTM C920, Type S or M, Grade NS, Class 25, Use NT. For joints in horizontal surfaces, provide ASTM C920, Type S or M, Grade P, Class 25, Use T. Provide location(s) and color(s) of sealant as follows. Note, color "as selected" refers to manufacturer's full range of color options:

LOCATION	COLOR
a. Joints and recesses formed where frames and subsills of windows, doors, louvers, and vents adjoin masonry, concrete, or metal frames. Use sealant at both exterior and interior surfaces of exterior wall penetrations.	Match adjacent surface color
b. Joints between new exterior masonry walls.	As Selected
c. Masonry joints where shelf angles occur.	As Selected
d. Joints in wash surfaces of stonework.	As Selected
e. Expansion and control joints.	As Selected
f. Interior face of expansion joints in exterior concrete or masonry walls where metal expansion joint covers are not required.	As Selected
g. Voids where items pass through exterior walls.	As Selected
h. Metal reglets, where flashing is inserted into masonry joints, and where flashing is penetrated by coping dowels.	As Selected

LOCATION	COLOR
i. Metal-to-metal joints where sealant is indicated or specified.	As Selected
j. Joints between ends of gravel stops, fascia, copings, and adjacent walls.	As Selected

2.1.3 Floor Joint Sealants

ASTM C920, Type S or M, Grade P, Class 25, Use T. Provide sealant products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide certification or validation of indoor air quality for interior floor joint sealants. Provide location(s) and color(s) of sealant as follows. Note, color "as selected" refers to manufacturer's full range of color options:

LOCATION	COLOR
a. Seats of metal thresholds for exterior doors.	As selected
b. Control and expansion joints in floors, slabs, ceramic tile, and walkways.	

2.1.4 Acoustical Sealants

Rubber or polymer based acoustical sealant in accordance with ASTM C919 to have a flame spread of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E84. Provide non-staining acoustical sealant with a consistency of 250 to 310 when tested in accordance with ASTM D217. Acoustical sealant must remain flexible and adhesive after 500 hours of accelerated weathering as specified in ASTM C734. Provide sealant products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide certification or validation of indoor air quality for interior acoustical sealants.

2.1.5 Preformed Sealants

Provide preformed sealants of polybutylene or isoprene-butylene based pressure sensitive weather resistant tape or bead sealants capable of sealing out moisture, air and dust when installed as recommended by the manufacturer. At temperatures from minus 30 to plus 160 degrees F, sealants must be non-bleeding and have no loss of adhesion.

2.1.5.1 Foam Strip

Provide foam strip capable of sealing out moisture, air, and dust when installed and compressed in accordance with manufacturer's printed

instructions. Service temperature must be minus 40 to plus 275 degrees F. Furnish untreated strips with adhesive to hold them in place. Do not allow adhesive to stain or bleed onto adjacent finishes. Saturate treated strips with butylene waterproofing or impregnate with asphalt.

2.2 PRIMERS

Non-staining, quick drying type and consistency as recommended by the sealant manufacturer for the particular application. Provide primers for interior applications that meet the indoor air quality requirements of the paragraph SEALANTS above.

2.3 BOND BREAKERS

Type and consistency as recommended by the sealant manufacturer to prevent adhesion of the sealant to the backing or to the bottom of the joint. Provide bond breakers for interior applications that meet the indoor air quality requirements of the paragraph SEALANTS above.

2.4 BACKSTOPS

Provide glass fiber roving, neoprene, butyl, polyurethane, or polyethylene foams free from oil or other staining elements as recommended by sealant manufacturer. Provide 25 to 33 percent oversized backing for closed cell and 40 to 50 percent oversized backing for open cell material, unless otherwise indicated. Provide backstop material that is compatible with sealant. Do not use oakum or other types of absorptive materials as backstops.

2.4.1 Rubber

Provide in accordance with ASTM D1056, Type 2, closed cell, Class A, round cross section for cellular rubber sponge backing.

2.4.2 PVC

Provide in accordance with ASTM D1667, Grade VO 12, open-cell foam, round cross section for polyvinyl chloride (PVC) backing.

2.4.3 Synthetic Rubber

Provide in accordance with ASTM C509, Option I, Type I preformed rods or tubes for synthetic rubber backing.

2.4.4 Neoprene

Provide in accordance with ASTM D1056, closed cell expanded neoprene cord Type 2, Class C, Grade 2C2 neoprene backing.

2.4.5 Butyl Rubber Based

Provide in accordance with ASTM C1311, from a single component, with solvent release. Color as selected.

2.4.6 Silicone Rubber Base

Provide in accordance with ASTM C920, from a single component, with solvent release, Non-sag.

2.5 CAULKING

For interior use and only where there is little or no anticipated joint movement. Provide in accordance with ASTM D2452 and ASTM D2453. Provide products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide certification or validation of indoor air quality for interior caulking.

2.6 CLEANING SOLVENTS

Provide type(s) recommended by the sealant manufacturer and in accordance with environmental requirements herein. Protect adjacent aluminum and bronze surfaces from solvents. Provide solvents for interior applications that meet the indoor air quality requirements of the paragraph SEALANTS above.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

Perform a field adhesion test in accordance with manufacturer's instructions and ASTM C1193, Method A or ASTM C1521, Method A, Tail Procedure. Remove sealants that fail adhesion testing; clean substrates, reapply sealants, and re-test. Test sealants adjacent to failed sealants. Submit field adhesion test report indicating tests, locations, dates, results, and remedial actions taken.

For each different sealant and substrate combination, allow for one test every 100 feet in the first 1000 linear feet. If any failures occur in the first 1000 linear feet, continue testing at frequency of one test per 500 linear feet.

When installing multi-component joint sealants, inspect that backing material has been properly installed prior to the application of sealant.

3.2 SURFACE PREPARATION

Prepare surfaces according to manufacturer's printed installation instructions. Clean surfaces from dirt, frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter that would destroy or impair adhesion. Remove oil and grease with solvent; thoroughly remove solvents prior to sealant installation. Wipe surfaces dry with clean cloths. When resealing an existing joint, remove existing caulk or sealant prior to applying new sealant. For surface types not listed below, provide in accordance with sealant manufacturer's printed instructions for each specific surface.

3.2.1 Steel Surfaces

Remove loose mill scale by sandblasting or, if sandblasting is impractical or would damage finished work, scraping and wire brushing. Remove protective coatings by sandblasting or using a residue free solvent. Remove resulting debris and solvent residue prior to sealant installation.

3.2.2 Aluminum or Bronze Surfaces

Remove temporary protective coatings from surfaces that will be in contact with sealant. When masking tape is used as a protective coating, remove tape and any residual adhesive prior to sealant application. For removing protective coatings and final cleaning, use non-staining solvents recommended by the manufacturer of the item(s) containing aluminum or bronze surfaces.

3.2.3 Concrete and Masonry Surfaces

Where surfaces have been treated with curing compounds, oil, or other such materials, remove materials by sandblasting or wire brushing. Remove laitance, efflorescence and loose mortar from the joint cavity. Remove resulting debris prior to sealant installation.

3.2.4 Wood Surfaces

Ensure wood surfaces that will be in contact with sealants are free of splinters, sawdust and other loose particles.

3.3 SEALANT PREPARATION

Do not add liquids, solvents, or powders to sealants. Mix multicomponent elastomeric sealants in accordance with manufacturer's printed instructions.

3.4 APPLICATION

3.4.1 Joint Width-To-Depth Ratios

Acceptable Ratios:

<u>JOINT WIDTH</u>	<u>JOINT DEPTH</u>	
	Minimum	Maximum
For metal, glass, or other nonporous surfaces:		
1/4 inch (minimum)	1/4 inch	1/4 inch
over 1/4 inch	1/2 of width	Equal to width
For wood, concrete, masonry, or stone:		
1/4 inch (minimum)	1/4 inch	1/4 inch
over 1/4 inch to 1/2 inch	1/4 inch	Equal to width
over 1/2 inch to 1 inch	1/2 inch	5/8 inch
Over 1 inch	prohibited	

Unacceptable Ratios: Where joints of acceptable width-to-depth ratios have not been provided, clean out joints to acceptable depths and grind or cut to acceptable widths without damage to the adjoining work. Grinding is prohibited at metal surfaces.

3.4.2 Unacceptable Sealant Use

Do not install sealants in lieu of other required building enclosure weatherproofing components such as flashing, drainage components, and joint closure accessories, or to close gaps between walls, floors, roofs, windows, and doors, that exceed acceptable installation tolerances. Remove sealants that have been used in an unacceptable manner and correct building enclosure deficiencies to comply with contract documents requirements.

3.4.3 Masking Tape

Place masking tape on the finished surface on one or both sides of joint cavities to protect adjacent finished surfaces from primer or sealant smears. Remove masking tape within 10 minutes of joint filling and tooling.

3.4.4 Backstops

Provide backstops dry and free of tears or holes. Tightly pack the back or bottom of joint cavities with backstop material to provide joints in specified depths. Provide backstops where indicated and where backstops are not indicated but joint cavities exceed the acceptable maximum depths specified in JOINT WIDTH-TO-DEPTH RATIOS Table.

3.4.5 Primer

Clean out loose particles from joints immediately prior to application of. Apply primer to joints in concrete masonry units, wood, and other porous surfaces in accordance with sealant manufacturer's printed instructions. Do not apply primer to exposed finished surfaces.

3.4.6 Bond Breaker

Provide bond breakers to surfaces not intended to bond in accordance with, sealant manufacturer's printed instructions for each type of surface and sealant combination specified.

3.4.7 Sealants

Provide sealants compatible with the material(s) to which they are applied. Do not use a sealant that has exceeded its shelf life or has jelled and cannot be discharged in a continuous flow from the sealant gun. Apply sealants in accordance with the manufacturer's printed instructions with a gun having a nozzle that fits the joint width. Work sealant into joints so as to fill the joints solidly without air pockets. Tool sealant after application to ensure adhesion. Apply sealant uniformly smooth and free of wrinkles. Upon completion of sealant application, roughen partially filled or unfilled joints, apply additional sealant, and tool smooth as specified. Apply sealer over sealants in accordance with the sealant manufacturer's printed instructions.

3.5 PROTECTION AND CLEANING

3.5.1 Protection

Protect areas adjacent to joints from sealant smears. Masking tape may be used for this purpose if removed 5 to 10 minutes after the joint is filled

and no residual tape marks remain.

3.5.2 Final Cleaning

Upon completion of sealant application, remove remaining smears and stains and leave the work in a clean and neat condition.

- a. Masonry and Other Porous Surfaces: Immediately remove fresh sealant that has been smeared on adjacent masonry, rub clean with a solvent, and remove solvent residue, in accordance with sealant manufacturer's printed instructions. Allow excess sealant to cure for 24 hour then remove by wire brushing or sanding. Remove resulting debris.
- b. Metal and Other Non-Porous Surfaces: Remove excess sealant with a solvent moistened cloth. Remove solvent residue in accordance with solvent manufacturer's printed instructions.

-- End of Section --

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SECTION 08 11 13

STEEL DOORS AND FRAMES

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2020; Errata 1 2021) Structural Welding
Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A879/A879M	(2012; R 2017) Standard Specification for Steel Sheet, zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface
ASTM C578	(2019) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM C591	(2021) Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM C612	(2014; R 2019) Standard Specification for Mineral Fiber Block and Board Thermal Insulation
ASTM D2863	(2019) Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)
ASTM E1300	(2016) Standard Practice for Determining Load Resistance of Glass in Buildings
ASTM F2247	(2018) Standard Test Method for Metal Doors Used in Blast Resistant Applications (Equivalent Static Load Method)
ASTM F2248	(2012) Standard Practice for Specifying an Equivalent 3-Second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass
ASTM F2927	(2012) Standard Test Method for Door Systems Subject to Airblast Loadings

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.115 (2016) Hardware Preparation in Steel Doors
and Steel Frames

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 80 (2022) Standard for Fire Doors and Other
Opening Protectives

NFPA 252 (2022) Standard Methods of Fire Tests of
Door Assemblies

STEEL DOOR INSTITUTE (SDI/DOOR)

SDI/DOOR 111 (2009) Recommended Details for Standard
Steel Doors, Frames, and Accessories and
Related Components

SDI/DOOR 113 (2013; R2018) Standard Practice for
Determining the Steady-State Thermal
Transmittance of Steel Door and Frame
Assemblies

SDI/DOOR A250.4 (2018) Test Procedure and Acceptance
Criteria for Physical Endurance for Steel
Doors, Frames and Frame Anchors

SDI/DOOR A250.6 (2015) Recommended Practice for Hardware
Reinforcing on Standard Steel Doors and
Frames

SDI/DOOR A250.8 (2017) Specifications for Standard Steel
Doors and Frames

SDI/DOOR A250.11 (2012) Recommended Erection Instructions
for Steel Frames

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 4-010-01 (2018;with Change 1, 2020) DoD Minimum
Antiterrorism Standards for Buildings

UNDERWRITERS LABORATORIES (UL)

UL 10C (2016; Reprint May 2021) UL Standard for
Safety Positive Pressure Fire Tests of
Door Assemblies

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Doors; G RO

Frames; G RO

Guillotine Kennel Door; G RO

Guillotine Kennel Door Lift Cable Assembly; G RO

Accessories

Schedule of Doors; G RO

Schedule of Frames; G RO

SD-03 Product Data

Doors; G RO

Recycled Content for Steel Door Product; S

Frames; G RO

Guillotine Kennel Door; G RO

Guillotine Kennel Door Lift Cable Assembly; G RO

Recycled Content for Steel Frame Product; S

Accessories

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver doors, frames, and accessories undamaged and with protective wrappings or packaging. Provide temporary steel spreaders securely fastened to the bottom of each welded frame. Store doors and frames on platforms under cover in clean, dry, ventilated, and accessible locations, with 1/4 inch airspace between doors. Remove damp or wet packaging immediately and wipe affected surfaces dry. Replace damaged materials with new.

PART 2 PRODUCTS

2.1 STANDARD STEEL DOORS

SDI/DOOR A250.8, except as specified otherwise. Prepare doors to receive door hardware as specified in Section 08 71 00 DOOR HARDWARE. Undercut where indicated. Provide exterior doors with top edge closed flush and sealed to prevent water intrusion. Provide doors at 1-3/4 inch thick, unless otherwise indicated. Provide door material that uses a minimum of 25 percent recycled content. Provide data indicating percentage of recycled content for steel door product. Provide exterior glazing in accordance with ASTM F2248 and ASTM E1300. Exterior doors must be tested in accordance with ASTM F2247 or ASTM F2927 to meet requirements of UFC 4-010-01.

2.1.1 Classification - Level, Performance, Model

2.1.1.1 Heavy Duty Doors

SDI/DOOR A250.8, Level 2, physical performance Level B, Model 2, with core construction as required by the manufacturer for interior doors and for exterior doors, of size(s) and design(s) indicated. Where vertical stiffener cores are required, the space between the stiffeners must be filled with board insulation.

2.1.1.2 Extra Heavy Duty Doors

SDI/DOOR A250.8, Level 3, physical performance Level A, Model 2 with core construction as required by the manufacturer for indicated exterior doors, of size(s) and design(s) indicated. Where vertical stiffener cores are required, the space between the stiffeners must be filled with board insulation.

2.2 INSULATED STEEL DOOR SYSTEMS

Provide insulated steel doors and frames in accordance with SDI/DOOR 113 at entrances to dwelling units and where indicated. Meet energy requirements including Solar Heat Gain Coefficient (SHGC) and U-factor. Provide insulated steel doors with a core of polyurethane foam; face sheets, edges, and frames of galvanized steel not lighter than 23 gauge, 16 gauge, and 16 gauge respectively; magnetic weatherstripping; nonremovable-pin hinges; thermal-break aluminum threshold; and vinyl door bottom. Provide to doors and frames a phosphate treatment, rust-inhibitive primer, and baked acrylic enamel finish. Test doors in accordance with SDI/DOOR A250.4 and meet the requirements for Level C. Prepare doors to receive specified hardware. Provide doors 1-3/4 inch thick.

2.3 ACCESSORIES

2.3.1 Astragals

For pairs of exterior steel doors which will not have aluminum astragals or removable mullions, as specified in Section 08 71 00 DOOR HARDWARE provide overlapping steel astragals with the doors.

2.3.2 Moldings

Provide moldings around glass of interior and exterior doors and louvers of interior doors. Provide nonremovable moldings on outside of exterior doors and on corridor side of interior doors. Other moldings may be stationary or removable. Secure inside moldings to stationary moldings, or provide snap-on moldings.

2.4 INSULATED GUILLOTINE KENNEL DOOR

Provide cable operated vertical sliding guillotine kennel doors constructed of 1/2-inch composite insulated panel clad on both sides with 18-gauge aluminum sheets. Panel top and floor caps must be constructed of 0.055 thick walled aluminum channels affixed with stainless fasteners. Heavy duty dual-channel side rails must be of solid 6063-T6 extruded aluminum. Rails must be heat treated and feature machine screw slots for ease of mounting and adjustment. Provide eye bolt life cable attachment assembly, with associated panel reinforcement to counteract lifting loads

on panel core or approved equal. Door to include a hidden bottom and wall seal to block air gaps.

2.4.1 Coated Guillotine Kennel Door Lift Cable Assembly

Provide coated stainless steel lift cable and associated hardware to include cable clamps, pulleys, handles and stops as recommended by the guillotine door manufacturer for the installation indicated of approved equal.

2.5 INSULATION CORES

Provide insulating cores at all exterior doors and provide an apparent U-factor of .48 in accordance with SDI/DOOR 113 and conforming to:

- a. Rigid Cellular Polyisocyanurate Foam: ASTM C591, Type I or II, foamed-in-place or in board form, with oxygen index of not less than 22 percent when tested in accordance with ASTM D2863; or
- b. Rigid Polystyrene Foam Board: ASTM C578, Type I or II; or
- c. Mineral board: ASTM C612, Type I.

2.6 STANDARD STEEL FRAMES

SDI/DOOR A250.8, Level to coordinate with door type except as otherwise specified. Form frames to sizes and shapes indicated, with welded corners. Provide steel frames for doors, sidelights, mullions, cased openings, and interior glazed panels, unless otherwise indicated. Provide frame product that uses a minimum of 25 percent recycled content. Provide data indicating percentage of recycled content for steel frame product.

2.6.1 Welded Frames

Continuously weld frame faces at corner joints. Mechanically interlock or continuously weld stops and rabbets. Grind welds smooth.

Weld frames in accordance with the recommended practice of the Structural Welding Code Sections 1 through 6, AWS D1.1/D1.1M and in accordance with the practice specified by the producer of the metal being welded.

2.6.2 Stops and Beads

Provide form and loose stops and beads from 20 gauge steel. Provide for glazed and other openings in standard steel frames. Secure beads to frames with oval-head, countersunk Phillips self-tapping sheet metal screws or concealed clips and fasteners. Space fasteners approximately 12 to 16 inch on center. Miter molded shapes at corners. Butt or miter square or rectangular beads at corners.

2.6.3 Terminated Stops

Where indicated, terminate interior door frame stops 6 inch above floor.

2.6.4 Cased Openings

Fabricate frames for cased openings of same material, gauge, and assembly as specified for metal door frames, except omit door stops and preparation for hardware.

2.6.5 Anchors

Provide anchors to secure the frame to adjoining construction. Provide steel anchors, zinc-coated not lighter than 18 gauge.

2.6.5.1 Wall Anchors

Provide at least three anchors for each jamb. For frames which are more than 7.5 feet in height, provide one additional anchor for each jamb for each additional 2.5 feet or fraction thereof.

- a. Masonry: Provide anchors of corrugated or perforated steel straps or 3/16 inch diameter steel wire, adjustable or T-shaped;
- b. Stud partitions: Weld or otherwise securely fasten anchors to backs of frames. Design anchors to be fastened to closed steel studs with sheet metal screws, and to open steel studs by wiring or welding;
- c. Completed openings: Secure frames to previously placed concrete or masonry with expansion bolts in accordance with SDI/DOOR 111; and
- d. Solid plaster partitions: Secure anchors solidly to back of frames and tie into the lath. Provide adjustable top strut anchors on each side of frame for fastening to structural members or ceiling construction above. Provide size and type of strut anchors as recommended by the frame manufacturer.

2.6.5.2 Floor Anchors

Provide floor anchors drilled for 3/8 inch anchor bolts at bottom of each jamb member.

2.7 FIRE DOORS AND FRAMES

Provide fire doors and frames in accordance with NFPA 80 and this specification. Include insulated core materials in fire doors where indicated in the door schedule.

2.7.1 Labels

Provide fire doors and frames bearing the label of Underwriters Laboratories (UL), Factory Mutual Engineering and Research (FM), or Warnock Hersey International (WHI) attesting to the rating required. Testing must be in accordance with NFPA 252 or UL 10C. Provide labels that are metal with raised letters, bearing the name or file number of the door and frame manufacturer. Labels must be permanently affixed at the factory to frames and to the hinge edge of the door. Do not paint door and labels.

2.7.2 Oversized Doors

For fire doors and frames which exceed the size for which testing and labeling are available, furnish certificates stating that the doors and frames are identical in design, materials, and construction to a door which has been tested and meets the requirements for the class indicated.

2.7.3 Astragal on Fire Doors

On pairs of labeled fire doors, conform to NFPA 80 and UL requirements.

2.8 EXTERIOR FRAMES

Provide thermal insulation in all exterior frames. Provide frames of a minimum Level 4, with frames of a minimum thickness of 0.067 inch, 14 gauge.

2.9 HARDWARE PREPARATION

Drill and tap doors and frames to receive finish hardware. Prepare doors and frames for hardware in accordance with the applicable requirements of SDI/DOOR A250.8 and SDI/DOOR A250.6. For additional requirements refer to ANSI/BHMA A156.115. Drill and tap for surface-applied hardware at the project site. Build additional reinforcing for surface-applied hardware into the door at the factory. Punch door frames, with the exception of frames that will have weatherstripping or lightproof or soundproof gasketing, to receive a minimum of two rubber or vinyl door silencers on lock side of single doors and one silencer for each leaf at heads of double doors. Set lock strikes out to provide clearance for silencers.

2.10 FINISHES

2.10.1 Factory-Primed Finish

Thoroughly clean all surfaces of doors and frames then chemically treat and factory prime with a rust inhibiting coating as specified in SDI/DOOR A250.8.

2.10.2 Electrolytic Zinc-Coated Anchors and Accessories

Provide electrolytically deposited zinc-coated steel in accordance with ASTM A879/A879M, Commercial Quality, Coating Class A. Phosphate treat and factory prime zinc-coated surfaces as specified in SDI/DOOR A250.8.

2.11 FABRICATION AND WORKMANSHIP

Provide finished doors and frames that are strong and rigid, neat in appearance, and free from defects, waves, scratches, cuts, dents, ridges, holes, warp, and buckle. Provide molded members that are clean cut, straight, and true, with joints coped or mitered, well formed, and in true alignment. Dress exposed welded and soldered joints smooth. Design door frame sections for use with the wall construction indicated. Corner joints must be well formed and in true alignment. Conceal fastenings where practicable. On wraparound frames for masonry partitions, provide a throat opening 1/8 inch larger than the actual masonry thickness. Design other frames in exposed masonry walls or partitions to allow sufficient space between the inside back of trim and masonry to receive caulking compound.

2.12 PROVISIONS FOR GLAZING

Materials are specified in Section 08 81 00 GLAZING.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Frames

Set frames in accordance with SDI/DOOR A250.11. Plumb, align, and brace securely until permanent anchors are set. Anchor bottoms of frames with expansion bolts or powder-actuated fasteners. Build in or secure wall anchors to adjoining construction. Where frames require ceiling struts or overhead bracing, anchor frames to the struts or bracing.

3.1.2 Doors

Hang doors in accordance with clearances specified in SDI/DOOR A250.8. After erection and glazing, clean and adjust hardware.

3.1.3 Fire Doors and Frames

Install fire doors and frames, including hardware, in accordance with NFPA 80.

3.2 PROTECTION

Protect doors and frames from damage. Repair damaged doors and frames prior to completion and acceptance of the project or replace with new, as directed. Wire brush rusted frames until rust is removed. Clean thoroughly. Apply an all-over coat of rust-inhibitive paint of the same type used for shop coat.

3.3 CLEANING

Upon completion, clean exposed surfaces of doors and frames thoroughly. Remove mastic smears and other unsightly marks.

-- End of Section --

SECTION 08 31 00

ACCESS DOORS AND PANELS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2020; Errata 1 2021) Structural Welding
Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M (2019) Standard Specification for Carbon
Structural Steel

ASTM A653/A653M (2020) Standard Specification for Steel
Sheet, Zinc-Coated (Galvanized) or
Zinc-Iron Alloy-Coated (Galvannealed) by
the Hot-Dip Process

ASTM A666 (2015) Standard Specification for Annealed
or Cold-Worked Austenitic Stainless Steel
Sheet, Strip, Plate and Flat Bar

ASTM A1008/A1008M (2021a) Standard Specification for Steel,
Sheet, Cold-Rolled, Carbon, Structural,
High-Strength Low-Alloy, High-Strength
Low-Alloy with Improved Formability,
Solution Hardened, and Bake Hardenable

ASTM E90 (2009; R2016) Standard Test Method for
Laboratory Measurement of Airborne Sound
Transmission Loss of Building Partitions
and Elements

ASTM E119 (2020) Standard Test Methods for Fire
Tests of Building Construction and
Materials

ASTM E413 (2016) Classification for Rating Sound
Insulation

ASTM E1332 (2016) Standard Classification for Rating
Outdoor-Indoor Sound Attenuation

MASTER PAINTERS INSTITUTE (MPI)

MPI 79 (2016) Primer, Alkyd, Anti-Corrosive for
Metal

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 80	(2022) Standard for Fire Doors and Other Opening Protectives
NFPA 252	(2022) Standard Methods of Fire Tests of Door Assemblies
NFPA 288	(2017) Standard Methods of Fire Tests of Horizontal Fire Door Assemblies Installed in Horizontal Fire Resistance-Rated Assemblies

UNDERWRITERS LABORATORIES (UL)

UL 10B	(2008; Reprint May 2020) Fire Tests of Door Assemblies
UL 263	(2011; Reprint Aug 2021) UL Standard for Safety Fire Tests of Building Construction and Materials

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Access Doors And Panels; G RO

SD-03 Product Data

Access Doors And Panels; G RO

Hardware Including Locks and Keys; G RO

Accessories

Recycled Content; S

SD-06 Test Reports

Fire-rating(s) of Assemblies

Acoustical Ratings of Assemblies

1.3 MISCELLANEOUS REQUIREMENTS

For access doors and panels provide the following:

1.3.1 Shop Drawings

For field assembled access doors and panels, provide plans, elevations, sections, and details for each type of access door and panel assembly.

Indicate frame, surface and edge construction, materials, and accessories. Indicate types of finished surfaces and details for panel edge conditions. Provide a door schedule with a unique number for each access door and panel, specific location in the project, location of hinges and hardware for each door. Indicate acoustical ratings of assemblies as sound transmission class (STC) ratings, and fire-rating(s) of assemblies.

1.3.2 Product Data

For shop assembled access doors and panels, provide literature indicating sizes, types, frame and edge construction, finishes, hardware, accessories such as gaskets, seals and weatherstripping, and location of each door and panel in the project. Indicate acoustical ratings of assemblies, fire-ratings of assemblies. Provide details of adjoining work for each condition indicated.

1.3.3 Finish Samples

Submit two color charts from manufacturer's standard color and finish options for each type of frame and panel assembly finish indicated.

1.3.4 Test Reports

Provide test reports for acoustical assemblies when tested in accordance with ASTM E90 and classified in accordance with ASTM E413 and ASTM E1332. Provide test reports for fire-rated assemblies when tested in accordance with NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically and NFPA 288 for fire-rated access door assemblies installed horizontally.

1.4 PERFORMANCE REQUIREMENTS

1.4.1 Structural Requirements

Provide floor access assemblies to support live loads indicated for floors. Deflection must not exceed 1/180 of span.

1.4.2 Acoustical Requirements

Provide access panels with a minimum sound transmission class (STC) as indicated on the Drawings. Provide gasketing in accordance with manufacturer's written recommendations.

1.4.3 Fire-Rating Requirements

Provide access panels with a minimum fire-rating of as indicated on the Drawings.

1.5 DELIVERY, STORAGE, AND PROTECTION

Protect from corrosion, deformation, and other types of damage. Store items in an enclosed area free from contact with soil and weather. Remove and replace damaged items with new items.

PART 2 PRODUCTS

2.1 RECYCLED CONTENT

Provide products with recycled content. Provide data for each product with recycled content, identifying percentage of recycled content.

2.2 MATERIALS

2.2.1 Steel Plates, Shapes, and Bars

Provide in accordance with ASTM A36/A36M.

2.2.2 Sheet Steel

Provide cold rolled steel sheet substrate in accordance with ASTM A1008/A1008M, Commercial Steel (CS), exposed.

2.2.3 Stainless Steel

Provide in accordance with ASTM A666, type 302 or 304.

2.2.4 Metallic Coated Steel Sheet

Provide in accordance with ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.2.5 Hardware

Provide automatic closing devices. Provide latch releases operable from insides of doors. Provide anchors in accordance with applicable fire test parameters.

2.2.6 Hinges

Provide concealed spring hinges, 175 degrees of opening, with removable hinge pins. Provide hinges of same steel as door and frame or in accordance with manufacturer's written recommendations. If providing non-continuous hinges, provide in numbers required to maintain alignment of door panel with frame. Provide coatings as necessary to permanently protect dissimilar metals from contact with one another; see Part 3 herein for more information.

2.2.7 Locks

Unless otherwise indicated, provide flush screwdriver operated cam lock. Provide plastic sleeve or stainless steel bushings to protect holes in surface finishes for screwdriver to access lock.

2.2.8 Accessories

Provide anchors in size, number and location on four sides to secure access door to substrate. Provide anchors in types as recommended by manufacturer's written installation instructions for each substrate indicated. Provide shims, bushings, clips, gaskets, and other devices as necessary for a complete installation.

2.3 FABRICATION

2.3.1 Thickness, Size, Edges

Fabricate frames for access doors of steel not lighter than 16 gauge with welded joints and anchorage for securing to adjacent construction. Provide doors a minimum of 24 by 24 inches and of not lighter than 16 gauge steel, with stiffened edges and welded attachments. Provide with eased (lightly rounded) edges, without burrs, snags or sharpness and exposed welds ground smooth.

2.3.2 Welding

Provide in accordance with AWS D1.1/D1.1M.

2.4 ACCESS ASSEMBLY TYPES

Unless indicated otherwise, provide flush-face steel access doors and panels with steel frames and flanges.

2.4.1 Recessed Doors

Provide recessed access doors with gypsum wallboard bead flanges. Depth of door panel recess must accommodate the installed thickness of the finish material of the wall assembly for a flush finished condition of the wall and the access panel face. Reinforce panel and frame to prevent sagging.

2.4.2 Fire-rated Doors

2.4.2.1 Door Construction

Provide ceiling access door construction in accordance with ASTM E119 or UL 263. Provide wall access doors in accordance with NFPA 252 or UL 10B.

2.4.2.2 Labels

Provide class B opening according to UL 10B or test by another nationally recognized laboratory, approved by the Contracting Officer. Provide fire-rating as indicated herein, with a maximum temperature rise of 216 degrees F.

2.4.2.3 Door Panel and Frame

Steel sheet, with mineral fiber insulation core, insulated sandwich type construction.

2.4.3 Acoustical Doors

Manufacturer's standard assembly rated in accordance with STC requirements indicated herein. Acoustical insulating materials must have a flame spread rating of no more than 25.

2.5 FINISHES

Provide steel frame and panel surfaces with a shop applied prime coat. Field paint frames and panels to match wall and ceiling surfaces in which they occur. Provide exposed fastenings that approximately match the color and finish of the each material to which fastenings are applied.

PART 3 EXECUTION

3.1 PREPARATION

Field verify all measurements prior to fabrication. Verify access door locations and sizes provide required maintenance access to installed building services components. Protect existing construction and completed work from damage during installation.

3.2 GENERAL INSTALLATION REQUIREMENTS

Install items at locations indicated, in accordance with manufacturer's written instructions. Include materials and parts as necessary for a complete installation of each item. Conceal fastenings where practicable. Poor matching of holes to fasteners is cause for rejection of the work.

3.3 ACCESS LOCATIONS

Install removable access panels directly below each valve, flow indicator, damper, air splitter or other utility requiring access that is located above ceilings, other than at acoustical panel ceilings, and that would otherwise not be accessible. Install access doors and panels permitting access to service valves, traps, dampers, cleanouts, and other mechanical, electrical and conveyor control items concealed in walls and partitions.

3.4 ACCESS LOCATIONS IN WET AREAS

When possible, avoid locating access panels in wet areas. When such locations cannot be avoided, provide moisture resistant assemblies as indicated in Part I herein.

3.5 RECESSED ACCESS DOORS

Install fire-rated access doors in fire-rated partitions and ceilings in accordance with NFPA 80.

3.6 FIELD PAINTING

Field painting primed access doors in accordance with the requirements of Section 09 90 00 PAINTS AND COATINGS.

3.7 DISSIMILAR MATERIALS

Where dissimilar metals are in contact, protect surfaces with a coating in accordance with MPI 79 to prevent galvanic or corrosive action.

3.8 ADJUSTMENT

Adjust hardware so that door panel opens freely. Adjust door when closed center door panel in frame.

3.9 ENVIRONMENTAL CONDITIONS

Do not paint surfaces when damp or exposed to weather, when surface temperature is below 45 degrees F or over 95 degrees F, unless approved by the Contracting Officer.

SOF Military Working Dog Kennel
Hunter Army Airfield, Georgia

PN 69262

-- End of Section --

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SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ALUMINUM ASSOCIATION (AA)

AA DAF45 (2003; Reaffirmed 2009) Designation System
for Aluminum Finishes

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 501 (2015) Methods of Test for Exterior Walls

AAMA 611 (2014) Voluntary Specification for
Anodized Architectural Aluminum

AAMA 800 (2016) Voluntary Specifications and Test
Methods for Sealants

AAMA 1503 (2009) Voluntary Test Method for Thermal
Transmittance and Condensation Resistance
of Windows, Doors and Glazed Wall Sections

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7-16 (2017; Errata 2018; Supp 1 2018) Minimum
Design Loads and Associated Criteria for
Buildings and Other Structures

ASTM INTERNATIONAL (ASTM)

ASTM B221 (2021) Standard Specification for Aluminum
and Aluminum-Alloy Extruded Bars, Rods,
Wire, Profiles, and Tubes

ASTM E283 (2019) Standard Test Method for
Determining the Rate of Air Leakage
Through Exterior Windows, Curtain Walls,
and Doors Under Specified Pressure
Differences Across the Specimen

ASTM E330/E330M (2014; R 2021) Standard Test Method for
Structural Performance of Exterior
Windows, Doors, Skylights and Curtain
Walls by Uniform Static Air Pressure
Difference

ASTM E331 (2000; R 2016) Standard Test Method for
Water Penetration of Exterior Windows,

Skylights, Doors, and Curtain Walls by
Uniform Static Air Pressure Difference

ASTM E783	(2002; R 2018) Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors
ASTM E1105	(2015) Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference
ASTM E1424	(1991; R 2016) Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure and Temperature Differences Across the Specimen
ASTM E1886	(2019) Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
ASTM E1996	(2017) Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes
ASTM F1642/F1642M	(2017) Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loadings

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.4	(2013) Door Controls - Closers
ANSI/BHMA A156.10	(2017) Power Operated Pedestrian Doors

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2018) International Building Code

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS TT-P-645	(Rev C; Notice 1) Primer, Paint, Zinc-Molybdate, Alkyd Type

UNDERWRITERS LABORATORIES (UL)

UL 325	(2017; Reprint Feb 2020) UL Standard for Safety Door, Drapery, Gate, Louver, and Window Operators and Systems

1.2 ADMINISTRATIVE REQUIREMENTS

1.2.1 Pre-Installation Meetings

Conduct a meeting before installation begins to verify the project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

Within 30 days of the Contract Award, submit the following for review and approval by the Contracting Officer:

- a. List of product installations
- b. Sample warranty
- c. Finish and color samples
- d. Manufacturer's catalog data

Concurrently submit certified test reports showing compliance with specified performance characteristics and UL 325 for the following:

- a. Wind Load (Resistance) in accordance with AAMA 501
- b. Deflection in accordance with ASTM F1642/F1642M
- c. Condensation Resistance and Thermal Transmittance Performance Requirements in accordance with AAMA 1503
- d. Water Infiltration in accordance with ASTM E331
- e. Structural Requirements in accordance with ASTM F1642/F1642M

1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Sample Warranty

List of Product Installations

SD-02 Shop Drawings

Installation Drawings; G AE

Fabrication Drawings; G AE

SD-03 Product Data

Manufacturer's Catalog Data

Finish; G RO

Recycled Content of Aluminum Material; S

SD-04 Samples

Finish and Color Samples; G RO

SD-06 Test Reports

Certified Test Reports; G RO

Deflection

Air Infiltration

Condensation Resistance and Thermal Transmittance

Water Infiltration

SD-08 Manufacturer's Instructions

Manufacturer's Instructions

SD-11 Closeout Submittals

Manufacturer's Product Warranty

1.4 QUALITY CONTROL

1.4.1 Qualifications

1.4.1.1 Installer Qualifications

Provide documentation of the installer's experience in performing the work specified in this section.

Ensure that the installers are specialized in work similar to that required for this project, and that they are acceptable to product manufacturer.

1.4.1.2 Manufacturer Qualifications

Ensure that manufacturers meet the requirements specified in this section and project drawings.

Ensure that the manufacturer is capable of providing field service representation during construction, approving acceptable installers and approving application methods.

1.4.2 Single-Source Responsibility

When aluminum entrances are part of a building enclosure system, that includes storefront framing, windows, a curtain wall system, and related products, provide building enclosure system products from a single-source manufacturer.

Use a single source manufacturer with sole responsibility for providing design, structural engineering, and custom fabrication for door portal systems and for supplying components, materials, and products. Do not use

products provided from numerous sources for assembly at the site. Ensure that the following work items and components are fabricated or supplied by a single source are:

- a. Door assemblies to be installed in door portals as specified in Section 08 11 13 STEEL DOORS AND FRAMES.
- b. Glazed walls to be constructed around door portals as specified in this Section.
- c. Door operating hardware to be installed on or within door portals as specified in Section 08 71 00 DOOR HARDWARE.
- d. Glass as specified in Section 08 81 00 GLAZING.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Ordering

To avoid construction delays, comply with the manufacturer's lead-time requirements and instructions for ordering.

1.5.2 Packing, Shipping, Handling and Unloading

Deliver materials in the manufacturer's original, unopened, undamaged containers with identification labels intact.

1.5.3 Storage and Protection

Store materials in a way that protects them from exposure to harmful weather conditions. Avoid damaging the storefront material and components during handling. Protect storefront material against damage from elements, construction activities, and other hazards before, during, and after storefront installation.

Do not use adhesive papers or sprayed coatings that become firmly bonded when exposed to sunlight. Do not leave coating residue on surfaces.

1.6 PROJECT / SITE CONDITIONS

1.6.1 Field Measurements

Verify actual measurements or openings by taking field measurements before fabrication; record these measurements on shop drawings. To avoid construction delays, coordinate field measurements, and fabrication schedule with construction progress.

1.7 WARRANTY

Provide a written manufacturer's warranty, executed by a company official, warranting against defects in materials and products for 2 years from the date of shipment. Warrant that the door corner construction is for the life of the project. Provide a written installer's warranty, warranting work to be watertight and free from defective materials, defective workmanship, and glass breakage as a result of defective design, and agreeing to replace components that fail within 2 years.

The warranty states the following:

- a. Watertight and airtight system installation is completed within specified tolerances.
- b. The completed installation remains free of rattles, wind whistles and noise caused by thermal movement and wind pressure.
- c. System is structurally sound and free from distortion.
- d. Glass and glazing gaskets will not break or "pop" from frames as a result of design, wind load pressure, movement caused by expansion or contraction, or structural loading.
- e. Glazing sealants and gaskets remain free of abnormal deterioration or dislocation as a result of sunlight, weather, or oxidation.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide aluminum entrances, with glass and glazing, door hardware, and components.

Aluminum entrances include impact resistance entrances; medium stile, 3 1/2 inch vertical face dimension, 1 3/4 inch depth, for interior structural silicone glaze, for high-traffic/impact-resistant applications.

2.1.1 Design Requirements for Aluminum (Entrances and Components)

Provide a door portal system designed to withstand the following loads without breakage, loss, failure of seals, product deterioration, or other defects.

- a. Dead and Live Loads: Determined by ASCE 7-16 and calculated in accordance with applicable codes.
- b. Seismic Loads: Design and install the system to comply with the seismic requirements for the project location in accordance with Section 1613 of the International Building Code, ICC IBC.
- c. Wind Loads: Design and install the system so that the effects of wind load acting inward and outward normal to the plane of the wall are in accordance with ASTM E330/E330M.
- d. Thermal Loads And Movement:
 - (1) Ambient Temperature Range: 120 degrees F
 - (2) Material Surfaces Range: 180 degrees F
- e. Water and Air Resistance: Provide weatherstripping, exterior gaskets, sealants, and other accessories to resist water and air penetration.
- f. Impact-Protective Systems Provide an impact-protective system in accordance with ASTM E1886 and ASTM E1996.

2.1.1.1 Material Standard

ASTM B221; 6063-T5 alloy and tempered.

Provide door stile and rail face dimensions of the entrance doors as follows:

Vertical Stile	Top Rail	Bottom Rail
3-1/2 inches	3-1/2 inches	6-1/2 inches

Provide major portions of the door members at 0.125 inches nominal in thickness and glazing molding at 0.050 inches thick.

2.1.1.2 Recycled Content

Provide aluminum framed entrances and storefronts that have a minimum of 20 percent recycled content based upon the aluminum billet used in the original material. Provide data indicating percentage of recycled content of aluminum material.

2.1.1.3 Sealants

Provide either ethylene propylene diene monomer (EPDM) elastomeric extrusions or thermoplastic elastomer glazing gaskets. Structural silicone sealant is required.

Internal Sealants: Provide sealants that according to the manufacturer will remain permanently elastic, tacky, non-drying, non-migrating, and weather tight.

2.1.1.4 Thermal Barrier

Use a rigid, structural thermal barrier to separate all exterior aluminum from interior aluminum. For purposes of this specification, a structural thermal barrier is defined as a system that transfers shear during bending and, therefore, promotes composite action between the exterior and interior extrusions. Do not use a nonstructural thermal barrier. Ensure that the thermal barrier provides a structural connection between the two sides of the door.

2.2 FABRICATION

Provide the following information when submitting fabrication drawings for custom fabrications:

- a. Indicate elevations, detailed design, dimensions, member profiles, joint locations, arrangement of units, and member connections.
- b. Show the following items:
 - (1) Details of special shapes.
 - (2) Reinforcing.
 - (3) Anchorage system.
 - (4) Interfacing with building construction.
 - (5) Provisions for expansion and contraction.
- c. Indicate typical glazing details, locations of various types and thickness of glass, and internal sealant requirements as recommended

by the sealant manufacturer.

- d. Clearly indicate locations of exposed fasteners and joints.
- e. Clearly show where and how the manufacturer's system deviates from Contract drawings and these specifications.

2.2.1 Entrance System Fabrication

Provide door corner construction consisting of mechanical clip fastening, SIGMA deep penetration plug welds and 1 1/8 inch long fillet welds inside and outside all four corners. Provide a hook-in type exterior glazing stop with EPDM glazing gaskets reinforced with non-stretchable cord. Provide an interior glazing stop that is mechanically fastened to the door member and that incorporates a silicone-compatible spacer used with silicone sealant.

Accurately fit and secure joints and corners. Make joints hairline in appearance. Remove burrs and smooth edges. Prepare components with internal reinforcement for door hardware. Arrange fasteners and attachments so that they are concealed from view.

Separate dissimilar metals with protective coating or pre-formed separators to prevent contact and corrosion.

2.2.2 Shop Assembly

Fabricate and assemble units with joints only at the intersection of aluminum members with hairline joints; rigidly secure these units, and seal them in accordance with the manufacturer's recommendations.

2.2.2.1 Welding

Conceal welds on aluminum members in accordance with AWS recommendations or methods recommended by the manufacturer. Members showing welding bloom or discoloration on finish or material distortion will be rejected by the Contacting Officer.

2.2.3 Finish

Before fabrication, clean the units and give them a AA-M-10-C22-A31 clear (natural) anodized finish in accordance with the requirements of the AA DAF45. The finish thickness is A41, 0.4 mil or greater.

- a. Clear Anodized; Conforming to AA-M12C22A31 and AAMA 611.

Select and edit the following items for the appropriate finish; delete types that do not apply.

- (1) Clear anodic coating, 0.4 minimum thickness

2.2.4 Fabrication Tolerance

Fabricate and assemble units with joints only at intersection of aluminum members with hairline joints; rigidly secure these units, and seal them in accordance with the manufacturer's recommendations.

Fabricate aluminum entrances in accordance with the entrance manufacturer's prescribed tolerances.

2.2.4.1 Material Cuts

Square to 1/32 inch off square, over largest dimension; proportionate amount of 1/32 inch on the two dimensions.

2.2.4.2 Joints

Between adjacent members in same assembly: Joints are hairline and square to the adjacent member.

2.2.4.3 Variation

In squaring diagonals for doors and fabricated assemblies: 1/16 inch.

2.2.4.4 Flatness

For doors and fabricated assemblies: Plus/minus 1/16 inch of neutral plane.

2.3 MATERIALS

2.3.1 Sealants

Refer to Section 07 92 00 JOINT SEALANTS. Ensure that all sealants conform to AAMA 800.

2.3.2 Glass

Refer to Section 08 81 00 GLAZING.

2.4 ACCESSORIES

2.4.1 Fasteners

Provide stainless steel fasteners in areas where the fasteners are exposed.

Use non-corrosive and compatible fasteners with components being fastened. Do not use exposed fasteners, except where unavoidable for application of hardware.

In areas where fasteners are not exposed, use aluminum, non-magnetic stainless steel, or other materials warranted by the manufacturer.

For exposed locations, provide countersunk Phillips head screws when items with a matching finish are fastened. For concealed locations, provide the manufacturer's standard fasteners.

Provide nuts or washers that have been designed with a means to prevent disengagement; do not deform fastener threads.

2.4.2 Perimeter Anchors

When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

2.4.2.1 Inserts and Anchorage Devices

Provide manufacturer's standard formed or fabricated assemblies, steel or

aluminum, of shapes, plates, bars, or tubes. Shop-coat steel assemblies after fabrication with an alkyd zinc chromate primer complying with FS TT-P-645.

2.4.3 Standard Entrance Hardware

2.4.3.1 Weatherstripping

Equip meeting stiles on pairs of doors with an adjustable astragal using wool pile with a polymeric fin.

Provide door weatherstripping on a single-acting offset pivot or butt-hung door and frame (single or pairs) consisting of a thermoplastic elastomer weatherstripping on a tubular shape with a semi-rigid polymeric backing.

Provide sill-sweep strips: Provide an EPDM blade gasket sweep strip in an aluminum extrusion applied to the interior exposed surface of the bottom rail with concealed fasteners. (Provide as necessary to meet specified performance tests.)

2.4.3.2 Threshold

Provide an extruded aluminum threshold, one piece per door opening, with ribbed surface.

2.4.3.3 Offset Pivots

Provide the manufacturer's standard top and bottom pivots with one intermediate offset pivot.

2.4.3.4 Panic Device

Provide the manufacturer's recommended standard panic hardware.

2.4.3.5 Closer

Provide a surface closer in accordance with ANSI/BHMA A156.4.

2.4.3.6 Security Lock or Dead Lock

Provide A/R MS 1850A lock with two A/R 1871 cylinder operated flush bolts.

2.4.3.7 Cylinder(s)/Thumb-turn

Provide the manufacturer's recommended standard.

2.4.3.8 Cylinder Guard

Provide the manufacturer's recommended standard.

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Site Verification of Conditions

Verify that the condition of substrate previously installed under other sections is acceptable for product installation in accordance with the manufacturer's instructions.

Verify that openings are sized to receive the storefront system and that the sill plate is level in accordance with the manufacturer's acceptable tolerances.

3.2 PREPARATION

Field-verify dimensions before fabricating components for the door portal assembly.

Coordinate requirements for locations of blockouts for anchorage of door portal columns and other embedded components with Section 03 30 00 CAST-IN-PLACE CONCRETE.

Coordinate the erection of door portal with installation of surrounding glass wall and door assemblies. Ensure that the door portals can provide support and anchorage for assembly components.

Coordinate electrical requirements for electrified door hardware to ensure proper power source, conduit, wiring, and boxes.

3.2.1 Adjacent Surfaces Protection

Protect adjacent work areas and finish surfaces from damage during product installation.

3.2.2 Aluminum Surface Protection

Protect aluminum surfaces from contact with lime, mortar, cement, acids, and other harmful contaminants.

3.3 INSTALLATION

Submit installation drawings for review and approval. Include installation details showing interface with the adjacent wall assembly and all required locations of seals.

Install the entrance system in accordance with the manufacturer's instructions and the AAMA storefront and entrance guide specifications manual. Attach the entrance system to the structure, allowing it to be adjusted to accommodate construction tolerances and other irregularities. Provide alignment attachments and shims to permanently fasten the system to the building structure. Align the assembly so that it is plumb and level, and free of warp and twist. Maintain assembly dimensional tolerances aligning with adjacent work.

Set thresholds in a bed of mastic and secure the thresholds. Protect aluminum members in contact with masonry, steel, concrete, or dissimilar materials using nylon pads or a bituminous coating. Shim and brace the aluminum system before anchoring the system to the structure. Verify that weep holes are open, and the metal joints are sealed in accordance with the manufacturer's installation instructions. Seal metal-to-metal joints using a sealant recommended by the system manufacturer.

3.3.1 Tolerances

Ensure that tolerances for wall thickness and other cross-sectional dimensions of entrance members are nominal and in compliance with Aluminum Standards and Data, published by the Aluminum Association.

3.3.2 Adjusting

Adjust operating hardware for smooth operation, and as recommended by the manufacturer.

3.3.3 Related Products Installation Requirements

3.3.3.1 Sealants (Perimeter)

Refer to Section 07 92 00 JOINT SEALANTS.

3.3.3.2 Glass

Refer to Section 08 81 00 GLAZING.

3.4 FIELD QUALITY CONTROL

3.4.1 Air Infiltration

Test air infiltration in accordance with ASTM E783.

Submit certified test reports showing compliance with specified performance characteristics as follows:

- a. For single-acting offset pivot, butt hung, or continuous geared hinge entrances in the closed and locked position, test the specimen in accordance with ANSI/BHMA A156.10, and ASTM E283 at a pressure differential of 1.57 psf for pairs of doors; ensure that maximum infiltration for a pair of 7 foot by 8 foot entrance doors and frame is 1.2 cfm/square foot.
- b. Ensure the maximum allowable infiltration for a completed storefront system does not exceed 0.06 cfm/square foot when tested in accordance with ASTM E1424 at a differential static pressure of 6.24 psf.

3.4.2 Wind Loads

Provide a completed storefront system capable of withstanding wind pressure loads as indicated on structural drawings.

3.4.3 Deflection

Submit certified test reports showing that the maximum allowable deflection in a member when tested in accordance with ASTM E330/E330M with allowable stress is L/175 or 3/4 inches maximum.

3.4.4 Condensation Resistance and Thermal Transmittance

Submit certified test reports showing compliance with specified performance characteristics as follows:

- a. U-Value Requirements:
 - (1) Perform test in accordance with the AAMA 1503 procedure and on the configuration specified therein.
 - (2) Thermal Transmittance ("U" Value) maximum 0.65 (6250) BTU/hr/sf/deg F at 15 mph exterior wind.

b. CRF Class Requirements:

- (1) Perform a test in accordance with AAMA 1503.
- (2) Condensation Resistance Factor Requirements (CRF) minimum.

3.4.5 Water Infiltration

Submit certified test reports showing that the system is designed to provide no uncontrolled water when tested in accordance with ASTM E1105 at a static pressure of 8 psf.

3.5 ADJUSTING AND CLEANING

3.5.1 Protection

Protect the installed product's finish surfaces from damage during construction. Protect the aluminum storefront system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.

3.5.2 Cleaning

Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions before acceptance remove excess mastic, mastic smears, and other foreign materials. Remove construction debris from the project site and legally dispose of this debris.

3.6 WARRANTY

Submit three signed copies of the manufacturer's product warranty for the entrance system as follows:

- a. Warranty Period: Five years from Date of Substantial Completion of the project, provided that the Limited Warranty begins no later than six months from the date of shipment by the manufacturer. In addition, support welded door corner construction with a limited lifetime warranty for the life of the door under normal use.

Ensure that the Warranty's language is identical to the "As Approved" version of the sample warranty submitted to and returned from the Contracting Officer.

-- End of Section --

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SECTION 08 71 00

DOOR HARDWARE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM E283	(2019) Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.1	(2021) Butts and Hinges
ANSI/BHMA A156.2	(2017) Bored and Preamsembled Locks and Latches
ANSI/BHMA A156.3	(2020) Exit Devices
ANSI/BHMA A156.4	(2013) Door Controls - Closers
ANSI/BHMA A156.5	(2020) Cylinder and Input Devices for Locks
ANSI/BHMA A156.6	(2021) Architectural Door Trim
ANSI/BHMA A156.7	(2016) Template Hinge Dimensions
ANSI/BHMA A156.8	(2021) Door Controls - Overhead Stops and Holders
ANSI/BHMA A156.10	(2017) Power Operated Pedestrian Doors
ANSI/BHMA A156.13	(2017) Mortise Locks & Latches Series 1000
ANSI/BHMA A156.16	(2018) Auxiliary Hardware
ANSI/BHMA A156.18	(2020) Materials and Finishes
ANSI/BHMA A156.21	(2019) Thresholds
ANSI/BHMA A156.22	(2021) Door Gasketing and Edge Seal Systems
ANSI/BHMA A156.25	(2013) Electrified Locking Devices
ANSI/BHMA A156.30	(2014) High Security Cylinders

ANSI/BHMA A156.31 (2013) Electric Strikes and Frame Mounted Actuators

ANSI/BHMA A156.36 (2010) Auxiliary Locks

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA 20-1; TIA 20-2; TIA 20-3; TIA 20-4) National Electrical Code

NFPA 72 (2019; TIA 19-1; ERTA 1 2019) National Fire Alarm and Signaling Code

NFPA 80 (2022) Standard for Fire Doors and Other Opening Protectives

NFPA 101 (2018; ERTA 18-1; ERTA 18-2; ERTA 18-3; ERTA 18-4; TIA 18-1; TIA 18-2; TIA 18-3; TIA 18-4) Life Safety Code

NFPA 252 (2022) Standard Methods of Fire Tests of Door Assemblies

STEEL DOOR INSTITUTE (SDI/DOOR)

SDI/DOOR A250.8 (2017) Specifications for Standard Steel Doors and Frames

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

36 CFR 1191 Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

UNDERWRITERS LABORATORIES (UL)

UL Bld Mat Dir (updated continuously online) Building Materials Directory

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Manufacturer's Detail Drawings; G RO

Verification of Existing Conditions; G RO

Hardware Schedule; G RO

Keying System; G RO

SD-03 Product Data

Hardware Items; G, RO

SD-08 Manufacturer's Instructions

Installation

SD-10 Operation and Maintenance Data

Hardware Schedule Items, Data Package 1; G RO

SD-11 Closeout Submittals

Key Bitting

1.3 SHOP DRAWINGS

Submit manufacturer's detail drawings indicating all hardware assembly components and interface with adjacent construction. Indicate power components and wiring coordination for electrified hardware. Base shop drawings on verified field measurements and include verification of existing conditions.

1.4 PRODUCT DATA

Indicate fire-ratings at applicable components. Provide documentation of ABA/ADA accessibility compliance of applicable components, as required by 36 CFR 1191 Appendix D - Technical.

1.5 HARDWARE SCHEDULE

Provide Hardware Item List and Hardware Schedule containing the following information, and additional information as needed to identify the complete make up of each hardware set and its application to each opening:

1.5.1 Hardware Item List:

- a. Hardware Type
- b. Item Number
- c. Quantity
- d. Size(s)
- e. Reference Publication / Type Number
- f. Manufacturer's Name / Catalog Number
- g. Key Control Symbols
- h. UL Mark (If fire rated and listed)
- i. BHMA Finish(es)
- j. Remarks

1.5.2 Hardware Schedule

- a. Hardware Set Number
- b. Opening Number(s)
- c. Opening Description (single/double leaf, hand, size, door/frame material)
- d. Fire Rating
- e. Sound Rating
- f. Hardware Items
- g. Quantity
- h. Size
- i. BHMA Finish
- j. Remarks

In addition, submit hardware schedule data package 1 in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

1.6 KEY BITTING CHART REQUIREMENTS

1.6.1 Requirements

Submit key bitting charts to the Contracting Officer prior to completion of the work. Include:

- a. Complete listing of all keys (e.g., AA1 and AA2).
- b. Complete listing of all key cuts (AA1-123456, AA2-123458).
- c. Tabulation showing which key fits which door.
- d. Copy of floor plan showing doors and door numbers.
- e. Listing of 20 percent more key cuts than are presently required in each master system.

1.7 QUALITY ASSURANCE

1.7.1 Hardware Manufacturers and Modifications

Provide, as far as feasible, locks, hinges, and closers of one lock, hinge, or closer manufacturer's make. Modify hardware as necessary to provide features indicated or specified.

1.7.2 Key Shop Drawings Coordination Meeting

Prior to the submission of the key shop drawing, the Contracting Officer, Contractor, Door Hardware Subcontractor, using Activity and Base Locksmith must meet to discuss and coordinate key requirements for the facility.

1.8 DELIVERY, STORAGE, AND HANDLING

Deliver hardware in original individual containers, complete with necessary appurtenances including fasteners and instructions. Mark each individual container with item number as shown on hardware schedule. Deliver permanent keys and removable cores to the Contracting Officer, either directly or by certified mail. Deliver construction master keys with the locks.

PART 2 PRODUCTS

2.1 TEMPLATE HARDWARE

Hardware applied to metal or to prefinished doors must be manufactured using a template. Provide templates to door and frame manufacturers in accordance with ANSI/BHMA A156.7 for template hinges. Coordinate hardware items to prevent interference with other hardware.

2.2 HARDWARE FOR FIRE DOORS AND EXIT DOORS

Provide all hardware necessary to meet the requirements of NFPA 72 for door alarms, NFPA 80 for fire doors, NFPA 101 for exit doors, NFPA 252 for fire tests of door assemblies, ABA/ADA accessibility requirements, and all other requirements indicated, even if such hardware is not specifically mentioned in paragraph HARDWARE SCHEDULE. Provide Underwriters Laboratories, Inc. labels for such hardware in accordance with UL Bld Mat Dir or equivalent labels in accordance with another testing laboratory approved in writing by the Contracting Officer.

2.3 HARDWARE ITEMS

Clearly and permanently mark with the manufacturer's name or trademark, hinges, pivots, locks, latches, exit devices, bolts and closers where the identifying mark is visible after the item is installed. For closers with covers, the name or trademark may be beneath the cover. Coordinate electrified door hardware components with corresponding components specified in Division 28 ELECTRONIC SECURITY SYSTEMS (ESS).

2.3.1 Hinges

Provide in accordance with ANSI/BHMA A156.1. Provide hinges that are 4-1/2 by 4-1/2 inch unless otherwise indicated. Construct loose pin hinges for interior doors and reverse-bevel exterior doors so that pins are non-removable when door is closed. Other anti-friction bearing hinges may be provided in lieu of ball bearing hinges.

2.3.2 Locks and Latches

2.3.2.1 Mortise Locks and Latches

Provide in accordance with ANSI/BHMA A156.13, Series 1000, Operational Grade 1, Security Grade 2. Provide mortise locks with escutcheons not less than 7 by 2-1/4 inch with a bushing at least 1/4 inch long. Cut escutcheons to fit cylinders and provide trim items with straight, beveled, or smoothly rounded sides, corners, and edges. Provide levers and roses of mortise locks with screwless shanks and no exposed screws.

2.3.2.2 Auxiliary Locks

Provide in accordance with ANSI/BHMA A156.36, Grade 1.

2.3.3 Exit Devices

Provide in accordance with ANSI/BHMA A156.3, Grade 1. Provide adjustable strikes for rim type and vertical rod devices. Provide open back strikes for pairs of doors with mortise and vertical rod devices. Provide touch bars in lieu of conventional crossbars and arms.

Use stainless steel or bronze base metal with plated finishes. Also include stainless steel fasteners and screws.

2.3.4 Cylinders and Cores

Provide cylinders and cores for new locks, including locks provided under other sections of this specification. Provide cylinders and cores with seven pin tumblers. Provide cylinders from the products of one manufacturer, and provide cores from the products of one manufacturer. Rim cylinders, mortise cylinders, and levers of bored locksets have interchangeable cores which are removable by special control keys. Stamp each interchangeable core with a key control symbol in a concealed place on the core.

2.3.4.1 High Security Cylinders

Provide in accordance with ANSI/BHMA A156.30, security level as required to match existing system for all high security cylinder components.

2.3.5 Electrified Hardware

Comply with the requirements of NFPA 70 for wiring of electrified hardware.

2.3.5.1 Electric Strikes and Frame Mounted Actuators

Provide in accordance with ANSI/BHMA A156.31, Grade 1. Provide electric strikes and actuators as required to meet operational requirements. Provide electric strikes that remain secure during power failure. Provide a separate power supply for electric strikes, other locking devices and ancillary parts. Provide strikes and actuators with a minimum opening force of 2300 pounds.

Provide facility interface devices that use direct current (dc) power to energize the solenoids. Provide electric strikes and actuators that incorporate end-of-line resistors to facilitate line supervision by the system. If not incorporated into the electric strike or local controller, provide metal oxide resistors (MOVs) to protect the controller from reverse current surges.

2.3.5.1.1 Solenoid

Provide actuating solenoid for strikes and actuators that are rated for continuous duty, cannot dissipate more than 12 Watts and must operate on 12 or 24 Volts dc. Inrush current cannot exceed 1 ampere and the holding current cannot be greater than 500 milliamperes. Actuating solenoid must move from fully secure to fully open positions in less than 500 milliseconds.

2.3.5.1.2 Signal Switches

Provide strikes and actuators with signal switches to indicate to the system when the bolt is not engaged or the strike mechanism is unlocked. Signal switches must report a forced entry to the system.

2.3.5.1.3 Tamper Resistance

Provide strike guards that prevent tampering with the latch bolt of the locking hardware or the latch bolt keeper of the electric strike. Strike guards to bolt through the door using tamper resistant screws. Provide strike guards made of 1/8 inch thick brass and that are 11-1/14 inch high by 1-5/8 inch wide, with a minimum 5/32 inch wide offset.

2.3.5.1.4 Coordination

Provide electric strikes and actuators of a size, weight and profile compatible with each specified door frame. Field verify installation clearances prior to procurement.

2.3.5.1.5 Mounting Method

Provide electric strikes and actuators suitable for use with single and double doors, with mortise or rim type hardware specified, and for right or left hand mounting as specified. In double door installations, locate the lock in the active leaf and monitor the fixed leaf.

2.3.5.2 Electrified Mortise Locks

Provide in accordance with ANSI/BHMA A156.25, Grade 1. Provide electrified mortise locks that remain secure during power failure. Provide facility interface devices that use dc power to energize solenoids. Provide solenoids, resistors, and signal switches in accordance with paragraph ELECTRIC STRIKES AND FRAME MOUNTED ACTUATORS.

2.3.5.2.1 Power Transfer Hinges

Provide power transfer hinges with each electrified lock that route power and monitoring signals from the lockset to the door frame. Coordinate power transfer hinges with door frames.

2.3.5.3 Power Operated Pedestrian Door Hardware

Provide in accordance with ANSI/BHMA A156.10, Grade 1.

2.3.6 Keying System

Provide an extension of the existing keying system. Existing locks were manufactured by confirm with end user and have interchangeable cores. Provide construction interchangeable cores. Provide key cabinet as specified.

2.3.7 Lock Trim

Provide cast, forged, or heavy wrought construction and commercial plain design for lock trim.

2.3.7.1 Levers and Roses

Provide in accordance with ANSI/BHMA A156.2 and ANSI/BHMA A156.13 for levers, roses, and escutcheons. For unreinforced levers, roses, and escutcheons, provide a 0.050 inch thickness. For reinforced levers, roses, and escutcheons, provide an outer shell thickness of 0.035 inch and a combined total thickness of 0.070 inch, except at lever shanks. Provide lever shanks 0.060 inch thick.

2.3.7.2 Lever Handles

Provide lever handles. Provide in accordance with ANSI/BHMA A156.3 for mortise locks of lever handles for exit devices. Provide lever handle locks with a breakaway feature (such as a weakened spindle or a shear key) to prevent irreparable damage to the lock when force in excess of that specified in ANSI/BHMA A156.13 is applied to the lever handle. Provide lever handles return to within 1/2 inch of the door face.

2.3.8 Keys

Provide one file key, one duplicate key, and one working key for each key change and for each master and grand master keying system. Provide one additional working key for each lock of each keyed-alike group. Provide 4 great grand master keys, 6 construction master keys, and 4 control keys for removable cores. Stamp each key with appropriate key control symbol and "U.S. property - do not duplicate." Do not place room number on keys.

2.3.9 Door Bolts

Provide in accordance with ANSI/BHMA A156.16. Provide dustproof strikes for bottom bolts, except at doors having metal thresholds. Provide automatic latching flush bolts in accordance with ANSI/BHMA A156.3, Type 25.

2.3.10 Closers

Provide in accordance with ANSI/BHMA A156.4, Series C02000, Grade 1, with PT 4C. Provide with brackets, arms, mounting devices, fasteners, full size covers and other features necessary for the particular application. Size closers in accordance with manufacturer's printed recommendations, or provide multi-size closers, Sizes 1 through 6, and list sizes in the Hardware Schedule. Provide manufacturer's 10 year warranty.

2.3.10.1 Identification Marking

Engrave each closer with manufacturer's name or trademark, date of manufacture, and manufacturer's size designation in locations that will be visible after installation.

2.3.11 Overhead Holders

Provide in accordance with ANSI/BHMA A156.8.

2.3.12 Door Protection Plates

Provide in accordance with ANSI/BHMA A156.6.

2.3.12.1 Sizes of Armor Kick Plates

2 inch less than door width for single doors; 1 inch less than door width for pairs of doors. Provide 10 inch kick plates for flush doors and 1 inch less than height of bottom rail for panel doors. Provide a minimum 34 inch armor plates for flush doors.

2.3.13 Door Stops and Silencers

Provide in accordance with ANSI/BHMA A156.16. Silencers Type L03011. Provide three silencers for each single door, two for each pair.

2.3.14 Thresholds

Provide in accordance with ANSI/BHMA A156.21. Use J35100, with vinyl or silicone rubber insert in face of stop, for exterior doors opening out, unless specified otherwise.

2.3.15 Weatherstripping Gasketing

Provide in accordance with ANSI/BHMA A156.22. Provide the type and function designation where specified in paragraph HARDWARE SCHEDULE. Provide a set to include head and jamb seals, sweep strips, and, for pairs of doors, astragals. Air leakage of weatherstripped doors not to exceed 1.25 cubic feet per minute of air per square foot of door area when tested in accordance with ASTM E283. Provide weatherstripping with one of the following:

2.3.15.1 Extruded Aluminum Retainers

Extruded aluminum retainers not less than 0.050 inch wall thickness with vinyl, neoprene, silicone rubber, or polyurethane inserts. Provide clear anodized aluminum.

2.3.16 Gasketing

Provide in accordance with ANSI/BHMA A156.22. Provide adjustable doorstops at heads, jambs and automatic door bottoms in accordance with the hardware set, of extruded aluminum, clear anodized, surface applied, with vinyl fin seals between plunger and housing. Provide doorstops with solid neoprene tube, silicone rubber, or closed cell sponge gasket. Provide door bottoms with adjustable operating rod and silicone rubber or closed cell sponge neoprene gasket. Provide doorstops that are mitered at corners. Provide type and function designation where specified in paragraph HARDWARE SETS.

2.3.17 Rain Drips

Provide in accordance with ANSI/BHMA A156.22. Provide extruded aluminum rain drips, not less than 0.08 inch thick, clear anodized finish. Provide rain drips with a 4 inch overlap on each side of each exterior door that is not protected by an awning, roof, eave or other horizontal projection. Set drips in sealant and fasten with stainless steel screws.

2.3.17.1 Door Rain Drips

Approximately 1-1/2 inch high by 5/8 inch projection. Align bottom with bottom edge of door.

2.3.17.2 Overhead Rain Drips

Approximately 1-1/2 inch high by 2-1/2 inch projection. Align bottom with door frame rabbet.

2.3.18 Auxiliary Hardware (Other than locks)

Provide in accordance with ANSI/BHMA A156.16, Grade 1.

2.3.19 Special Tools

Provide special tools, such as spanner and socket wrenches and dogging keys, as required to service and adjust hardware items.

2.4 FASTENERS

Provide fasteners of type, quality, size, and quantity appropriate to the specific application. Fastener finish to match hardware. Provide stainless steel or nonferrous metal fasteners in locations exposed to weather. Verify metals in contact with one another are compatible and will avoid galvanic corrosion when exposed to weather.

2.5 FINISHES

Provide in accordance with ANSI/BHMA A156.18. Provide hardware in BHMA 630 finish (satin stainless steel), unless specified otherwise. Provide items not manufactured in stainless steel in BHMA 626 finish (satin chromium plated) over brass or bronze, except aluminum paint finish for surface door closers, and except BHMA 652 finish (satin chromium plated) for steel hinges. Provide hinges for exterior doors in stainless steel with BHMA 630 finish or chromium plated brass or bronze with BHMA 626 finish. Furnish exit devices in BHMA 626 finish in lieu of BHMA 630 finish except where BHMA 630 is specified under paragraph HARDWARE SETS. Match exposed parts of concealed closers to lock and door trim. Match hardware finish for aluminum doors to the doors.

2.6 KEY CABINET AND CONTROL SYSTEM

Provide in accordance with ANSI/BHMA A156.5, Type required to yield a capacity (number of hooks) 50 percent greater than the number of key changes used for door locks.

PART 3 EXECUTION

3.1 INSTALLATION

Provide hardware in accordance with manufacturers' printed installation instructions. Fasten hardware to wood surfaces with full-threaded wood screws or sheet metal screws. Provide machine screws set in expansion shields for fastening hardware to solid concrete and masonry surfaces. Provide toggle bolts where required for fastening to hollow core construction. Provide through bolts where necessary for satisfactory installation.

3.1.1 Weatherstripping Installation

Provide full contact, weathertight seals that allow operation of doors without binding the weatherstripping.

3.1.1.1 Stop Applied Weatherstripping

Fasten in place with color matched sheet metal screws not more than 9 inch on center after doors and frames have been finish painted.

3.1.2 Installation

Provide as specified for stop applied weatherstripping.

3.1.3 Threshold Installation

Extend thresholds the full width of the opening and notch end for jamb stops. Set thresholds in a full bed of sealant and anchor to floor with cadmium-plated, countersunk, steel screws. For aluminum thresholds placed on top of concrete surfaces, coat the underside surfaces that are in contact with the concrete with fluid applied waterproofing as a separation measure prior to placement.

3.2 FIRE DOORS AND EXIT DOORS

Provide hardware in accordance with NFPA 72 for door alarms, NFPA 80 for fire doors, NFPA 101 for exit doors, and NFPA 252 for fire tests of door assemblies.

3.3 HARDWARE LOCATIONS

Provide in accordance with SDI/DOOR A250.8, unless indicated or specified otherwise.

- a. Kick and Armor Plates: Push side of single-acting doors.

3.4 KEY CABINET AND CONTROL SYSTEM

Locate where directed. Tag one set of file keys and one set of duplicate keys. Place other keys in appropriately marked envelopes, or tag each key. Provide complete instructions for setup and use of key control system. On tags and envelopes, indicate door and room numbers or master or grand master key.

3.5 FIELD QUALITY CONTROL

After installation, protect hardware from paint, stains, blemishes, and other damage until acceptance of work. Submit notice of testing 15 days before scheduled, so that testing can be witnessed by the Contracting Officer. Adjust hinges, locks, latches, bolts, holders, closers, and other items to operate properly. Demonstrate that permanent keys operate respective locks, and give keys to the Contracting Officer. Correct, repair, and finish, errors in cutting and fitting and damage to adjoining work.

3.6 HARDWARE SETS

Provide hardware for aluminum doors under this section. Deliver Hardware templates and hardware, except field applied hardware, to the aluminum door and frame manufacturer for use in fabricating doors and frames.

Set: 1.0

Doors: 101, 114A, 120A, 120B, 126A, 126B, 127, 130A, 133A

Description: Single Exterior Vest/ Hall/ Corridor (CR)

2	Hinge, Hvy Wt	A5111 4-1/2" x 4-1/2" NRP	US32D
1	Electrified Hinge	A5111 4-1/2" x 4-1/2" ETW as req'd	US32D
1	Mortise Lock (fail secure)	1000 Grade 1 F07 Lever E01 E06	626
1	Cylinder	Type as req'd for lock	626
1	Door Closer w/stop	C02021 PT4H-BF/PT4D/PT4G	AL
1	Kick Plate	J102 10" x 2" LDW BEV CSK	US32D-316
1	Threshold	J35130	
1	Gasketing	R3E165 (Head & Jambs)	
1	Rain Guard	RAY976	
1	Sweep	R3B435	
1	Wiring Harness	Wiring Harness w/ plug in connectors (Door)	
1	Wiring Harness	Wiring Harness w/ plug in connectors (Frame)	
1	Position Switch	By Access Control; Prep by D/F Mfr.	
1	Card Reader	By Access Control	
1	Power Supply	By Access Control	

Notes:

Operation:

1. Doors electrically unlocked or locked during established time zones as programmed by the access control system. When lever on non secure side is locked the card reader grants access upon presentation of a valid credential. Locksets mechanically lock during power failure with a mechanical key override entry.
2. Lever is always operational from the secure side and retracts latch.
3. Request to exit switch in lever to signal authorized egress to the access control system.
4. Door position switch to signal door open/closed to the access control system.

Set: 2.0

Doors: 109

Description: Single Exterior Elec

3	Hinge, Hvy Wt	A5111 4-1/2" x 4-1/2" NRP	US32D
1	Rim Exit Device, Storeroom	Type 1 GR1 F09 Lever	US32D
1	Cylinder	Type as req'd for exit device	626
1	Door Closer w/stop	C02021 PT4H-BF/PT4D/PT4G	AL
1	Kick Plate	J102 10" x 2" LDW BEV CSK	US32D-316
1	Threshold	J35130	
1	Gasketing	R3E165 (Head & Jambs)	
1	Rain Guard	RAY976	
1	Sweep	R3B435	

Set: 3.0

Doors: 110, 151

Description: Pair Exterior Mech

6	Hinge, Hvy Wt	A5111 4-1/2" x 4-1/2" NRP	US32D
2	Manual Flush Bolt	L04251	US26D
1	Dust Proof Strike	L04021 w/floor plate	US26D

1	Mortise Lock (storeroom)	1000 Grade 1 F07 Lever x 7/8" Strike	626
1	Cylinder	Type as req'd for lock	626
2	Door Closer w/stop	C02021 PT4H-BF/PT4D/PT4G	AL
2	Kick Plate	J102 10" x 2" LDW BEV CSK	US32D-316
1	Threshold	J35130	
1	Gasketing	R3E165 (Head & Jambs)	
1	Rain Guard	RAY976	
2	Sweep	R3B435	
1	Astragal	ROY636	

Notes: Mount astragal on pull side of active leaf and size doors for 1/8" clearance between leaves. Paint astragal to match doors.

Set: 4.0

Doors: 113A, 115A

Description: Pair Exterior Food Storage/ Tack (CR)

5	Hinge, Hvy Wt	A5111 4-1/2" x 4-1/2" NRP	US32D
1	Electrified Hinge	A5111 4-1/2" x 4-1/2" ETW as req'd	US32D
2	Manual Flush Bolt	L04251	US26D
1	Dust Proof Strike	L04021 w/floor plate	US26D
1	Mortise Lock (storeroom)	1000 Grade 1 F07 Lever x 7/8" Strike	626
1	Cylinder	Type as req'd for lock	626
2	Surf Overhead Hold Open	C02511	630
2	Door Closer PA	C02021 PT4H-BF/PT4D	AL
2	Armor Plate	J102 34" x 2" LDW BEV CSK	US32D-316
1	Threshold	J35130	
1	Gasketing	R3E165 (Head & Jambs)	
1	Rain Guard	RAY976	
2	Sweep	R3B435	
1	Astragal	ROY636	
1	Wiring Harness	Wiring Harness w/ plug in connectors (Door)	
1	Wiring Harness	Wiring Harness w/ plug in connectors (Frame)	
2	Position Switch	By Access Control; Prep by D/F Mfr.	
1	Card Reader	By Access Control	
1	Power Supply	By Access Control	

Notes:

Mount astragal on pull side of active leaf and size doors for 1/8" clearance between leaves. Paint astragal to match doors.

Operation:

1. Doors electrically unlocked or locked during established time zones as programmed by the access control system. When lever on non secure side is locked the card reader grants access upon presentation of a valid credential. Locksets mechanically lock during power failure with a mechanical key override entry.
2. Lever is always operational from the secure side and retracts latch.
3. Request to exit switch in lever to signal authorized egress to the access control system.
4. Door position switch to signal door open/closed to the access control system.

Set: 5.0

Doors: 101A

Description: Single Corridor (CR, STC)

2	Hinge, Hvy Wt	A8111 4-1/2" x 4-1/2"	US26D
1	Hinge, Hvy Wt	A8111 4-1/2" x 4-1/2" ETW as req'd	US26D

1	Mortise Lock (fail secure)	1000 Grade 1 F07 Lever E01 E06	626
1	Cylinder	Type as req'd for lock	626
1	Door Closer PA	C02021 PT4H-BF/PT4D	AL
1	Kick Plate	J102 10" x 2" LDW BEV CSK	US32D
1	Wall Stop	L02251	US32D
1	Wiring Harness	Wiring Harness w/ plug in connectors (Door)	
1	Wiring Harness	Wiring Harness w/ plug in connectors (Frame)	
1	Position Switch	By Access Control; Prep by D/F Mfr.	
1	Card Reader	By Access Control	
1	Power Supply	By Access Control	

Notes: Perimeter seals, door bottom, and threshold (if required) by acoustic door manufacturer.

Operation:

1. Doors electrically unlocked or locked during established time zones as programmed by the access control system. When lever on non secure side is locked the card reader grants access upon presentation of a valid credential. Locksets mechanically lock during power failure with a mechanical key override entry.
2. Lever is always operational from the secure side and retracts latch.
3. Request to exit switch in lever to signal authorized egress to the access control system.
4. Door position switch to signal door open/closed to the access control system.

Set: 6.0

Doors: 118

Description: Single Corridor Rated (STC)

3	Hinge, Hvy Wt	A8111 4-1/2" x 4-1/2"	US26D
1	Mortise Lock (classroom)	1000 Grade 1 F05 Lever	626
1	Cylinder	Type as req'd for lock	626
1	Door Closer Reg	C02011 PT4H-BF/PT4D	AL
1	Kick Plate	J102 10" x 2" LDW BEV CSK	US32D
1	Wall Stop	L02251	US32D

Notes: Perimeter seals, door bottom, and threshold (if required) by acoustic door manufacturer.

Set: 7.0

Doors: 112

Description: Single Surgery (STC, ADA)

3	Hinge, Hvy Wt	A8111 4-1/2" x 4-1/2"	US26D
1	Mortise Lock (passage)	1000 Grade 1 F01 Lever	626
1	Electric Strike	E09321	630
1	Automatic Operator	Low Energy Automatic Operator	689
1	Power Supply	By Hardware Supplier as Req'd for Strike	
2	Actuator - Wall mount	Wave to Open Type	

Notes: Perimeter seals, door bottom, and threshold (if required) by acoustic door manufacturer.

Operation:

1. Performing wave to open at inside or outside actuator will always release electric strike and open the door unless the operator is turned off.

Set: 8.0

Doors: 123A, 123B, 123C, 123D

Description: Single Kennel Corridor (CR)

2	Hinge, Hvy Wt	A5111 4-1/2" x 4-1/2"	US32D
1	Electrified Hinge	A5111 4-1/2" x 4-1/2" ETW as req'd	US32D
1	Mortise Lock (fail secure)	1000 Grade 1 F07 Lever E01 E06	626
1	Cylinder	Type as req'd for lock	626
1	Door Closer Reg	C02011 PT4H-BF/PT4D	AL
1	Armor Plate	J102 34" x 2" LDW BEV CSK	US32D-316
1	Wall Stop	L02251	US32D
3	Silencer	Metal frame type	
1	Wiring Harness	Wiring Harness w/ plug in connectors (Door)	
1	Wiring Harness	Wiring Harness w/ plug in connectors (Frame)	
1	Position Switch	By Access Control; Prep by D/F Mfr.	
1	Card Reader	By Access Control	
1	Power Supply	By Access Control	

Operation:

1. Doors electrically unlocked or locked during established time zones as programmed by the access control system. When lever on non secure side is locked the card reader grants access upon presentation of a valid credential. Locksets mechanically lock during power failure with a mechanical key override entry.

2. Lever is always operational from the secure side and retracts latch.

3. Request to exit switch in lever to signal authorized egress to the access control system.

4. Door position switch to signal door open/closed to the access control system.

Set: 9.0

Doors: 102, 103

Description: Single Office (STC)

3	Hinge, Hvy Wt	A8111 4-1/2" x 4-1/2"	US26D
1	Mortise Lock (entry)	1000 Grade 1 F04 Lever	626
1	Cylinder	Type as req'd for lock	626
1	Wall Stop	L02251	US32D

Notes: Perimeter seals, door bottom, and threshold (if required) by acoustic door manufacturer.

Set: 10.0

Doors: 104

Description: Single Multi-Purpose (STC)

3	Hinge, Hvy Wt	A8111 4-1/2" x 4-1/2"	US26D
1	Mortise Lock (classroom)	1000 Grade 1 F05 Lever	626
1	Cylinder	Type as req'd for lock	626
1	Door Closer Reg	C02011 PT4H-BF/PT4D	AL
1	Kick Plate	J102 10" x 2" LDW BEV CSK	US32D
1	Wall Stop	L02251	US32D

Notes: Perimeter seals, door bottom, and threshold (if required) by acoustic door manufacturer.

Set: 11.0

Doors: 111

Description: Single Treatment Rated (STC)

3	Hinge, Hvy Wt	A8111 4-1/2" x 4-1/2"	US26D
1	Mortise Lock (classroom)	1000 Grade 1 F05 Lever	626
1	Cylinder	Type as req'd for lock	626
1	Surface Overhead Stop	C02541	630
1	Door Closer Reg	C02011 PT4H-BF/PT4D	AL
1	Kick Plate	J102 10" x 2" LDW BEV CSK	US32D

Notes: Perimeter seals, door bottom, and threshold (if required) by acoustic door manufacturer.

Set: 12.0

Doors: 113, 115

Description: Single Food Storage/ Tack

3	Hinge, Hvy Wt	A8111 4-1/2" x 4-1/2"	US26D
1	Mortise Lock (classroom)	1000 Grade 1 F05 Lever	626
1	Cylinder	Type as req'd for lock	626
1	Surface Overhead Stop	C02541	630
1	Door Closer Reg	C02011 PT4H-BF/PT4D	AL
1	Kick Plate	J102 10" x 2" LDW BEV CSK	US32D
3	Silencer	Metal frame type	

Set: 13.0

Doors: 117, 117A

Description: Single Locker (CR, STC)

2	Hinge, Hvy Wt	A8111 4-1/2" x 4-1/2"	US26D
1	Electrified Hinge	A5111 4-1/2" x 4-1/2" ETW as req'd	US32D
1	Mortise Lock (fail secure)	1000 Grade 1 F07 Lever E01 E06	626
1	Cylinder	Type as req'd for lock	626
1	Door Closer Reg	C02011 PT4H-BF/PT4D	AL
1	Kick Plate	J102 10" x 2" LDW BEV CSK	US32D
1	Wall Stop	L02251	US32D
1	Wiring Harness	Wiring Harness w/ plug in connectors (Door)	
1	Wiring Harness	Wiring Harness w/ plug in connectors (Frame)	
1	Position Switch	By Access Control; Prep by D/F Mfr.	
1	Card Reader	By Access Control	
1	Power Supply	By Access Control	

Notes: Perimeter seals, door bottom, and threshold (if required) by acoustic door manufacturer.

Operation:

1. Doors electrically unlocked or locked during established time zones as programmed by the access control system. When lever on non secure side is locked the card reader grants access upon presentation of a valid credential. Locksets mechanically lock during power failure with a mechanical key override entry.
2. Lever is always operational from the secure side and retracts latch.
3. Request to exit switch in lever to signal authorized egress to the access control system.
4. Door position switch to signal door open/closed to the access control system.

Set: 14.0 (Not Used)

Set: 15.0

Doors: 130

Description: Single Quarantine

3	Hinge, Hvy Wt	A8111 4-1/2" x 4-1/2"	US26D
1	Mortise Lock (passage)	1000 Grade 1 F01 Lever	626
1	Door Closer w/stop	C02021 PT4H-BF/PT4D/PT4G	AL
1	Kick Plate	J102 10" x 2" LDW BEV CSK	US32D-316
3	Silencer	Metal frame type	

Set: 16.0

Doors: 108

Description: Single Tele (X-10, STC)

3	Hinge, Hvy Wt	A8111 4-1/2" x 4-1/2" NRP	US26D
1	High Security Lock	LKM10K H X10 Type II x Strike as Req	US26D
1	Cylinder	Type as req'd for lock	626
1	Door Closer PA	C02021 PT4H-BF/PT4D	AL
1	Kick Plate	J102 10" x 2" LDW BEV CSK	US32D
1	Wall Stop	L02251	US32D
1	Electric Power Transfer	Type as req'd for Lock	
1	Position Switch	By Access Control; Prep by D/F Mfr.	
1	Card Reader	By Access control	
1	Power Supply	By Access Control	

Notes: Perimeter seals, door bottom, and threshold (if required) by acoustic door manufacturer.

Operation:

1. X-10 Combination lock is the first tier of security and must be unlocked in order for the second tier (card reader) to become operational.
2. Card reader grants access upon presentation of a valid credential. Device to fail secure during power failure.
3. Egress always free from inside by inside push/pull handle.
4. Request switch in handle to signal authorized egress to the intrusion detection system.
5. Balanced magnetic switch to signal door open/closed to the intrusion detection system.

Set: 17.0

Doors: 106

Description: Single Restroom (STC)

3	Hinge, Hvy Wt	A8111 4-1/2" x 4-1/2"	US26D
1	Mortise Lock (passage)	1000 Grade 1 F01 Lever	626
1	Surface Overhead Stop	C02541	630
1	Door Closer Reg	C02011 PT4H-BF/PT4D	AL
1	Kick Plate	J102 10" x 2" LDW BEV CSK	US32D

Notes: Perimeter seals, door bottom, and threshold (if required) by acoustic door manufacturer.

Set: 18.0

Doors: 107, 116

Description: Single Toilet/ Mothers (STC)

3	Hinge, Hvy Wt	A8111 4-1/2" x 4-1/2"	US26D
1	Mortise Lock (privacy)	1000 Grade 1 F02 Lever VIN	626
1	Door Closer Reg	C02011 PT4H-BF/PT4D	AL
1	Kick Plate	J102 10" x 2" LDW BEV CSK	US32D
1	Wall Stop	L02251	US32D

Notes: Perimeter seals, door bottom, and threshold (if required) by
acoustic door manufacturer.

-- End of Section --

SECTION 08 81 00

GLAZING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 800 (2016) Voluntary Specifications and Test
Methods for Sealants

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z97.1 (2015) Safety Glazing Materials Used in
Buildings - Safety Performance
Specifications and Methods of Test

ASTM INTERNATIONAL (ASTM)

ASTM C509 (2006; R 2021) Standard Specification for
Elastomeric Cellular Preformed Gasket and
Sealing Material

ASTM C864 (2005; R 2015) Dense Elastomeric
Compression Seal Gaskets, Setting Blocks,
and Spacers

ASTM C920 (2018) Standard Specification for
Elastomeric Joint Sealants

ASTM C1021 (2008; R 2014) Standard Practice for
Laboratories Engaged in Testing of
Building Sealants

ASTM C1036 (2021) Standard Specification for Flat
Glass

ASTM C1048 (2018) Standard Specification for
Heat-Strengthened and Fully Tempered Flat
Glass

ASTM C1087 (2016) Standard Test Method for
Determining Compatibility of
Liquid-Applied Sealants with Accessories
Used in Structural Glazing Systems

ASTM C1172 (2019) Standard Specification for
Laminated Architectural Flat Glass

ASTM C1281 (2016) Standard Specification for
Preformed Tape Sealants for Glazing

Applications

ASTM D395	(2016; E 2017) Standard Test Methods for Rubber Property - Compression Set
ASTM D2287	(2019) Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
ASTM E1300	(2016) Standard Practice for Determining Load Resistance of Glass in Buildings
ASTM E2190	(2010) Standard Specification for Insulating Glass Unit Performance and Evaluation

GLASS ASSOCIATION OF NORTH AMERICA (GANA)

GANA Glazing Manual	(2008) Glazing Manual
GANA Sealant Manual	(2008) Sealant Manual

INSULATING GLASS MANUFACTURERS ALLIANCE (IGMA)

IGMA TB-1200	(1983; R 2016) Guidelines for Insulating Glass Dimensional Tolerances
IGMA TB-3001	(2001) Guidelines for Sloped Glazing
IGMA TM-3000	(1990; R 2016) North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

NFRC 100	(2020) Procedure for Determining Fenestration Product U-Factors
NFRC 200	(2020) Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

16 CFR 1201	Safety Standard for Architectural Glazing Materials

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Insulating Glass; G, RO

Glazing Accessories

Sealants; G, RO

Joint Backer; G, RO

SD-04 Samples

Insulating Glass; G, RO

Glazing Compound

Glazing Tape

Sealing Tapes

SD-07 Certificates

Insulating Glass; G, RO

SD-08 Manufacturer's Instructions

Setting and Sealing Materials

Glass Setting

SD-11 Closeout Submittals

Warranty for Insulated Glass Units; G, RO

1.3 SYSTEM DESCRIPTION

Fabricate and install watertight and airtight glazing systems to withstand thermal movement and wind loading without glass breakage, gasket failure, deterioration of glazing accessories, or defects in the work. Glazed panels must comply with the safety standards, in accordance with ANSI Z97.1, and comply with indicated wind/snow loading in accordance with ASTM E1300.

1.4 QUALITY CONTROL

Submit two 8 by 10 inch samples of each of the following: Tinted glass and insulating glass units.

Submit three samples of each other material. Samples of plastic sheets must be minimum 5 by 7 inches.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver products to the site in unopened containers, labeled plainly with manufacturers' names and brands. Store glass and setting materials in safe, enclosed dry locations and do not unpack until needed for installation. Handle and install materials in a manner that will protect them from damage.

1.6 ENVIRONMENTAL REQUIREMENTS

Do not start glazing work until the outdoor temperature is above 40 degrees F and rising, unless procedures recommended by the glass

manufacturer and approved by the Contracting Officer are made to warm the glass and rabbit surfaces. Provide ventilation to prevent condensation of moisture on glazing work during installation. Do not perform glazing work during damp or rainy weather.

1.7 WARRANTY

1.7.1 Warranty for Insulated Glass Units

Warranty insulating glass units against development of material obstruction to vision (such as dust, fogging, or film formation on the inner glass surfaces) caused by failure of the hermetic seal, other than through glass breakage, for a 10-year period following acceptance of the work. Provide new units for any units failing to comply with terms of this warranty within 45 working days after receipt of notice from the Government.

PART 2 PRODUCTS

2.1 GLASS

ASTM C1036, unless specified otherwise. In doors and sidelights, provide safety glazing material conforming to 16 CFR 1201.

2.1.1 Clear Glass

Type I, Class 1 (clear), Quality q4 (A). Provide for glazing openings not indicated or specified otherwise. Use double-strength sheet glass or 1/8 inch float glass for openings up to and including 15 square feet, 3/16 inch for glazing openings over 15 square feet but not over 30 square feet, and 1/4 inch for glazing openings over 30 square feet but not over 45 square feet.

2.2 INSULATING GLASS UNITS

Two panes of glass separated by a 1/2 inch dehydrated airspace, filled with argon gas, and hermetically sealed, conforming to ASTM E2190. Submit performance and compliance documentation for each type of insulating glass.

Insulated glass units must have a Solar Heat Gain Coefficient (SHGC) maximum of 0.23 determined according to NFRC 200 and a U-factor maximum of 4.37 Btu per square foot by hr by degree F in accordance with NFRC 100.

Dimensional tolerances must be as specified in IGMA TB-1200. Spacer must be black, roll-formed, steel-reinforced butyl rubber or thermally broken aluminum with bent or tightly welded or keyed and sealed joints to completely seal the spacer periphery and eliminate moisture and hydrocarbon vapor transmission into airspace through the corners. Primary seal must be compressed polyisobutylene and the secondary seal must be a specially formulated silicone.

The inner light must be ASTM C1172, clear annealed flat glass Type I, Class I, Quality q3 1/4 inch thick. The outer light must be ASTM C1036, Type I, Class 1 (transparent) Quality q4, 1/2 inch thick.

2.2.1 Low Emissivity Coatings

Interior and exterior glass panes for Low-E insulating units must be Type I annealed flat glass, Class 1-clear with anti-reflective low-emissivity

coating or heat-strengthened or fully tempered glass complying with ASTM C1048, Condition C on No. 2 surface (inside surface of exterior pane), Quality q3 - glazing select, conforming to ASTM C1036. Glass performance must be U value maximum of 0.28 Btu/hr-ft²-F, Solar Heat Gain Coefficient (SHGC) maximum of 0.2. Color must be blue.

2.3 SETTING AND SEALING MATERIALS

Provide as specified in the GANA Glazing Manual, IGMA TM-3000, IGMA TB-3001, and manufacturer's recommendations, unless specified otherwise herein. Do not use metal sash putty, nonskinning compounds, nonresilient preformed sealers, or impregnated preformed gaskets. Materials exposed to view and unpainted must be gray or neutral color. Sealant testing must be performed by a testing agency qualified according to ASTM C1021.

Submit glass manufacturer's recommendations for setting and sealing materials and for installation of each type of glazing material specified.

2.3.1 Putty and Glazing Compound

Provide glazing compound as recommended by manufacturer for face-glazing metal sash. Putty must be linseed oil type. Do not use putty and glazing compounds with insulating glass or laminated glass.

2.3.2 Glazing Compound

Use for face glazing metal sash. Do not use with insulating glass units or laminated glass.

2.3.3 Sealants

Provide elastomeric sealants.

2.3.3.1 Elastomeric Sealant

ASTM C920, Type S, Grade NS, Class 12.5, Use G. Use for channel or stop glazing metal sash. Sealants must be chemically compatible with setting blocks, edge blocks, and sealing tapes, with sealants used in manufacture of insulating glass units. Color of sealant must be white.

2.3.4 Joint Backer

Joint backer must have a diameter size at least 25 percent larger than joint width; type and material as recommended in writing by glass and sealant manufacturer.

2.3.5 Glazing Tapes

2.3.5.1 Back-Bedding Mastic Glazing Tapes

Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:

- a. AAMA 804.3 tape, where indicated.
- b. AAMA 806.3 tape, for glazing applications in which tape is subject to

continuous pressure.

- c. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.3.5.2 Expanded Cellular Glazing Tapes

Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

- a. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
- b. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.3.6 Sealing Tapes

Preformed, semisolid, PVC-based material of proper size and compressibility for the particular condition, complying with ASTM D2287. Use only where glazing rabbet is designed for tape and tape is recommended by the glass or sealant manufacturer. Provide spacer shims for use with compressible tapes. Tapes must be chemically compatible with the product being set.

2.3.7 Setting Blocks and Edge Blocks

Closed-cell neoprene setting blocks must be dense extruded type conforming to ASTM C509 and ASTM D395, Method B, Shore A durometer between 70 and 90. Edge blocking must be Shore A durometer of 50 (plus or minus 5). Provide silicone setting blocks when blocks are in contact with silicone sealant. Profiles, lengths and locations must be as required and recommended in writing by glass manufacturer. Block color must be black.

2.3.8 Glazing Gaskets

Glazing gaskets must be extruded with continuous integral locking projection designed to engage into metal glass holding members to provide a watertight seal during dynamic loading, building movements and thermal movements. Glazing gaskets for a single glazed opening must be continuous one-piece units with factory-fabricated injection-molded corners free of flashing and burrs. Glazing gaskets must be in lengths or units recommended by manufacturer to ensure against pull-back at corners. Provide glazing gasket profiles as recommended by the manufacturer for the intended application.

2.3.8.1 Fixed Glazing Gaskets

Fixed glazing gaskets must be closed-cell (sponge) smooth extruded compression gaskets of cured elastomeric virgin neoprene compounds conforming to ASTM C509, Type 2, Option 1.

2.3.8.2 Wedge Glazing Gaskets

Wedge glazing gaskets must be high-quality extrusions of cured elastomeric virgin neoprene compounds, ozone resistant, conforming to ASTM C864, Option 1, Shore A durometer between 65 and 75.

2.3.8.3 Aluminum Framing Glazing Gaskets

Glazing gaskets for aluminum framing must be permanent, elastic, non-shrinking, non-migrating, watertight and weathertight.

2.3.9 Accessories

Provide as required for a complete installation, including glazing points, clips, shims, angles, beads, and spacer strips. Provide noncorroding metal accessories. Provide primer-sealers and cleaners as recommended by the glass and sealant manufacturers. Use ASTM C1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to surface.

PART 3 EXECUTION

Any materials that show visual evidence of biological growth due to the presence of moisture must not be installed on the building project.

3.1 PREPARATION

Preparation, unless otherwise specified or approved, must conform to applicable recommendations in the GANA Glazing Manual, GANA Sealant Manual, IGMA TB-3001, IGMA TM-3000, and manufacturer's recommendations. Determine the sizes to provide the required edge clearances by measuring the actual opening to receive the glass. Grind smooth in the shop glass edges that will be exposed in finish work. Leave labels in place until the installation is approved, except remove applied labels on heat-absorbing glass and on insulating glass units as soon as glass is installed. Securely fix movable items or keep in a closed and locked position until glazing compound has thoroughly set.

3.2 GLASS SETTING

Shop glaze or field glaze items to be glazed using glass of the quality and thickness specified or indicated. Glazing, unless otherwise specified or approved, must conform to applicable recommendations in the GANA Glazing Manual, GANA Sealant Manual, IGMA TB-3001, IGMA TM-3000, and manufacturer's recommendations. Aluminum windows, wood doors, and wood windows may be glazed in conformance with one of the glazing methods described in the standards under which they are produced, except that face puttying with no bedding will not be permitted. Handle and install glazing materials in accordance with manufacturer's instructions. Use beads or stops which are furnished with items to be glazed to secure the glass in place. Verify products are properly installed, connected, and adjusted.

3.2.1 Sheet Glass

Cut and set with the visible lines or waves horizontal.

3.2.2 Insulating Glass Units

Do not grind, nip, or cut edges or corners of units after the units have left the factory. Springing, forcing, or twisting of units during setting will not be permitted. Handle units so as not to strike frames or other objects. Installation must conform to applicable recommendations of IGMA TB-3001 and IGMA TM-3000.

3.2.3 Installation of Laminated Glass

Sashes which are to receive laminated glass must be weeped to the outside to allow water drainage into the channel.

3.3 CLEANING

Clean glass surfaces and remove labels, paint spots, putty, and other defacement as required to prevent staining. Glass must be clean at the time the work is accepted.

3.4 PROTECTION

Protect glass work immediately after installation. Identify glazed openings with suitable warning tapes, cloth or paper flags, attached with non-staining adhesives. Protect reflective glass with a protective material to eliminate any contamination of the reflective coating. Place protective material far enough away from the coated glass to allow air to circulate to reduce heat buildup and moisture accumulation on the glass. Upon removal, separate protective materials for reuse or recycling. Remove and replace glass units which are broken, chipped, cracked, abraded, or otherwise damaged during construction activities with new units.

-- End of Section --

SECTION 08 91 00

METAL WALL LOUVERS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC. (AMCA)

AMCA 500-L (2015) Laboratory Methods of Testing
Louvers for Rating

AMCA 511 (2010; R 2016) Certified Ratings Program
for Air Control Devices

ALUMINUM ASSOCIATION (AA)

AA DAF45 (2003; Reaffirmed 2009) Designation System
for Aluminum Finishes

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 611 (2014) Voluntary Specification for
Anodized Architectural Aluminum

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M (2017) Standard Specification for Zinc
(Hot-Dip Galvanized) Coatings on Iron and
Steel Products

ASTM A653/A653M (2020) Standard Specification for Steel
Sheet, Zinc-Coated (Galvanized) or
Zinc-Iron Alloy-Coated (Galvannealed) by
the Hot-Dip Process

ASTM A780/A780M (2020) Standard Practice for Repair of
Damaged and Uncoated Areas of Hot-Dip
Galvanized Coatings

ASTM A1008/A1008M (2021a) Standard Specification for Steel,
Sheet, Cold-Rolled, Carbon, Structural,
High-Strength Low-Alloy, High-Strength
Low-Alloy with Improved Formability,
Solution Hardened, and Bake Hardenable

ASTM B209 (2014) Standard Specification for Aluminum
and Aluminum-Alloy Sheet and Plate

ASTM B221 (2021) Standard Specification for Aluminum
and Aluminum-Alloy Extruded Bars, Rods,
Wire, Profiles, and Tubes

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Wall Louvers

SD-03 Product Data

Metal Wall Louvers; G, RO

SD-04 Samples

Louver Samples

1.3 DELIVERY, STORAGE, AND PROTECTION

Deliver materials to the site in an undamaged condition. Carefully store materials off the ground to provide proper ventilation, drainage, and protection against dampness. Louvers must be free from nicks, scratches, and blemishes. Replace defective or damaged materials with new.

1.4 DETAIL DRAWINGS

Show all information necessary for fabrication and installation of wall louvers. Indicate materials, sizes, thicknesses, fastenings, and profiles.

1.5 COLOR SAMPLES

Colors of finishes for louver samples must closely approximate colors indicated. Where color is not indicated, submit the manufacturer's standard colors to the Contracting Officer for selection.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Galvanized Steel Sheet

ASTM A653/A653M, coating designation G90.

2.1.2 Aluminum Sheet

ASTM B209, alloy 3003 or 5005 with temper as required for forming.

2.1.3 Extruded Aluminum

ASTM B221, alloy 6063-T5 or -T52.

2.1.4 Stainless Steel

Type 302 or 304, with 2B finish.

2.1.5 Cold Rolled Steel Sheet

ASTM A1008/A1008M, Class 1, with matte finish. Use for interior louvers only.

2.2 METAL WALL LOUVERS

Weather and wind driven rain resistant type, with bird screens and made to withstand a wind load of not less than 30 pounds per square foot. Wall louvers must bear the AMCA certified ratings program seal for air performance and water penetration in accordance with AMCA 500-L and AMCA 511. The rating must show a water penetration of 0.20 or less ounce per square foot of free area at a free velocity of 800 feet per minute.

2.2.1 Extruded Aluminum Louvers

Fabricated of extruded 6063-T5 or -T52 aluminum with a wall thickness of not less than 0.081 inch.

2.2.2 Formed Metal Louvers

Formed of stainless steel sheet not thinner than 16 U.S. gauge, or aluminum sheet not less than 0.08 inch thick.

2.2.3 Mullions and Mullion Covers

Same material and finish as louvers. Provide mullions for all louvers more than 5 feet in width at not more than 5 feet on centers. Provide mullion covers on both faces of joints between louvers.

2.2.4 Screens and Frames

For aluminum louvers, provide 1/2 inch square mesh, 14 or 16 gauge aluminum or 1/4 inch square mesh, 16 gauge aluminum bird screening. For steel louvers, provide 1/2 inch square mesh, 12 or 16 gauge zinc-coated steel; 1/2 inch square mesh, 16 gauge copper; or 1/4 inch square mesh, 16 gauge zinc-coated steel or copper bird screening. Mount screens in removable, rewirable frames of same material and finish as the louvers.

2.3 FASTENERS AND ACCESSORIES

Provide stainless steel screws and fasteners for aluminum louvers and zinc-coated or stainless steel screws and fasteners for steel louvers. Provide other accessories as required for complete and proper installation.

2.4 FINISHES

2.4.1 Aluminum

Exposed aluminum surfaces must be factory finished with an anodic coating. Color must be as indicated. Louvers for each building must have the same finish.

2.4.1.1 Anodic Coating

Clean exposed aluminum surfaces and provide an anodized finish conforming to AA DAF45 and AAMA 611. Finish must be:

- a. Architectural Class I (0.7 mil or thicker), designation AA-M10-C22-A41, clear (natural) anodized.

2.4.2 Steel

Surfaces specified must have a zinc coating, a phosphate treatment, and a shop prime coat of rust-inhibitive paint. The galvanized coating must conform to ASTM A653/A653M, coating designation Z275 (G90), except that louvers located in conditioned spaces on interior of the building may be Z180 (G60). The weight of zinc coatings must be as designated in Table I of ASTM A123/A123M for the thickness of base metal to be coated. The prime coat must be a type especially developed for materials treated by phosphates and adapted to application by dipping or spraying. Repair damaged zinc-coated surfaces by the materials and methods conforming to ASTM A780/A780M and spot prime. At the option of the Contractor, a two-part system including bonderizing, baked-on epoxy primer, and baked-on enamel top coat may be applied before forming, in lieu of prime coat specified.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Wall Louvers

Install using stops or moldings, flanges, strap anchors, or jamb fasteners as appropriate for the wall construction and in accordance with manufacturer's recommendations.

3.1.2 Door Louvers

Install louvers in wood doors by using metal "Z" or "L" moldings. Fasten moldings to door with screws.

3.1.3 Screens and Frames

Attach frames to louvers with screws or bolts.

3.2 PROTECTION FROM CONTACT OF DISSIMILAR MATERIALS

3.2.1 Copper or Copper-Bearing Alloys

Paint copper or copper-bearing alloys in contact with dissimilar metal with heavy-bodied bituminous paint or separate with inert membrane.

3.2.2 Aluminum

Where aluminum contacts metal other than zinc, paint the dissimilar metal with a primer and two coats of aluminum paint.

3.2.3 Metal

Paint metal in contact with mortar, concrete, or other masonry materials with alkali-resistant coatings such as heavy-bodied bituminous paint.

3.2.4 Wood

Paint wood or other absorptive materials that may become repeatedly wet and in contact with metal with two coats of aluminum paint or a coat of heavy-bodied bituminous paint.

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CREATE AMAZING.