REPLACE CHILLER
BLDG 1095
MAXWELL AFB, AL

PNQS 23-4685
WO #287121

SECTION 00002
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END OF SECTION

SECTION 00005

SCHEDULE OF BID ITEMS

Furnish all plant, labor, materials and equipment necessary to perform all work in connection with Project Number PNQS 23-4685 REPLACE CHILLER B1095, MAXWELL AFB in accordance with the attached Statement of Work (SOW), specifications, and drawings.

Item No.	Description	Unit of Issue	Total Amount
0001	REPLACE CHILLER BLDG 1095 MAXWELL AFB, AL	EA	$_____

TOTAL FOR ITEM: 0001 **Lump Sum $ _____**

COMPANY NAME: _____

PRINTED NAME: _____

SIGNATURE: _____

DATE: _____

1.0 DIVISION 1: SECTION 01000: GENERAL REQUIREMENTS

1.01 SUMMARY OF WORK

The work covered by these specifications consists of furnishing all plant, labor, equipment and materials and performing all operations in connection with PNQS 23-4685 REPLACE CHILLER B1095, Maxwell AFB, AL, to include all areas as indicated on drawings and in strict accordance with these specifications and applicable drawings and subject to terms and conditions of the contract.

The work generally consists of the following:

a. Remove existing chiller, primary pump, secondary pump, insulation, heat trace, air separator, expansion tank, piping, and water makeup piping accessories.
b. Provide and install chiller, primary pump, secondary pump, air separator, expansion tank, piping, and water makeup piping accessories.
c. Insulate and heat trace all piping, hydronic equipment, and accessories.
d. Enlarge the existing chiller concrete mounting pad.
e. Remove electrical power disconnects, motor control equipment, wiring, and conduit as shown.
f. Provide and install power disconnects, motor control equipment, wiring, and conduit as shown.
g. Connect HVAC equipment controls to the existing Energy Management Control System (EMCS).
h. Balance the chilled water system.

2.01 BUILDING OCCUPANCY

2.01.1 The building will be occupied.

3.01 SCHEDULE OF WORK

The Contractor shall be responsible for establishing a schedule to meet construction time. Contractor shall prepare a work schedule on forms provided by Contracting Officer (CO)/Contract Administrator for schedule of work. ***Contractor shall have 330 calendar days to complete the work.***

3.01.1 PHASING OF WORK: See the plans.

4.01 GENERAL

4.01.1 The contractor shall coordinate work with the Technical Manager (TM)/Contract Administrator to avoid interference with necessary activities within and adjacent to the construction site. The Contractor shall coordinate the work of all trades to prevent any conflicts. The Contractor, before proceeding with the construction, shall resolve any conflicts of components.

4.01.2 The Contractor will perform work during work hours between 6:00 A. M. and 5:00 P.M (normal working hours) and after normal hours as shown in the plans. The Contractor will not normally be permitted to work on weekends or on the following legal holidays (or the day the federal government observes these holidays) unless the work has coordinated such work with the TM/Contract Administrator at least 72 hours in advance:

a. New Year's Day
b. Martin Luther King, Jr.'s Birthday
c. Washington's Birthday
d. Memorial Day
e. Juneteenth
f. Independence Day
g. Labor Day
h. Columbus Day
i. Veteran's Day
j. Thanksgiving Day
k. Christmas Day

5.01 SITE VISIT

Contractor is responsible for site investigation in accordance with contract clause entitled "Site Investigation and Conditions Affecting the Work" (FAR 52.236-3).

6.01 CONTRACT DRAWINGS AND SPECIFICATIONS

The Contractor must comply with the contract clause entitled "Specifications and Drawings for Construction" (FAR 52.236-21). See paragraph 19.01 entitled "INTENT OF DRAWINGS".

7.01 MATERIAL AND EQUIPMENT SUBMITTALS AND REQUIRED REAL ESTATE SUBMITTAL DATA

7.01.1 SUBMITTAL REGISTER

Within ten (10) calendar days after receipt of "Notice to Proceed," of the contract, the Contractor shall furnish the Government a Submittal Register to indicate the Contractor's scheduled submittal dates. The Register shall contain all items (shop drawings, manufacturer's literature, certificates of compliance, material samples, guarantees, etc.) that the Contractor shall submit for review and approval action during the life of the contract. The Register will be furnished as one (1) original plus two (2) copies. The Contractor shall take special care to timely schedule the submittal data required for long lead-time items.

The Contractor will submit three (3) copies of all required submittals unless otherwise specifically indicated.

7.02 DESCRIPTIVE DATA

The Contractor shall submit three (3) copies of AF Form 3000, Material Submittal Approval, to the Contracting Officer (CO) for approval. Included shall be manufacturer's descriptive data for materials, fixtures, and equipment the Contractor proposes to incorporate in the work. The submittal shall include catalog numbers, diagrams, drawings, and such additional descriptive data and samples required to properly evaluate all items. When specifications require materials to conform to Federal, Military, Commercial, American Society for Testing Materials (ASTM), or other specifications and standards, the Contractor shall submit supplier's or manufacturer's Certification of Conformance in addition to other descriptive data. Catalog numbers and trade names specified indicate examples of a standard product. Other manufacturers' products may be substituted contingent upon approval. Approval of all items must be obtained prior to fabrication or purchase. Payment for work incorporating these materials will not be made if required material submittals have not been approved. Approval of materials, fixtures, and equipment will be based on manufacturer's published ratings and conformance with specifications.

7.02.1 The Material Descriptive Data Submittal shall include the information indicated in each specification section.

7.02.2 The Shop Drawing Submittal shall include the information indicated in the each specification section.

7.02.3 The Samples Submittal shall include the information indicated in each specification section.

7.03 CONTRACTOR DEVIATION

When data is submitted for approval, the Contracting Officer approval of such data shall not relieve the Contractor from responsibility for errors or deviation from contract drawings and specifications. In the case of a deviation, the Contractor shall inform the Contracting Officer in writing of the request for deviation with all the specific data related to the change.

8.01 REAL PROPERTY SUBMITTAL DATA:

Provide data as requested by the Government to complete real property records.

8.01 REMOVAL PROCEDURES:

No removed items will be reused in this contract unless specifically listed in these specifications and/or on the drawings. All removed equipment becomes the property of the Contractor unless noted otherwise. The Contractor will be required to furnish lifting equipment as necessary to remove the equipment, and shall provide all equipment to transport the removed items off base. All unused material or debris will be removed from Government-controlled property. Use of Government-contracted dumpsters is prohibited. Unused materials, debris and rubbish shall be disposed of off base in a permitted landfill. The Contractor shall comply with Alabama Department of Environmental Management (ADEM) Code, Division 13, Solid Waste Program, and Chapter 335-13-1, through 335-13-8; Adopted November 18, 1981; Amended July 26, 1996.

REFER TO SPECIFICATION SECTION 01001A – GENERAL REQUIREMENTS ENVIRONMENTAL PROTECTION

8.03 REFRIGERANTS

All refrigerants must remain the possession of the Air Force. Refrigerants from any refrigeration systems removed must be turned over to the Refrigerant Manager, 42CES/CEOH, 400 Cannon Street, Maxwell AFB.

REFER TO SPECIFICATION SECTION 01001A – GENERAL REQUIREMENTS ENVIRONMENTAL PROTECTION

9.01 GOVERNMENT-FURNISHED ITEMS: N/A

10.01 REFERENCED PUBLICATIONS

All publications referenced in this specification, but not shown in each part under paragraph entitled "APPLICABLE PUBLICATIONS", also form a part of these specifications to the extent referenced.

11.01 HEALTH STANDARDS

The following specified guidance is essential to maintaining compliance with the health standards on this base. This contract must adhere to all of the following.

11.01 Radioactive Materials (RAM): Air Force requirements for the management are listed in AFI 40-201, Management Radioactive Materials in the USAF. All contractors who intend to bring RAM (such as the materials in the soil density gauges, X-ray fluorescence meters, etc.) onto Maxwell AFB must first obtain written approval from the Base Radiation Safety Officer (RSO), in the Bioenvironmental Engineering (BEE) Flight 334-953-5848. To provide this approval, the RSO needs a written request no later than 30 days prior to initiating any work requiring radioactive material. The request must include the following information:

11.01.1 A copy of your NRC license (or State license with a current NRC FonD 241) that authorizes your use of radioactive material on this installation.

11.01.2 Training certificate(s) for individual(s) who will use the instrument on base.

11.01.3 The most recent leak/wipe test for the instrument(s) that will be used on base.

11.01.4 A signed document on company letterhead paper that includes:

a. A brief description of your proposed activities including: instruments to be used and their purpose, the contract number and title under which you will work, location of the work (closest building number, annotated map, or similar identification), and anticipated start and end dates (with the understanding that actual days of use are difficult to specify in advance).

b. The name, local address, and telephone number of both the responsible local representative and the RSO.

c. Name and phone number of the Maxwell AFB inspector overseeing the project.

d. An acknowledgement that the Maxwell AFB RSO can make periodic Checks to ensure contractor personnel follow radiation safety practices to prevent exposure to Air Force personnel and avoid contamination of government property as well as an understanding that the Maxwell AFB RSO has the authority to suspend any contractor operation believed to be unsafe.

11.02 **Asbestos/Lead-Based Paint**

Contractors who will perform asbestos and or lead-based paint abatement work must comply with all OSHA regulations and be certified by Safe State of Alabama. In particular, after all visible debris has been removed and the abatement area has been appropriately decontaminated, the contractor must perform clearance sampling verifying the area is clean before re-occupancy can be allowed. BEE must review all clearance sample results prior to government acceptance of abatement areas as clean. Contractors can expedite this process by faxing copies of clearance results directly to the BEE for review.

REFER TO SPECIFICATION SECTION 01001A – GENERAL REQUIREMENTS ENVIRONMENTAL PROTECTION

11.03 **Drinking Water:**

11.03.1 If a facility is to be constructed in which sources of drinking water are provided (sinks, water fountains, showers, etc.), the water lines must be flushed thoroughly prior to occupancy. BEE approval is required before the water is declared potable. If the contractor is required to test the interior water lines, provide BEE the documentation at two weeks prior to occupancy of the facility .If the contractor is not required to do bacteriological testing of the interior water lines, the BEE office should be contacted at least two weeks prior to occupancy so that we may schedule our testing of the system.

11.03.2 If water mains are constructed or repaired, disinfection of the lines must be conducted as stated in ANSI/AWWA C651-92, American Water Works Association for Disinfecting Water Mains prior to putting into service. Provide our office with a copy of the documentation that demonstrates compliance with the above requirements. We recommend coordination of the plan to disinfect water mains prior to construction to ensure that we agree with the disinfection and testing method.

11.04 **HAZARDOUS MATERIALS:**

All hazardous chemicals (including paint, cleaning solutions, solvents and so on) used by the contractor must be registered with the Maxwell AFB Hazardous Material Manager, which can be contacted at 953-5260.

REFER TO SPECIFICATION SECTION 01001A – GENERAL REQUIREMENTS ENVIRONMENTAL PROTECTION

12.01 EXCAVATION:

Prior to excavating for any purpose, the Contractor shall obtain an approved Construction Permit, AF Form 103 (dated July 1982), from the MSD/CE, 400 Cannon Street, Maxwell Air Force Base. The purpose of this form is to give the Contractor clearance to excavate a given area, to protect the underground facilities, and to protect personnel from injury. The Government will determine what facilities are beneath the surfaces and discuss their locations with the Contractor prior to issuing the AF Form 103. The Contractor is required to determine the exact location to be excavated in relation to the underground facilities prior to excavating. The AF Form 103 may note cable, pipe, etc., in the area; if this occurs, Contractor will be responsible for digging in such a manner so as not to damage the hidden facility. Contractor will place particular emphasis on the site inspection prior to proposing to determine which facilities are obviously in the area. After receipt of the approved AF Form 103, the Contractor will not perform any excavation work without specific approval by the Contracting Officer.

13.01 GROUND FAULT CIRCUIT INTERRUPTERS

Whenever the Contractor uses portable electrical tools or equipment in an outside location or in an interior wet location where floor is conductive such as concrete, the Contractor shall provide and use a portable ground fault circuit interrupter (GFCI). This shall apply wherever electric power is supplied through Government-controlled facilities. The Contractor shall be responsible for maintaining the GFCI in operating condition and testing it before each use.

14.01 EQUIPMENT MAINTENANCE AND OPERATING INFORMATION:

Provide maintenance and operating information during training as specified in each specification section included in this project.

15.01 EQUIPMENT OPERATING, MAINTENANCE, AND REPAIR MANUALS:

15.01.1 Data Required. Three (3) copies of each manual shall be submitted for approval to the Contracting Officer. The submittal schedule shall be as shown on the submittal register. Each manual shall include the following:

15.02.1 The manuals shall be bound in a 3-ring binder with a hard cover, or 3-hole portfolio for small projects. The following identification shall be inscribed on the cover: "EQUIPMENT OPERATING, MAINTENANCE, AND REPAIR MANUAL" and the building name and number, location, and indication of utility or system covered. Manuals shall be approximately 8 1/2 by 11 inches with large sheets folded in and capable of being easily pulled out for reference.

15.02.2 A warning page shall be provided to warn of potential dangers (it they exist), such as high voltage, toxic chemicals, flammable liquids, explosive materials, carcinogens, or high pressures. The warning page shall be placed inside the front cover, in front of the title page.

15.02.3 The title page shall show the name, address and phone number of the Contractor, the contract number and the date of publication.

15.02.4 Provide a table of contents in accordance with standard commercial practice.

15.02.5 Separate Sections and manuals. Manuals shall include, in separate sections, the following information for each item of equipment and system:

15.02.6 Performance sheets and graphs showing capacity data, efficiencies, electrical characteristics, pressure drops, and flow rates. Marked-up catalogs or catalog pages do not satisfy this requirement. Performance information shall be presented as concisely as possible and contain only data pertaining to equipment actually installed.

15.02.7 Catalog cuts showing application information

15.02.8 Installation information showing minimum acceptable requirements.

15.02.9 Operation and maintenance requirements. Include adequate illustrative material to identify and locate operating controls, indicating devices and locations of areas or items requiring maintenance. Describe, in detail, starting and stopping procedures for components, adjustments required to obtain optimum equipment performance, and corrective actions for malfunctions. Maintenance instructions describing the nature and frequency of routine maintenance and procedures to be followed. Indicate any special tools, materials, and test equipment that may be required.

15.03 Repair information including diagrams and schematics, guidance for diagnosing problems, and detailed instructions for making repairs. Provide trouble-shooting information that includes a statement of the indication or symptom of trouble and the sequential instructions necessary. Include test hookups to determine the cause, special tools, and test equipment, and methods for returning the equipment to operating conditions. Information may be in chart form or in tabular format with appropriate headings.

15.03.2 Parts list, names and addresses of the two closest parts supply agencies.

15.03.3 Names and addresses of the local manufacturer representatives and the parent company.

16.01 OTHER EQUIPMENT

The Contractor will be required to furnish a brochure, catalog cut sheet, parts list, manufacturer's spec sheet, and/or other printed information that shows detailed parts data, and the manufacturer's name, address, and telephone number, for all other equipment (such as hardware, lighting fixtures, etc.) subject to repair or maintenance procedures. The data shall be furnished in three (3) copies (for each building) to the CO. at the final inspection. This requirement is in addition to the requirements for material submittals specified elsewhere in this contract. Information submitted as a part of "Equipment Operating, Maintenance, and Repair Manuals" will be considered a part of this requirement.

17.01 FIRE REGULATIONS

The Contractor shall comply with all aspects of the National Fire Protection Association (NFPA) publication 241, "Safeguarding Building Construction, Alteration and Demolition Operations; EM 385-1-1, Safety and Health Requirements Manual; and Maxwell AFB Instruction 32-2005, Fire Prevention and Protection During Construction, Alteration, Demolition, and Repair Operations.

18.01 ASBESTOS

No friable asbestos containing materials will be installed as a part of this contract. Spray application of asbestos or asbestos-containing materials to exposed walls, ceilings, ducts, columns, etc. is prohibited. In the event friable asbestos containing materials are encountered during "rip out" and demolition operations, the Contractor shall stop work immediately and notify the TM/Contract Administrator who will take appropriate action.

REFER TO SPECIFICATION SECTION 01001A – GENERAL REQUIREMENTS ENVIRONMENTAL PROTECTION

19.01 INTENT OF DRAWINGS

All drawings are diagrammatic and are intended to qualify the materials specified and indicate their intended relationship to each other. The drawings are not to be scaled, rather field conditions should dictate placement. The various scales used on the drawings may not allow the indications of all fittings, offsets, and accessories that may be required. The Contractor is to carefully investigate the conditions that would affect the work to be performed and shall arrange such work accordingly.

20.01 AS-BUILT DRAWINGS

The Contractor shall provide to the Government marked drawings commonly referred to as "as-builts" indicating conditions that differ from that shown on the contract plans. The Contractor will review with the CO the "as-builts" as needed to ensure an accurate up-to-date set of documents is being kept. Changes are to be noted as the work progresses. The Contractor will utilize a Government-furnished copy of the contract drawings with the changes neatly indicated in red using the drafting standards and legends indicated in the contract drawings. One copy is required and will be submitted to the CO at the final inspection. If there are no changes, a title sheet (from the contract drawings) will only be required with the note "NO CHANGES" marked appropriately.

21.01 TRAFFIC CONTROL

The Contractor shall be responsible for the orderly handling of traffic through the work at all times during the life of the construction contract. This shall be accomplished in conformity with Sub article (d). "HANDLING OF TRAFFIC," of Article 104.04, "Sequence of Construction for Handling Traffic Through the Work and Construction and Maintenance of Detours," of Section 104, "SCOPE OF WORK," of the Alabama Highway Department "Standard Specifications for Highway Construction," 1992 Edition. In this specification, the word "Engineer" Shall be replaced with the words CO.

22.01 CONTRACTOR MAINTENANCE

At the end of each working day the Contractor shall clean up the work site which includes the construction area(s), construction office area(s), material storage area(s), parking and eating area(s), and any other area(s) affected by the construction process. Stacked material shall not be within 8m (25-feet) of an active roadway. Tracking of soil, mud or other construction debris or substance on any Base street, parking area, sidewalk, patio, driveway, turf, or other area shall not be permitted. In accordance with "The Maxwell Landscape Management Operational Instruction Manual," the Contractor shall keep all turfed areas mowed and clean within the construction limits, and shrubs and other elements in the landscape shall be maintained.

23.01 ENVIRONMENTAL PROTECTION

REFER TO SPECIFICATION SECTION 01001A – GENERAL REQUIREMENTS ENVIRONMENTAL PROTECTION

23.01.3 MAXWELL & GUNTER STORMWATER BMP FOR LATEX PAINT:

REFER TO SPECIFICATION SECTION 01001A – GENERAL REQUIREMENTS ENVIRONMENTAL PROTECTION

23.01.4 MAXWELL & GUNTER STORMWATER BMP FOR OIL BASE PAINT, POLYURETHANE & CLEANING SOLUTIONS:

REFER TO SPECIFICATION SECTION 01001A – GENERAL REQUIREMENTS ENVIRONMENTAL PROTECTION

23.01.5 CONTRACT REQUIREMENTS FOR BUILDINGS WITH LEAD-BASED PAINT

REFER TO SPECIFICATION SECTION 01001A – GENERAL REQUIREMENTS ENVIRONMENTAL PROTECTION

24.01 ENVIRONMENTAL RELEASE REPORTING

An environmental release report shall be completed for all environmental releases that are caused by an Air Force activity or which occur on an Air Force installation or facility. Examples of environmental releases are listed as follows but not limited to: oil releases to navigable waters, hazardous substance release above the reportable quantity, vinyl chloride releases, excessive emissions over amount allowed in permits, hazardous material incidents occurring during transportation, underground storage tank spills and releases, and any emergency incidents of environmental contamination. The Contractor shall immediately notify the TM in the event of any environmental release. The following information shall be documented; the time, type, amount, and cause of release.

25.01 PROTECTION OF EXISTING LANDSCAPE DURING CONSTRUCTION:

REFER TO SPECIFICATION SECTION 01001A – GENERAL REQUIREMENTS ENVIRONMENTAL PROTECTION

25.01.1 REPAIR OR REPLACEMENT OF DAMAGED LANDSCAPE

If any failure to comply with these General Requirements Section or any other Contract Specification or provision or term of this contract occurs during installation, maintenance, or warranty, the Contractor shall be held responsible. Any damage occurring to Government property during the execution of this contract shall be repaired to the Government standards as defined in "The Maxwell Landscape Management Operational Instruction Manual" by the Contractor at no additional cost to the Government. The repair work shall be inspected and accepted by the Government. Any discrepancies shall be fixed before acceptance.

25.02.2 REQUIREMENTS

25.02.2.1 The following requirements shall be observed by the Contractor in order to protect existing landscape (to include trees, shrubs, flowers, turf, flower beds, sidewalks, patios, fences, etc.) during construction operations.

No vehicle parking is allowed under canopies or within the drip-line root zone of protected trees. All trees are to be protected unless they are shown to be removed on the plans.

No storage of materials will be allowed under protected tree canopies or beside existing shrub plantings**.**

25.02.2.2 No storage of materials on turf areas shall be allowed unless the TM/Contract Administrator has given the Contractor approval. If any lawn damage occurs (even with special permission), the Contractor shall restore the lawn per par. 25.02.2.4.05 below.

25.02.2.3 No driving across, parking, or other equipment operations on existing turf shall be permitted unless prior approval has been obtained from the TM/Contract Administrator. If any lawn damage occurs (even with special permission), the Contractor shall restore the lawn per par. 25.02.2.4.05 below.

25.02.2.3.01 No pruning or breaking off existing trees or shrubs shall be permitted unless prior approval has been obtained from the TM/Contract Administrator. If prior approval is not obtained, the Contractor is liable for the repair/replacement of any damaged landscape items.

25.02.2.3.02 No work shall damage the health of any tree whose roots extend into the construction area. No fences, ropes, cables, signs, or devices of any kind shall be attached to any tree.

25.02.2.3.03 The TM shall be notified immediately of any damage occurring to a tree in the construction site, or any tree damaged by Contractor personnel. The TM/Contract Administrator shall direct measures, if any, to treat the injury. The Government shall incur no cost for any corrective measures, including, but not limited to, removal and replacement of the tree.

25.02.2.3.04 If the Contractor causes the death or 60% decline to any protected tree(s) within a 24 month period, the Contractor shall remove and replace the damaged tree(s) with size and species of tree(s) directed by the TM. The size of the new tree(s) shall equal caliper size of removed tree(s).

25.02.2.3.05 Damaged turf areas shall be replaced with sod per “The Maxwell Landscape Management Operational Instruction Manual.” The use of grass seed to repair turf damage at Maxwell AFB or Gunter Annex is not permitted.

26.01 STAGING AREA

The Contractor will be provided space as indicated for an office trailer and a 6’ wood fence with lockable gates around the staging of materials in support of this project and must provide protection and security for it in that area.

PROJECT SIGNAGE: ALL construction projects that require outside storage or offices, trailers, etc. shall require a project board (sign). Project Board layout requirements will be included in the project specifications (01000 AA Project Board Template). The sign shall be at least 3’ X 5’ and no greater than 4’ X 8’. The sign will be installed similar to 01000 AA Project Board Appendix A.

27.01 TESTING

Where specific tests are required by this contract, the Contractor shall notify the TM/Contract Administrator at least 24 hours prior to testing. The Contractor shall turn in a test report, if required, to the TM/Contract Administrator as soon as possible. The Contractor shall not proceed with any work that would cover up the work being tested until the TM/Contract Administrator has approved the work being tested.

28.01 WARRANTIES

All workmanship, materials, and equipment shall be under warranty for at least one year as set forth in the contract clause entitled "Warranty of Construction" (FAR 52.246-21). See specs for warranties extending beyond the one year period.

29.01 PROTECTION OF GOVERNMENT PROPERTY AND PERSONNEL

29.01.1 WORK AREAS INCLUDED

29.01.2 Construction site.

Area or areas in which the work of the contract is accomplished or performed.

29.01.3 Storage areas.

Area or areas used for the storage of materials, devices, appliances, and equipment to be used in the work.

29.01.4 Office and shed areas.

Area or areas for placing or setting of temporary field office, tool sheds, or storage sheds.

29.01.5 Transportation areas.

Area or areas that are defined as streets, roads, driveways, parking areas, etc., paved, treated, and unpaved; area or areas not paved, such as grass plots or grass areas used for transportation purposes.

29.02 CONDUCT OF WORK

The Contractor shall conduct work so the Government property and personnel, other personnel, and work areas shall be protected at all times from inconvenience, damage of any nature, or injury caused by this work until completion of the contract.

29.03 REPAIR OR REPLACEMENT OF DAMAGED PROPERTY

In the event of damages of any nature caused by this work (including maintenance and warranty operations) due to improper protection, precaution, or safety measures, such damages shall be repaired or such property shall be replaced by the Contractor at no expense, cost, or charge to the Government. In the event the Contractor does not satisfactorily repair or replace such damage caused by the work of the contract, the Government reserves the right to make the necessary corrections and deduct from the contract price the cost to the Government for inconveniences, labor material, etc. involved. Reference contract clause "Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements" (FAR 52.236-9).

29.03.1 Contractor shall protect all communications cabling while working and if damage is caused by the contractor, then the contractor shall replace the damaged communications cabling with same, or for internal cable, base standard CAT 6 cable. All CAT 6 cable must be home run to the communications room. Copper tie cables must be replaced with same. Fiber optic cables must be a continuous strand with no splices. All communication cabling must be wired to T568B standards.

29.04 BARRICADES

The Contractor shall furnish, place and maintain all required barricades as directed by the Safety Office and the STM/Contract Administrator, and access driveways and doors will remain clear at all times.

30.01 FINAL CLEANING

30.01.1 CLEANING SCHEDULE

Execute final cleaning prior to the final inspection.

30.01.2 PROCEDURES

30.01.3 Clean surfaces exposed to view.

30.01.3.1 Remove temporary labels, stains, and foreign substances; polish transparent and glossy surfaces; wet mop tile or sealed concrete floors, vacuum carpeted floors, broom clean other floors.

30.01.3.2 Clean equipment and fixtures to a sanitary condition.

30.01.3.3 Clean or replace filters of mechanical equipment.

30.01.3.4 Any additional cleaning as specified in other sections.

30.01.3.5 Clean sites of all construction related and project related debris.

30.01.3.6 Remove waste and surplus materials, rubbish, and construction facilities from the work areas and the site.

31.01 CLOSEOUT PROCEDURES

When the Contractor is ready for final inspection, the Contractor shall notify the CO (in writing) within two (2) working days of the desired inspection date. During the inspection, the Contractor and the CO shall document all deficiencies on a "punchlist." The CO will provide a formal copy of the punchlist to the Contractor. The Contractor shall be responsible for correcting all punchlist items prior to the end of the contract completion date and notify the CO (in writing) when the contractor is ready for re-inspection.

32.01 SECURITY REQUIREMENTS FOR UNCLASSIFIED CONTRACTS

32.01.1 NOTIFICATION

The Contractor shall notify 42 SFS/SPAI, Maxwell AFB AL, no later than 10 days after contract award. The notification shall include:

a. Name, address, and telephone number of each company representative.
b. The contract number and contracting agency (e.g., 42 CONS/PKC).
c. The description of the work to be performed/construction project number.
d. The location(s) of the construction work (i.e., street address or other description of the construction site).
e. The date contract performance begins.
f. Any updates to information previously provided under this paragraph.

32.02 LIST OF EMPLOYEES

The Contractor shall maintain a current listing of employees. The list shall include employee's name, social security number, and level of security clearance (if contract work involves unescorted entry to Air Force restricted or other sensitive areas designated by the installation commander). The list shall be validated and signed by the company Facility Security Officer (FSO) and provided to the TM/Contract Administrator, Maxwell AFB, AL, prior to the contract start date. Updated listing shall be provided when an employee's status or information changes.

32.03 PASS AND IDENTIFICATION

32.03.1 The Contractor shall obtain the following pass and identification items:

32.03.1.1 DD Form 1172, "Application for Uniformed Services Identification Card" (AFI 36-3001 and AETCR 30-1). Forms shall be supplied by the Contracting Office Customer Service Station. The Contractor shall fill out the forms and take them to Pass and Identification, Building 502, 10 North Pine Street, Maxwell AFB.

32.03.1.2 AETC Form 58, "Civilian Identification Card" (AETCR 30-1). Pass and Identification will issue this to each Contractor employee.

32.03.1.3 AF Form 2219 (series), "Registered Vehicle Expiration Tab", (AFI 31-204), "Motor Vehicle

Traffic Supervision" and DD Form 2220, "DOD Registered Vehicle and Installation Tab" (AFI 31-204). The Security Forces, Pass and Registration Section, Building 502, 10 North Pine Street (at the Bell Street entrance) will issue vehicle registration decals, upon proof of employment, insurance, ownership of vehicle, and a valid driver's license. A temporary decal will be issued if employment is for six months or less.

32.03.1.4 AF Form 1199, USAF Restricted Area Badge, or a locally developed badge (if applicable).

32.03.1.5 AF Form 75, Visitor/Vehicle Pass (AFI 31-204)

32.03.1.6 The Contractor shall retrieve all identification media, including vehicle decals from employees who depart for any reason before the contract expires (e.g., terminated for cause, retirement, etc.)

32.04 PHYSICAL SECURITY; KEY CONTROL; LOCK COMBINATIONS & CONTROLLED/RESTRICTED AREAS

32.04.1 Physical security. The Contractor shall be responsible for safeguarding all Government property and controlled forms provided for the Contractor's use. At the end of each work period, all Government facilities, equipment, and materials shall be secured. The Contractor shall be also responsible for the security of his own facilities, equipment, and material.

32.04.2 Key control.

The Contractor shall establish and implement methods of making sure all keys issued to the Contractor by the Government are not lost or misplaced and are not used by unauthorized persons. The following shall apply:

32.04.2.1.01 The Contractor shall not duplicate any keys issued by the Government

32.04.2.1.02 The Contractor shall immediately report any occurrences of lost or duplicated keys to the Government.

32.04.2.1.03 In the event of lost or duplicated keys, the Contractor may be required, upon written direction of the Government, to re-key or replace the affected lock or locks without cost to the Government. The Government may, however, at its option, replace the affected lock or locks or perform re-keying and deduct the cost of such from payment due the Contractor. In the event a master key is lost or duplicated, the Government shall replace all locks and keys for that system and the total cost deducted from payment due the Contractor.

32.04.2.1.04 The Contractor shall prohibit the use of Government issued keys by any persons other than the Contractor's employees and the opening of locked areas by Contractor employees to permit entrance of persons other than Contractor employees engaged in performance of contract work requirements in those areas.

32.04.3 Controlled/Restricted Areas.

The Contractor shall implement local Base procedures for entry to Air Force control/restricted areas where Contractor personnel will work.

32.04.4 Lock combinations.

The Contractor shall control access to all Government-provided lock combinations to preclude unauthorized entry.

32.05 OPERATING INSTRUCTION (OI)

If applicable, the Contractor shall develop an OI for internal circulation control, protection of resources, and regulated entry into Air Force controlled areas during normal, simulated, and actual emergency operations. The OI shall be coordinated through 42 SFS/SPAIR located at 130 W. Selfridge Street, Maxwell AFB, and shall be written in accordance with AFI 31-209 ("Air Force Resource Protection Program"), the local Base Operations Plan, and AFI 31-210 ("Anti-Terrorism Program").

32.06 REPORTING THREATS TO SECURITY

The Contractor shall comply with the requirements of AFI 71-101V1, "Counterintelligence Awareness and Briefing Program." Contractor personnel shall report to an appropriate authority any information or circumstances of which they are aware that may pose a threat to the security of DOD or Contractor personnel, resources, and classified or unclassified defense information. Contractor employees shall be briefed by their immediate supervisor upon initial on-base assignment.

32.07 WEAPONS, FIREARMS, AND AMMUNITION

Contractor employees are prohibited from possessing weapons, firearms, or ammunition on themselves or within Contractor-owned or privately owned vehicles while on Maxwell AFB or Gunter Annex.

32.08 TRAFFIC LAWS

All Contractor personnel shall comply with Base traffic regulations.

32.09 SUITABILITY INVESTIGATIONS

Contractor personnel shall successfully complete, as a minimum, National Agency Check (NAC), before operating government furnished workstations that have access to Air Force e-mail systems. These investigations shall be submitted by the government at no additional cost to the contractor. The contractor shall comply with the DOD 5200.2-R, Personnel Security Program, and AFI 33-119, Electronic Mail (E-Mail) Management and Use, requirements.

33.01 REQUIRED INSURANCE

33.01 Reference FAR clause 52.228-5 entitled “Insurance...” the Contractor shall, at its own expense, procure and thereafter maintain the following kinds of insurance with respect to performance under the contract.

a. Workmen’s Compensation and Employers Liability Insurance as required by law except that if this contract is to be performed in a State which does not require or permit private insurance, then compliance with the statutory or administrative requirements in any such State will be satisfactory. The required Workmen’s Compensation insurance shall extend to cover employer’s liability for accidental bodily injury or death and for occupational disease with a minimum liability limit of **$100,000**.

b. General Liability Insurance. Bodily injury liability insurance, in the minimum limits of $**500,000** per occurrence shall be required on the comprehensive form of the policy.

c. Automobile Liability Insurance. The insurance shall be required on the comprehensive form of policy and shall provide bodily and property damage liability covering the operation of all automobiles used in connection with the performance of the contract. At least the minimum limits of **$200,000** per person and **$500,000**, per occurrence for bodily injury and **$20,000** per occurrence for property damage shall be required. This insurance shall cover the operation of automobiles by Contractor employees and authorized Government employees and third parties.

34.01 CLAUSES AND PROVISIONS (SEP 2000)

34.01 Clauses and provisions from the Federal Acquisition Regulation (FAR) and supplements thereto are incorporated in this document by reference and in full text. Those incorporated by reference have the same force and effect as if they were given in full text.

34.02 Even though most of the clauses and provisions are incorporated by reference, some clauses and provisions are required to be completed and submitted by the offeror with offer. The full text of the clauses and provisions may be seen at https://www.acquisition.gov/

34.03 Clauses and provisions in this document will be numbered in sequence.

34.04 Sections K, L and M will be physically removed from any resultant award, but will be deemed to be incorporated, by reference, in that award.

35.01 SMOKING IN AETC FACILITIES

Contractors are advised that the Commander has placed restrictions on the smoking of tobacco products in AETC facilities. AFI 40-102, Tobacco Use in the Air Force, and its AETC supplement 1, outline the procedures used by the commander to control smoking in our facilities. Contractor employees and visitors are subject to the same restrictions as government personnel. Smoking is permitted only in designated smoking areas.

36.01 INSPECTION AND ACCEPTANCE

36.01 42 CES/CEN is designated as the office responsible for inspecting the work while the Contracting Officer is responsible for final acceptance of the work.

37.01 REQUIRED POSTERS

37.1 Please utilize the following website to access and download as appropriate EEO posters, Service Contract posters, and disability posters required in accordance with 52.222-26, 52.222-41, and 52.222-36 respectively.

http://www.dol.gov/osbp/sbrefa/poster/main.htm

END OF SECTION

SECTION 01001A

EXHIBIT L

ENVIRONMENTAL PROTECTION

July 7, 2022

PART 1 GENERAL

1.0 DESCRIPTION

The work covered by this section consists of furnishing all labor, materials, and equipment and performing all work required for the prevention of environmental degradation during and as a result of construction operations under this contract. These requirements are in addition to any environmental protection requirements elsewhere in these specifications. For the purpose of this specification, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents, not naturally occurring at the site, which adversely affect human health or welfare; unfavorably alter ecological balances; negatively affect plant or animal species; or degrade the utility of the environment for aesthetic and recreational purposes. The control of environmental pollution by the contractor requires consideration of air, water, and land, and involves noise control, solid waste management and management of radiant energy and radioactive materials, as well as other pollutants. This section also requires the protection of natural, cultural and historic resources.

1.1 ACRONYMS AND DEFINITIONS

ADEM – Alabama Department of Environmental Management CAA – Clean Air Act

CO – Contracting Officer

CERCLA – Comprehensive Environmental Response, Compensation and Liability Act CWA – Clean Water Act

EPA – Environmental Protection Agency

MAFB – Maxwell Air Force Base and Gunter Annex. Throughout this environmental protection section, MAFB (including Gunter Annex) may commonly be referred to as the base or installation.

Media – Any soil, water, or air that is moved, disturbed, or released from a site

OSHA – Occupational Safety and Health Administration

TM – Technical Manager

RCRA – Resource Conservation and Recovery Act

SDWA – Safe Drinking Water Act TSCA – Toxic Substances Control Act

42 CES/CEIE – Maxwell Air Force Base Civil Engineering Squadron, Environmental Section. Throughout this environmental protection section, this office will commonly be referred to as the “installation environmental office.”

The terms *hazardous, waste, pollutant, contaminant*, and *substance* have the same meanings and usage here as they commonly do in the CAA, CERCLA, RCRA, SDWA, and TSCA.

1.2 CONTRACTOR'S GENERAL ENVIRONMENTAL COMPLIANCE OBLIGATIONS

1.2.1. Work under this contract is to be performed on a government facility. All environmental rules applying to contractor operations elsewhere shall also apply on the government facility. Contractor (and any of their additional contractors, agents or representatives) shall comply with all applicable Federal, State, and local laws and regulations providing for environmental protection and pollution control and abatement. These include but are not limited to: the Clean Air Act, Clean Water Act, Resource Conservation and Recovery Act, Comprehensive Environmental Response, Compensation and Liability Act, Toxic Substances Control Act, Federal Insecticide Fungicide and Rodenticide Act, Coastal Zone Management Act, Endangered Species Act, Migratory Bird Treaty Act, National Historic Preservation Act, Archeological Resources Protection Act, Safe Drinking Water Act, Emergency Planning and Community Right-to-Know Act, Oil Pollution Act, and Pollution Prevention Act. Contractor has the duty to determine for himself/herself where such laws and regulations apply. Although the contractor may request assistance from the TM/Contract Administrator or the installation environmental office in delineating applicable environmental laws and regulations, contractor has an independent responsibility to make its own determination and to do so in a timely fashion. Environmental Management System (EMS) significant aspect is Hazardous Waste Compliance. Please ensure all personnel are aware of applicable RCRA requirements and have reviewed the Commander's Policy at the end of this section.

1.2.2. Contractors are responsible to implement their own environmental compliance programs, to ensure that individuals working at the site are properly trained and aware of potential hazards and proper operating procedures, and to ensure that all personnel follow the guidelines of OSHA, EPA, ADEM, and the Air Force's policies, in addition to any guidelines of the jurisdiction(s) in which the operations will be performed. Compliance with the provisions of this section by lower tier contractors will be the responsibility of the contractor.

1.2.3 Notification: The Contract Administrator will notify the Contractor in writing of any non- compliance with environmental provisions and the action to be taken. The Contractor shall, after receipt of such notice, immediately take corrective action. If the Contractor fails or refuses to comply promptly, the Contract Administrator 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 any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it was later determined that the Contractor was in compliance.

1.2.4 Maintenance of Pollution Control Facilities During Construction: During the life of this contract, the Contractor shall maintain all facilities constructed for pollution control under this contract as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created.

1.3 FINES OR PENALTIES FOR ENVIRONMENTAL NON-COMPLIANCE

The contractor shall be responsible for paying any fines or penalties assessed against

the Government for violations of environmental laws or regulations resulting from acts or omissions of the contractor or its employees, contractors, or agents. This obligation is in addition to any fines or penalties that may be assessed against the contractor for the same conduct. Contractor shall either reimburse these fines or penalties through the appropriate Contract Administrator, or with the consent of the Contracting office and installation environmental office, the Contractor shall pay such fines or penalties directly to the regulatory agency or agencies concerned.

1.03.1 Pollution Reporting: No hazardous material can be released into the environment (ground, water, air) without prior approval of the contractor. In the event of an accidental release of a hazardous material to any of these medias, the contractor will be notified immediately. The contractor will supply the means to properly prevent/contain and dispose of an accidental release in accordance with all applicable Federal, State, and Local regulations. All costs incurred by the contractor during the mitigation and disposal from an accidental release shall be the responsibility of the contractor.

1.4 CONTRACTOR'S LIABILITY FOR ENVIRONMENTAL DAMAGES

Contractor agrees to hold harmless and indemnify the Government for any and all damages of any kind resulting from environmentally harmful activities by the contractor, contractor's employees, agents, or contractors. "Damages" includes personal injury or death, property damages (including diminution of value), environmental restoration and response costs, natural or cultural resource damages or restoration, expert witness and attorney's fees, and reimbursement of any and all expenses incurred to obtain permits as a result of contractor's failure to identify or obtain permits for itself, the Government.

1.5 CONTACT WITH ENVIRONMENTAL REGULATORY OFFICIALS

Contractor shall immediately advise the TM/Contract Officer, 42nd Contracting Office, and the installation environmental office of the content of all contacts with Federal, State, or local environmental regulators; before, during, and after the performance of this contract concerning the performance of this contract.

1.6 PERMITS FOR EQUIPMENT USED BY CONTRACTORIN PERFORMING GOVERNMENT CONTRACTS.

For equipment used in the performance of this contract, contractor shall obtain in contractor's name and at no additional expense to the Government all permits, coordination, certifications or other regulatory authorization necessary to perform and complete the work required by this contract under applicable environmental laws and regulations. "Applicable environmental laws and regulations" includes but is not limited to: the Clean Air Act, Clean Water Act, Resource Conservation and Recovery Act, Comprehensive Environmental Response, Compensation and Liability Act, (CERCLA), Toxic Substances Control Act, Federal Insecticide Fungicide and Rodenticide Act, Coastal Zone Management Act, Endangered Species Act, National Historic Preservation Act, Safe Drinking Water Act, Emergency Planning and Community Right-to-Know Act, Oil Pollution Act, and Pollution Prevention Act, and State, County, and Local laws and regulations on the same subjects.

1.7 PERMITS NEEDED FOR CONSTRUCTION, EXCAVATION, MODIFICTION,

RENOVATION, DEMOLITION, INSTALLATION, OR OTHER ALTERATION OF BUILDINGS, STRUCTURES, EQUIPMENT, INSTALLATIONS, REAL PROPERTY OR SYSTEMS

Contractor shall identify all Federal, State, County, or local permits, coordination, certifications or other regulatory authorization requirements under all applicable environmental laws and regulations. Contractor shall then prepare in draft, and submit to the Contracts office for review, all applicable permit applications, coordination, notices, or other required filings, together with all supporting data. Permit applications, notifications or other documents that must be submitted by the Government shall be submitted by the Government, and any documents that must be submitted by the contractor shall be returned to the contractor for submission after review. No work requiring permit or other written authorization shall proceed before the contractor has the permit or authorization or a copy thereof in its possession. Copies of all required environmental permits shall be submitted to the Contracts office to be forwarded to the installation environmental office to have on file **prior to the start of work.**

PART 2 MATERIALS

2.1 ASBESTOS

2.1.1. Asbestos shall not be used or included in this project unless specifically approved in writing by the 42nd Contracting Office and installation environmental office.

2.1.2. If workers should encounter any suspect asbestos-containing material such as fibrous insulation, pipe wrap, asbestos-containing plaster, etc., contractor shall cease any activity that may disturb the material and immediately contact the TM/Contract Administrator for coordination with the installation environmental office.

2.1.3. If potential asbestos-containing material has been identified in connection with proposed work, all asbestos abatement activities shall be conducted by a certified Safe-State contractor, following base asbestos protocol, asbestos specification section, *Maxwell AFB*

Asbestos Management and Operations Plan. Contractor shall follow all applicable governing regulations, including, but not limited to: 29 CFR 1926.1101 - *OSHA Safety and Health Regulations for Construction, Subpart Z, Toxic and Hazardous Substances,* 29 CFR 1910.1001 - *OSHA Standards, Subpart Z, Toxic and Hazardous Substances, and* CFR Part 61 - *EPA National Emission Standards for Hazardous Air Pollutants (NESHAPS)*

2.2 POLYCHLORINATED BIPHENYLS (PCBs)

2.2.1. PCBs shall not be used or included in this project.

2.2.2. If contractor encounters any lighting ballasts, electrical transformers, or other equipment that is suspected to contain PCBs, contractor shall contact the TM/Contract Administrator for notification to the installation environmental office. If the equipment is not labeled or does not specify that the unit has “no PCBs,” it is considered to be suspect and shall be handled as if it may contain PCBs. Disposal shall be coordinated through installation environmental office. Contractorshall not remove any hazardous waste from the installation without installation environmental office knowledge prior to scheduling.

2.3 LEAD-BASED PAINT

2.3.1. Lead-based paint shall not be used or included in this project.

2.3.2. In buildings that were constructed prior to 1978, it should be assumed that lead-based paint is present unless sampling results indicate otherwise. Any activities that will potentially disturb lead-based paint shall be coordinated through the installation environmental office. Contractor is responsible for complying with the *Maxwell AFB Lead-Based Paint Management Plan* and all applicable Federal, State, and local regulations, including OSHA *Lead in Construction Standard* 29 CFR 1926.62. Contractor shall be properly trained and is responsible for worker training and protection requirements. Documentation of training shall be provided to the 42nd Contracting Office prior to start of work.

2.3.3. If suspect lead-based paint is encountered during performance of work, contractor shall coordinate lead-based paint work plan through TM/Contract Administrator for coordination with installation environmental office before proceeding with any activities such as sanding, scraping, demolition, or other activities that may disturb lead-based paint.

2.4 OZONE-DEPLETING SUBSTANCES

2.4.1. The use of Class I ozone-depleting substances is generally prohibited. Any use of a Class I ozone-depleting substance shall be approved through the installation environmental office prior to use. All Class I ODSs recovered on site shall be returned to the base Civil Engineering HVAC shop (42 CES/CEOH). All reasonable efforts shall be made to reduce usage of Class II ozone-depleting substances. All usage shall be reported to 42 CES/CEIE.

2.4.2. Contractors shall follow regulations concerning ODS as specified in 42 USC 7671 (b), (c), and (d) and 40 CFR Part 82, Subpart E. All Class I and Class II ODS shall be labeled IAW these regulations.

2.4.3. The contractor shall comply with the applicable requirements of Sections 608 and 609 of the Clean Air Act (42 USC 7671g, National Recycling and Emission Reduction Program and 7671h, Servicing of Motor Vehicle Air Conditioners) as each or both apply to the contract.

2.5 PESTICIDES

Except as may be specified elsewhere in this contract, contractor shall not use or apply pesticides (such as insecticides, rodenticides, herbicides or weed-killers) without specific written prior approval of the TM/Contract Administrator.

2.6 HAZARDOUS MATERIALS, POLLUTION PREVENTION & WASTE MINIMIZATION

When a hazardous material is required in performance of this contract, the contractor is required to submit *Contractor's Hazardous Material Questionnaire*, *Contractor's Environmental Reporting Entry Form*, and Material Safety Data Sheets (MSDS) for each hazardous material to be used. The hazardous material must be approved prior to being brought onto Maxwell AFB or Gunter Annex.
The approval process should be less than 2 days in order to comply with the 10-day suspense time to receive submittals 5 days prior to contract start date. See AF Form 66.

PART 3 EXECUTION (WORK PRACTICES)

3.1 SITE DISTURBANCE DURING CONSTRUCTION ACTIVITIES

3.1.1. National Pollutant Discharge Elimination System (NPDES) - For any project that will disturb an area “equal to” or “more than” 1 acre, the contractor is required to submit an ADEM Notice of Intent (NOI) under the NPDES General Construction Permit. A completed copy of the NOI must be submitted to the 42nd Contracting Office and Environmental Department prior to any site work. The “site” encompasses the collective area of disturbance for any project, even if the disturbed areas are non-contiguous. The contractor is responsible for all required inspections under ADEM’s NPDES General Permits. However, Base Environmental will perform additional oversight inspections and instruct changes, alterations and/or modifications as necessary.

3.1.2. The contractor shall use industry recognized Best Management Practices (BMPs) to the maximum extent practical to avoid and control storm water runoff from the construction site and any temporary roads that may be used to access the site (entrances/exits). Contractor shall perform all work under this contract in such a manner that no pollutants of any kind are released into ditches, storm drains, streams, lakes, or other surface waters on or connected to the site. BMPs shall be implemented prior to site disturbance and maintained throughout project duration until permanent stabilization has been achieved. Protective measures shall include:

3.1.2.1. Silt Fencing: Install silt fencing around all storm drains and runoff channels that can be potentially impacted by the construction/demolition activity. Install silt fencing where appropriate and to the maximum extent necessary to prevent removal of particulates and debris with runoff from the site. Refer to the ADEM Handbook for Type A, B and C methods.

3.1.2.2. Wattles: Install wattles in front of curb inlets that will be impacted when sediment run-off is inevitable due to tracking, equipment and supply staging areas and/or other disturbed areas. Wattles shall be in lengths that cover entire inlet opening. Contract Administrator does not recommend blocking curb/street inlets unless absolute necessary. Blocking street inlets will cause temporary ponding which may impact traffic flow. The contractor must make all reasonable attempts to maintain sediment on the construction site to eliminate having to protect street inlets. Wattles are an acceptable practice when protecting drop inlets located in landscaped areas where stakes can be used to hold the wattles in place on a disturbed construction site. Straw wattles shall not be used for drop inlet protection on concrete or asphalt pavement areas

3.1.2.3. Silt Savers: Install silt savers as a primary means for drop inlet protection within the disturbed areas of a construction site. Silt savers come in round or square molds depending on the drop inlet configuration and size. Crushed stone and/or soils shall be used to support the mold and filter fabric in place. Install as per manufacture recommendations..

3.1.2.4. Hay Bales: Place and stake hay bales or other temporary dams where appropriate for impeding storm water flow across large, open areas of disturbed earth and as particulate barriers to prevent erosion and unintended soil relocation. Hay bales shall not be used as a sole source when protecting drop inlets. Silt fencing and/or crushed stone shall be used in support with hay bales to prevent entry of sediment and any construction debris during the activity. Hay bales shall not be

used to protect curb inlets.

3.1.2.5. Block and Gravel: Install block and gravel inlet protection where an impermeable surface (concrete, asphalt, etc.) exists around the drain and in other areas where this type protection is more appropriate to prevent particulate transport to the inlet. The height of the block and gravel inlet structure shall be a minimum of 12 inches. A geotextile fabric shall also be placed as a filter between the block and crushed stone (ALDOT #57 crushed stone or similar grade shall be used).

3.1.2.6 Geotextile Fabric (drop inlet barriers):
The contractor may use a non-woven geotextile fabric as a means to protect drop inlets with metal grates. The drop inlet grate can be removed in order to place a sufficient amount of geotextile fabric inside the storm inlet opening. The grate must be replaced on top of the fabric maintaining a tight fit with no gaps in order to provide a sock-like barrier. Excess fabric shall drape outside the grate allowing for any sediment to be captured. This method allows for construction traffic but must be maintained. Sediment overloaded geotextile fabric must be cleaned and replaced as needed.

3.1.2.7. Stabilization: All disturbed and exposed soils shall be preserved, covered if needed, in a manner that prevents soil migration with rainfall or runoff. Contractor is responsible for repair of any erosion caused by the contractor's construction activities. All disturbed or exposed soil shall be permanently stabilized at the earliest practicable date. In most cases, seeding is not allowed on the installation; areas shall be repaired with sod, re- vegetation shall be with non-invasive plants that are native species or approved turf species.

3.1.2.8Concrete & Asphalt Saw-Cutting: The contractor shall implement means and methods to control and clean-up from saw-cutting activities immediately and not allow for traffic to travel through the saw cut locations until the "saw-cut mud" clean-up activities are completed. **Washing into the nearest storm drain is prohibited.**

3.1.2.9Concrete Wash-Outs: The contractor must have a location on site or at an approved location by the TM/Contract Administrator where concrete trucks can wash out. The location must be in an area that will not allow the wastewater to flow or drain into storm inlets, drainage ditches, waterways or roadways. For large projects where multiple concrete placements will be performed, a wash out location must be designated and protected. Typically this is created by using a soil berm and combining with the use of hay bales, silt fencing, and/or wattles.

3.1.2.10 Materials & Fuel Storage: The contractor must maintain a clean and orderly project site and laydown yard with regards to materials storage. Containers with liquids, oils, lubricants, fuels and other materials must be properly covered and/or stored on site and protected from rainfall and inclement weather. Spill prevention controls and spill response materials must be available and/or on hand in case of a spill. Base Environmental must be notified of any spill for documentation, instructions for clean-up and disposal requirements.

3.1.2.11 Soil, Sand, and Crushed Stone Stock Piles: The contractor must store stock piles in a manner and in a location where sediment run-off will not leave the site. Storm inlets must be protected in affected or in adjacent areas with the use of silt fencing, wattles, berms and/or a combination of thereof, unless sediment control can be maintained on site.

3.1.2.12 Dust Control: Water shall be used in a manner to control dust during dry periods of the year and continuous during demolition activities. The amount of water used shall be monitored by the contractor. Excess water can create additional problems.

3.1.2.13 Construction Entrances/ Exit Pads: The contractor shall construct an adequate construction entrance/exit pad to protect from vehicle and construction equipment tracking onto roadways, parking lots and other impermeable hard surfaces. A layer of non-woven geotextile fabric shall be placed in a designated location(s) for the project. ALDOT #1 crushed stone shall be placed with a minimum thickness of 6 inches on the fabric. The pad must be constructed to an adequate length and width for the project traffic and equipment. The contractor **shall not** use crusher run, river gravel, or small crushed stone such as ALDOT #57 or #67 stone. This material compacts and thus does not provide an adequate surface for flexing rubber tires to remove mud and sediment. It is the responsibility of the contractor to maintain and replace the crushed stone when conditions do not provide adequate protection from off-site tracking.

3.1.3 ENFORCEMENT MECHANISM – CONSTRUCTION SITE STORM WATER RUNOFF CONTROL

3.1.3.1 All project sites will be subject to inspections by CEIE and/or CE project managers. Documenting inspections and non-compliance issues will occur on monthly summary reports to the Government Quality Assurance Evaluator (QAE) for Maxwell AFB.

3.1.3.2 If site condition(s) warrants an instruction for correction or implementation of a BMP, this item will be verbally discussed between the Contract Administrator, the contractor's representative, the CEIE representative and the CE project manager. Instructions will be given if a site condition is, or has the potential to become, a NPDES non-compliance issue. The contractor will be given a deadline by which to implement, change and/or fix the issue, depending on the finding.

3.1.3.3 A follow up inspection by CEIE or the CE project manager will be performed to observe for site corrections. If the site correction has not been implemented or fixed due to a lack of effort, lack of concern or contractor negligence, then a written warning will be documented and placed on file. The contractor will be given a warning letter and a final deadline for implementing the mandatory instruction.

3.1.3.4 If, on a 2nd follow up site inspection, the contractor has not completed the Base's instruction, a work stoppage, at the contractor's loss of time, will be enforced until the compliance issue or issues have been addressed.

3.1.3.5 If more than one work stoppage has to be enforced for a single project, due to non-compliance issues, the general contractor will be subject to removal from all future bid lists for a time determined by the Contract Administrators.

3.1.3.6 The above process can be used as guidance for all projects. However, CEIE and CE reserve the right to work with contractors on a project-to-project basis, based on special conditions. Special conditions may be determined by CEIE and CE. Special conditions may include, but are not limited to, situations such as the following:

A. Unforeseen weather conditions. (i.e. flooding, severe thunderstorms with significant rainfall events, etc…)
B. Vandalism
C. Contractor making continuous efforts to comply with standards, using means and methods typically applied in the construction industry, and exhibiting an overall concern with maintaining a site in compliance with the Base and under State guidelines.

3.1.3.7 A maintenance plan should be developed to address issues that need immediate corrections, which may result in off-site discharges, when the contractor is not on Base, refuses to return in a timely manner to make corrections and/or cannot be contacted. These issues include, but are not limited to, the following: silt fence repair, street sweeping, inlet protection, etc… The cost of these corrections could be passed on to the contractor, if the contractor is found to be at fault due to negligence.

3.2 OTHER PROTECTION OF WATER RESOURCES

3.2.1. GENERAL: The contractor shall not pollute storm drainage, streams, lakes, or reservoirs with fuels, oils, bitumen, calcium chloride, acids, construction wastes, or other harmful materials or pollutants. It is the responsibility of the contractor to determine and comply with all applicable Federal, State, regional, municipal, and other regulations.

3.2.2. SPILLAGE: The contractor shall take special measures to prevent chemical, fuels, oils, greases, bituminous materials, waste washings, herbicides, paints, cement, and surface drainage from entering public waters. In the event of a spill, the contractor must first notify the Maxwell AFB Fire Department (334-953-9911), and then notify the TM/Contract Administrator and the installation environmental office. Contractor is responsible to make all required notifications to Federal, State, or local authorities as soon as possible.

3.2.3. WASHING AND CURING WATER: Water used in aggregate processing, concrete curing, foundation, and concrete lift clean-up and other waste water shall not be allowed to enter the storm drainage system.

3.2.4. PAINTING: Contractor shall provide sufficiently-sized drop cloths at each job site to contain any accidental spillage during paint usage. All containers shall be placed on drop cloths before opening and at all times during use. Any unused paint and its containers brought onto the installation by the contractor shall be properly sealed and taken off the installation by the contractor upon completion of the job.

3.2.4.1. Latex Paint: Locations (sanitary waste drains/entry points) for cleaning of brushes and other paint application equipment are confined to only those designated by installation environmental personnel for the particular job. At the designated sanitary waste disposal site, the volume of water used for cleaning shall be sufficient to provide for adequate dilution of the paint material.

3.2.4.2. Oil-Based Paint, Polyurethane, and Other Chemicals or Cleaning Solutions: Contractor shall properly dispose of all oil-based paint, polyurethane, cleaning solutions, containers, and used applicators at an off-base site.

3.2.5. CARPET CLEANING: Contractor shall vacuum-extract or otherwise capture all cleaning fluids and chemicals applied to carpet during cleaning procedure. Fluids shall be collected in a portable tank and transported off the installation for proper disposal in accordance with all applicable regulations. No material or fluid used in carpet cleaning activities shall be disposed of anywhere on the installation.

3.3 PROTECTION OF LAND RESOURCES

General: It is intended that the land resources within the project boundaries and outside the limits of permanent work performed under this contract be preserved in their present condition or be restored to a condition after completion of construction that will appear as the natural state and not detract from the appearance of the project. The contractor shall limit his construction activities to areas defined by the Drawings or Specifications.

3.4 CONTROL OF AIR EMISSIONS

3.4.1. Contractor's actions shall conform to all applicable State, Federal, Air Force and MAFB requirements and directives for the control of air emissions under this and all contracts to be executed within the boundaries of Maxwell-Gunter AFB and associated GSU's. When installing, servicing or operating air pollution producing equipment, all work shall be completed in accordance with manufactures specifications to ensure optimal operation and minimal emissions to the environment. When new or remanufactured equipment, including boilers and generators, is being installed, all necessary specifications and documentation required to calculate air emissions shall be provided to 42 CES/CEIE 60 days prior to installation. Required emissions data consists of unit capacity, input rating, output rating, and low emissions modifications.

3.4.2. Burning shall only be permissible when approved in writing by a representative from 42 CES/CEIE. All burning operations shall conform with applicable State, Federal, Air Force and MAFB requirements and directives. It shall never be permissible to burn or allow the burning of any plastic, rubber, paper, treated lumber or other material that is not vegetative waste generated on the project site.

3.4.3. Dust control measures shall be employed when necessary to control dust production on a work site. Vehicles leaving the site shall have all practical amounts of dust/dirt removed by brushing, washing or other equally effective method to ensure that generation of airborne dust due to vehicle movement and tracking onto roadways is minimized. All bulk containers of loose material to be moved to or from a work site shall be covered to minimize airborne dust during transport.

3.5 WASTE DISPOSAL

3.5.1. GENERAL: Installation environmental office shall be notified 24 hours before any waste will be allowed to leave the facility. Recurrence of pickups can be scheduled for the duration of the project or throughout current fiscal year. All waste containers shall be properly labeled in accordance with applicable regulations. Quantity of waste materials shall be provided to the 42nd Contracting Office and installation environmental office.

3.5.2. HAZARDOUS WASTE GENERATION, HANDLING, AND DISPOSAL: Work done under this contract is to be performed on a government facility. According to rules and procedures of the United States Environmental Protection Agency, the Federal facility is required to have a generator identification number under the RCRA and to be responsible for wastes (as defined under RCRA and TSCA) produced, managed, stored, disposed on, or transported from the facility. Contractor shall, to the greatest extent practicable, use materials, processes, and techniques that will avoid the creation of hazardous waste. Under no circumstances shall contractor bring onto the site hazardous waste that has been generated elsewhere. No hazardous waste, petroleum waste, or universal waste shall be disposed of in solid waste containers.

Prior to generation of any hazardous wastes, contractor shall prepare and submit a written waste management and disposal plan for all hazardous wastes generated on the site, and all planned activities regarding hazardous materials and hazardous waste shall be coordinated through the Contract Administrator with the installation environmental office. Contractor shall follow this plan once it has been approved in writing by the CO in conjunction with the environmental office and shall dispose of all hazardous waste in accordance with all Federal, State, and local requirements. **Contractor shall coordinate and schedule all disposal of hazardous waste through the CO in conjunction with the installation environmental office. Installation environmental office must authorize, on site, all shipments of hazardous waste from Maxwell Air Force Base.**

3.5.3. DISPOSAL OF NON-RCRA WASTES: All non-hazardous wastes generated on the site as a result of this contract shall be disposed of properly, in accordance with all Federal, State, and local requirements. Prior to creation of such wastes, the contractor shall submit to the installation environmental management function, through the TM/Contract Administrator, a plan for disposal of wastes. Such plan shall include the types of waste to be created, estimated quantity expected, how they shall be stored, managed and disposed. Contractor shall follow this plan once it has been approved by the installation environmental office and TM/Contract Administrator. Such wastes shall not be created until approved by the TM/Contract Administrator. Unless specified otherwise in the contract, non-hazardous waste shall be disposed of off base by the contractor in a legal manner that will not result in liability to the United States Air Force. Waste manifest, Bill of Laden, and/or landfill receipt shall be provided to the 42nd Contracting Office for forwarding to installation environmental office.

3.5.4. CONSTRUCTION DEBRIS: This contract may require the contractor to remove clean construction debris from the site and dispose of the debris off the installation in a manner that is in compliance with all applicable Federal, State, and local regulations. (Site soil, water, or other site media are not covered by this paragraph.) Such debris shall be free of all contamination, including but not limited to, lead paint, asbestos, and insecticides. Prior to removal of any construction

debris, that debris shall be certified by an installation representative to be free of contamination and this certification shall be provided to the TM/Contract Administrator. To expedite work, this may be accomplished by a FAX, or other suitable electronic means; however, the original certification form shall be provided to the TM/Contract Administrator. All necessary information shall be provided and the document shall be signed by an authorized installation representative. The certification form is provided at the end of this section of the specifications. All construction debris removed from the installation shall be covered by a certification. The contractor shall arrange with the installation point of contact whether all debris will be covered by one certification or if several certifications will be required.

3.5.5. RECYCLING: Contractor shall recycle material to the greatest practicable extent in order to reduce disposal of solid waste. Where construction and/or demolition debris such as concrete, brick, asphalt, wood, carpeting, or other material can be recycled, this alternative will be considered. Contractor shall submit weight verification of recycled/reclaimed material to the 42nd Contracting Office for submission to the installation environmental office for solid waste diversion tracking.

3.5.6. ORGANIC WASTES: Organic waste from ground-clearing operations may usually be disposed of at the installation compost facility. Contractor shall check with the TM/Contract Administrator for final clearance.

3.5.7. CONSOLIDATED WASTE DISPOSAL PLANS: Contractor may, at contractor's option, submit for approval as specified above one consolidated plan for handling hazardous and non-hazardous wastes.

3.6 EARTHWORK AND REMOVAL OF POTENTIALLY CONTAMINATED MEDIA:

3.6.1. ENCOUNTERING UNEXPECTED CONTAMINATED SOIL OR GROUNDWATER: Unless otherwise specified elsewhere in this contract, the site has been inspected and is, consistent with best professional judgment, free of environmental contamination or pollution. However, work under this contract will be performed on a military installation, where the history of prior military and industrial activities is not necessarily completely known, and unexpected conditions can always arise. Contractor or contractor personnel may encounter soil or groundwater that is suspected to be contaminated, either because of odors, colors, free liquids, unexpected construction debris, or other suspicious conditions. Should this occur, contractor shall cease activity in the area except those initial actions necessary to protect workers, the site, and other personnel. Contractor shall then immediately notify the TM/Contract Administrator and the installation environmental office at 953-5260.

3.6.2. Chlordane: Facilities proposed for demolition, significant renovation, and /or additions that were constructed prior to 1990, will be suspect for the presence of chlordane and other pesticides. It is known that chlordane has been used on Maxwell AFB as a pesticide prior to its EPA ban in 1989. We require that soils around the building foundations be tested for the presence of pesticides (chlordane). The EPA has specific handling and disposal requirements for soils and/or any waste streams that have been contaminated with chlordane that exceed threshold limits. Any suspected chlordane-containing soil will be subject to these provisions.

3.6.3. REMOVAL OF POTENTIALLY CONTAMINATED MEDIA: The following

provisions prohibit the removal from the installation of potentially contaminated soil or other materials found on site and are included, in an abundance of caution, for the protection of the Government, the installation, and the contractor.

3.6.3.1. Notwithstanding any another clause in this contract, including but not limited to all standard site work general provisions; no media by-product resulting from site preparation, construction or excavation shall be moved off the installation where the construction is occurring without written permission from Contracting Officer. If the construction is off the installation, no media by-product shall be moved off the construction site.

3.6.3.2. The contractor shall: (1) leave the media in place at the site, subject to appropriate erosion control; or (2) haul the media to, and place it at, a location on the installation that has been designated either in this contract or in writing by the TM/Contract Administrator; and (3) if unforeseen difficulties arise, such as excessive quantity of media is generated, the contractor shall advise the TM/Contract Administrator and shall not remove media from the site without written authorization from the Contracting Officer.

PART 4 - RESOUCE PROTECTION

4.1 RESOURCE CONSERVATION

Consumption of resources shall be minimized where possible. Contractors shall shut down electrical and gas-powered equipment when not in use and minimize the consumption of water and other resources.

4.2 PROTECTION OF CULTURAL/HISTORICAL RESOURCES

4.2.1. HISTORIC FACILITIES: Modifications or renovations to any facilities on Maxwell-Gunter AFB that are listed on or eligible for the National Register of Historic Places or exceed 50 years in age must be reviewed and approved by the installation Cultural Resource Manager. If the proposed action affects any elements that contribute to the facility's historical characteristics, these actions are subject for review and approval by the State Historic Preservation Office (SHPO). Plans and drawings for projects that will impact historic facilities shall be submitted to installation environmental office for potential submission to SHPO. SHPO review is a minimum of 30 days, and work shall not proceed until authorized through the CO in conjunction with the installation environmental office. If the contractor or contractor's representative causes any damage to historical characteristics of a historic facility, contractor shall be responsible for full restoration of damage.

4.2.2. UNEXPECTED ARTIFACTS OR RELICS: Should contractor or employees, in the course of site preparation or other work on this contract, find unexpected historic or archeological remains, such as bones, arrow points, pottery remnants, foundations, or other evidence of previous uses of the site, contractor shall cease further site-disturbing activity and immediately notify the TM/Contract Administrator and installation environmental office.

4.3 PROTECTION OF NATURAL RESOURCES

4.3.1. PROTECTION OF SPECIAL WATER RESOURCES: If project will involve: any

disturbance below the ordinary high water mark of a pond, lake, stream, river, or other water body; any work within wetland areas; withdrawal of water from water bodies; or discharges into water bodies; planned work shall be coordinated through installation environmental office. Contractor shall obtain any required Federal, State, or local permits and submit copy of permit(s) to installation environmental office prior to work start.

4.3.2. PRESERVATION OF TREES, SHRUBS, AND OTHER LANDSCAPE: The following requirements shall be observed by the contractor in order to protect the existing landscape (to include trees, shrubs, turf, flowers, flower beds, sidewalks, patios, fences, etc.):

4.3.2.1. Tree Protection: All trees shall be protected unless they are designated on the plans to be removed. Contractor shall install protective fencing around trees in the construction area, at a radius extending from the tree trunk at least out to the drip line of the tree. No vehicle parking or storage of materials is allowed under tree canopies or within the drip line/root zone of the trees or beside existing shrub plantings. Work shall not damage roots of existing trees without prior coordination with installation Natural Resources Manager. No fences, ropes, cables, signs, or devices of any kind shall be attached to any tree. Pruning or removal of trees/shrubs shall only be permitted after written or electronic coordination with the Natural Resources Manager in the environmental office or the Horticulturist at the installation greenhouse. The TM/Contract Administrator and installation environmental office shall be notified immediately of any damage to trees caused by contractor or contractor's representative. The 42nd Contracting Office will direct measures, if any, to treat the injury. If the contractor or contractor's representative causes the death or 60% decline to any protected tree(s) within a 24-month period, the contractor shall remove and replace the damaged tree(s) with size and species of tree(s) directed by the 42nd Contracting Office. The size of replacement tree(s) shall equal caliper size of removed trees. Contractors shall replace trees in accordance with the AETC Tree Instruction, AETCI 32-7065.

4.3.2.2. Turf Protection: No driving across, parking, or other equipment operations on existing turf or storage of materials on turf areas shall be permitted unless prior approval has been obtained from the TM/Contract Administrator. If any lawn damage occurs (even with special permission), the contractor shall restore the lawn with approved sod, per "Maxwell Air Force Base Landscape Management Operational Instruction." (Turf in most areas is Tifton 419 Bermuda grass.) If sod fails to grow or is not viable within 60 days of the date of substantial completion of the contract, sod shall be replaced at contractor's expense. The use of grass seed to repair turf damage is not permitted.

4.3.3. REPAIR OR REPLACEMENT OF DAMAGE: If any failure to comply with these environmental protection provisions or any other provisions of this contract results in damage to government resources, contractor shall be held responsible. Any landscaping, turf, or other natural resource damage shall be repaired, at no additional cost to the government, to the government standards as defined in "Maxwell Air Force Base Landscape Management Operational Instruction." Repair work shall be inspected and accepted by the Contracts office or TM/Contract Administrator. Any discrepancies shall be fixed before acceptance.

PART 5 – CONTACT INFORMATION

If at any time, contractor has environmental protection concerns or questions, first attempt to contact the Contracting Officer, who can contact the installation environmental office, 42 CES/CEIE. If Contracting Officer is not available, or in case of emergency, contractor may contact the environmental office at **334-953-5260.**

For immediate response in case of any chemical release or spill, contact the MAFB Fire Department at 953-9911. (From a MAFB installation phone, dial 911.)

INSTALLATION CERTIFICATION FOR CLEAN CONSTRUCTION DEBRIS TO BE REMOVED FROM THE CONSTRUCTION PROJECT SITE

As representative of Maxwell Air Force Base (insert name of installation),

I am authorized to certify, and hereby do so certify, that the construction debris to be removed from the Government project site at:

_____

(describe project and list address, for example Building 1925, Shop Addition, Maxwell AFB, Montgomery, Alabama)

has been inspected and is free of all contamination, including but not limited to: lead paint, asbestos, PCBs, and pesticides.

CERTIFICATION:

Signed: _____ Date: _____

Printed Name, Rank or Grade, and Duty Title:

_____

ORIGINAL OF THIS FORM MUST BE PROVIDED TO THE PM/TM

END OF SECTION

DEPARTMENT OF THE AIR FORCE
42D AIR BASE WING (AETC)
MAXWELL AIR FORCE BASE ALABAMA

JAN 1 0 2020

MEMORANDUM FOR ALL MAXWELL AND GUNTER ANNEX PERSONNEL

FROM: 42 ABW/CC

SUBJECT: Maxwell AFB Environmental Commitment Statement

References: (a) AFI 32-7001, *Environmental Management*
(b) AFPD 90-8, *Environment, Safety & and Occupational Health Management and Risk Management*
(c) DODI 4715.17, *Environmental Management Systems*

1. The Maxwell AFB community is strongly committed to conducting our mission in an environmentally safe manner, IAW AFI 32-7001, AFPD 90-8 and DODI 4715.17. Our commitment goes beyond compliance and encompasses the integration of sound environmental management system (EMS) practices into our daily decisions and activities. During the EMS Planning Phase of the EMS Continuous Improvement Cycle, we will score the aspects and impacts of the installation's various processes and services. Significant aspects will be identified, and the resulting objectives and targets will be documented in Environmental Action Plans (EAPs). The status of the EAPs will be reviewed at least annually through the Cross Functional Team (CFT) and Senior Leadership. Our goal is to enhance mission performance by improving the management of environmental aspects of the mission.

2. In support of this EMS commitment statement, we must all follow the guidelines below:

a. Comply with all governing standards and environmental requirements.

b. Minimize environmental pollution/waste and promote waste reduction.

c. Integrate EMS information into all levels of management, to include appointing Unit Environmental Coordinators as members of the CFT.

d. Strive for continual improvement in our EMS performance.

3. Compliance with this commitment statement is the responsibility of every member of the Maxwell AFB and Gunter Annex communities, and I ask each of you to work aggressively to meet the intent of this commitment statement.

4. This EMS commitment statement will be publicized through several channels, including eDASH and CFT/UEC meetings. The commitment statement will be available to external parties through LeMay Center/PA, as determined by the CFT. If you have any questions, please contact the Installation Environmental Office at 953-5260.

PATRICK J. CARLEY, Colonel, USAF
Commander

SECTION 01305
SUBMITTAL PROCEDURES
July 7, 2022

PART 1 GENERAL

1.01 SUMMARY (Not Applicable)

1.02 REFERENCES (Not Applicable)

1.03 SUBMITTAL CLASSIFICATION

1.03.1 Submittals are classified as follows:

1.03.1.1 Contracting Officer (CO) Approval: CO approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction", they are considered to be "shop drawings."

1.03.1.2 For Information Only: All submittals not requiring the Government approval will be “For information only” (FIO). They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.

1.04 APPROVED SUBMITTALS:

The approval of submittals by the CO/Contract Administrator shall not be construed as a check, but will indicate only that the general method of construction, materials, detailing and other information are satisfactory. Approval will not relieve the Contractor of the responsibility for any error that may exist because the Contractor is responsible for the dimensions and design of adequate connections, details and satisfactory construction of all work. After submittals have been approved by the CO/Contract Administrator, no resubmittals for the purpose of substituting materials or equipment will be given consideration unless accompanied by an explanation as to why a substitution is necessary.

1.05 DISAPPROVED SUBMITTALS:

The Contractor shall make all corrections required by the CO/Contract Administrator and promptly furnish a corrected submittal in the form and number of copies as specified for the initial submittal. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, notice as required under the Contract Clause entitled "Changes" shall be given promptly to the CO.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTIONS

3.01 GENERAL:

The Contractor shall submit all items listed on the Submittal Register (AF Form 66 Schedule of Material Submittals, or equivalent) or specified in the other sections of these specifications. The CO may request

submittals in addition to those listed when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same used in the contract drawings. Unless noted otherwise by the CO/Contract Administrator, submittals shall be made in three (3) hard copies as shown on the Submittal Register or submitted electronically. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, all items shall be checked and approved and each respective transmittal form or material approval submittal (AF Form 3000, Material Approval Submittal) shall be stamped, signed and dated by the Contractor certifying that the accompanying submittal complies with the contract requirements. Submittals shall include line number of item from Government-prepared Submittal Register. Proposed deviations from the contract requirements shall be clearly identified. Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals including parts list; certifications; warranties and other such required submittals. Submittals requiring approval by the CO/Contract Administrator shall be scheduled and made prior to the acquisition of the material or equipment covered thereby.

3.02 SUBMITTAL REGISTER (AF FORM 66 Schedule of Material Submittals):

A Submittal Register on AF Form 66, Schedule of Material Submittals, shall be made available to the Contractor upon issuance of Notice to Proceed. Within ten working days, the Contractor shall meet with the Technical Manager (TM)/Contract Administrator to jointly review the contractor-prepared Submittal Register. The Contractor shall be responsible for providing all items listed on the Submittal Register in accordance with the scheduled submittal dates. Allowance shall be made for rejected submittals.

3.03 SCHEDULING:

Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. The Contractor shall take special care to timely schedule the submittal date required for long lead-time items and shall allow 10 working days for review action by the Contract Administrator on all submittals except as noted below. No delays damages or time extensions will be allowed for time lost in late submittals. All submittals will be made on AF Form 3000, Material Approval Submittal as specified below.

3.04 TRANSMITTAL FORM (AF FORM 3000, Material Approval Submittal):

AF FORM 3000, Material Approval Submittal shall be used for submitting both Government approved and information only submittals in accordance with the instructions on the reverse side of the form. These forms will be furnished to the Contractor by the Contract Administrator. This form shall be properly completed by filling out all the heading blank spaces and identifying each item submitted. Special care will be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

3.05 CONTROL OF SUBMITTALS:

The Contractor shall carefully control his procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved **"Submittal Register."**

3.06 SUBMITTALS:

Upon completion of the review of a submittal requiring approval, the submittal will be identified as having received approval or disapproval by being so noted on AF FORM 3000, Material Approval Submittal, by the CO/Contract Administrator. Such submittals shall be made in accordance with the Construction Contract Clause entitled "Specifications and Drawings for Construction" and the following: unless other wise noted on the Submittal Register, three (3) prints of all drawings; or, if catalog cuts, printed specifications or similar publications are used as submittals, three (3) original copies shall be submitted. One corrected copy shall be returned to the Contractor. In cases where "trade names or equal" specifications are used, any equal substitution by the Contractor will be considered a deviation and will require approval. Any submittal requesting a deviation shall be considered as one requiring "approval" action. Payment for materials incorporated into the work will not be allowed if required approvals have not been obtained. Upon completion of review of submittals requiring approval, the submittals will be identified as having received approval or disapproval by being so noted on AF FORM 3000, Material Approval Submittal.

3.07 FIO SUBMITTALS:

All other submittals are considered to be FIO submittals and may be subject to review action by the CO/Contract Administrator or may be simply receipt acknowledged. Any submittal “For Information Only” shall be clearly marked “FIO”. Normally FIO submittals will not be returned. Approval is not required for information only submittals. The CO reserves the right to 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 and will not prevent the CO from requiring removal and replacement if nonconforming material is incorporated in the work. This also does not relieve the Contractor of the requirement to furnish samples for testing by an independent laboratory or check testing by the CO/Contract Administrator, in those instances where the technical specifications so prescribe. It shall be the Contractor's responsibility to ensure that the materials and/or equipment covered by that submittal meets the contract requirements. Any such FIO submittal found to contain errors or omissions shall be resubmitted as one requiring "approval" action. All FIO submittals shall be made in triplicate unless otherwise specified.

END OF SECTION 01305

MATERIAL APPROVAL SUBMITTAL

(See Instructions on Reverse)

Form Approved
OMB No 9000-0062
Expires May 31, 2005

TO: *(Contracting Officer)*	**FROM:** *(Contractor)*	**DATE** *(YYYYMMDD)*
CONTRACT NUMBER	SUBMISSION NUMBER	SUBMITTAL ☐ NEW ☐ RESUBMITTAL
PREVIOUS SUBMISSION NUMBER	PROJECT NUMBER	

TO BE COMPLETED BY CONTRACTOR			**FOR GOVERNMENT USE ONLY**			
ITEM NO.	SPECIFICATION SECTION/ PARA NO./DRAWING NO.	DESCRIPTION OF MATERIAL (Include Type, Model Number, Catalog Number, Mfg., etc.)	AP-PROVED	DISAP-PROVED	SEE REVERSE	INITIAL
			☐	☐	☐	
			☐	☐	☐	
			☐	☐	☐	
			☐	☐	☐	
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			☐	☐	☐	
			☐	☐	☐	

BY COMPLETING THIS FORM, THE UNDERSIGNED CONTRACTOR CERTIFIES THAT THE MATERIAL COMPLIES WITH ALL SPECIFICATIONS OF SUBJECT CONTRACT.

DATE *(YYYYMMDD)*	TYPE OR PRINT NAME AND TITLE	SIGNATURE

FOR GOVERNMENT USE ONLY

TO: *(BASE CIVIL ENGINEERING OFFICER)*

For Evaluation and Action

DATE *(YYYYMMDD)*	TYPE OR PRINT NAME AND GRADE	SIGNATURE

TO: *(AF Contracting Office)*

RECOMMEND	☐ ☐ APPROVAL	☐ ☐ DISAPPROVAL AS INDICATED ABOVE AND SUBJECT TO ANY COMMENTS ON THE REVERSE

DATE *(YYYYMMDD)*	TYPE OR PRINT NAME AND GRADE	SIGNATURE

TO: *(Contractor)*

☐ APPROVED ☐ DISAPPROVAL AS INDICATED ABOVE AND SUBJECT TO ANY COMMENTS ON THE REVERSE SIDE. REQUEST RESUBMITTAL ON DISAPPROVED ITEMS WITHIN _____ DAYS OF SHOWN BELOW

DATE *(YYYYMMDD)*	TYPE OR PRINT NAME AND GRADE	SIGNATURE

PREVIOUS EDITION IS OBSOLETE

COMMENTS

(Number to correspond with applicable Item Number on reverse)

INSTRUCTIONS TO CONTRACTORS

1. The term "material" is defined as articles, supplies, raw materials, equipment, parts, components, and end items that are to be incorporated into thework required by the contract.

2. This form is to be used by contractors for submitting Shop Drawings, Equipment Data, Manufacturer's Literature and Certificates and samples ofMaterials to the Government for approval in accordance with the provisions of this contract. Unless otherwise specified, it is to be prepared in 4 copies, signed, and provided to the contracting officer with appropriate attachments.

3. Item(s) to be approved will be clearly tabbed or identified. Data pertaining to item(s) to be approved will be clearly identified or tabbed, particularlywhere documents are voluminous, in order to properly evaluate the materials or articles to be incorporated in the work. Each attachment will be numbered to correspond with the item number shown on the face of this form.

4. Requests submitted shall be numbered consecutively, by contract, in the space entitled "Submission No.". This number, in addition to the Contract No., will be used to identify each Material Approval Submittal. Resubmissions will be indicated in the appropriate block and the insertion of previoussubmission number and data in addition to a new submission number. A single submission should be used for all work of a section of thespecifications, but in NO instance should the submission include work for more than one (1) contract. Submittals requiring priority handling will be submitted by separate submittal using the form and so marked across the face of the form.

5. This Material Approval Submittal is not valid unless it is signed by the contracting officer. This approval is required as called for by the contracting officer under the terms of this contract.

(REVERSE)

SUBMITTAL REGISTER																			
											PROJECT NUMBER			PROJECT TITLE				
											PNQS 23-4685			REPLACE CHILLER B1095, MAXWELL AFB				
TO BE COMPLETED BY PROJECT MANAGER													TO BE COMPLETED BY CONTRACT ADMINISTRATOR						
ITEM NUMBER	ITEM OR DESCRIPTION OF ITEM, CONTRACT REFERENCE, TYPE OF SUBMITTAL	NO. OF COPIES REQUIRED									REQUIRED SUBMISSION DATE	DATE TO CIVIL ENGINEERING	RETURN SUSPENSE DATE	DATE CONTRACTOR NOTIFIED		CONTRACTOR RESUBMITTAL	FINAL APPROVAL	REMARKS
		CERTIFICATION OF COMPLIANCE	SHOP DRAWINGS	SAMPLES	COLOR SELECTION	MANUFACTURER'S RECOMMENDATIONS	MANUFACTURER'S WARRANTY	CATALOG DATA	OPERATING INSTRUCTIONS	DATA	DOCUMENT \ REPORT				APPROVED	DIS-APPROVED			
1	HazMat Questionnaire (File With Item 1 thru 3)									3	3	5 Days Prior to Start Date							
2	HazMat MSDS (File With Item 1 thru 3)									3		5 Days Prior to Start Date							
3	Hazmat Reporting Entry Form (File With Item 1 thru 3)									3	3	5 Days Prior to Start Date							Must be filled out if contractor answers **YES** to the Hazmat Questionnaire
4	Hazmat Reporting Entry Form (File With Item 4 thru 5)									3	3	End of Contract							Submit Final Quantities
5	Recycling and Landfill Report (File With Item 4 thru 5)									3	3	End of Contract							
6	Warranties & as-builts										3	End of Contract							
7	O&M Manuals, pdf										3	End of Contract							
8	Project construction schedule										3	5 days after NTP							
9	Section 23 05 15 pipe, valves, fittings, accessories									3		10 days after NTP							
10	Section 23 05 15 Heat trace									3		10 days after NTP							
11	Section 23 05 93 TAB certifications	3										30 days after NTP							
12	Section 23 05 93 TAB reports										3	End of Contract							
13	Section 23 07 00 Insulation for chilled water piping									3		10 days after NTP							

SUBMITTAL REGISTER												PROJECT NUMBER		PROJECT TITLE					
												PNQS 23-4685		REPLACE CHILLER B1095, MAXWELL AFB					
TO BE COMPLETED BY PROJECT MANAGER														TO BE COMPLETED BY CONTRACT ADMINISTRATOR					
ITEM NUMBER	ITEM OR DESCRIPTION OF ITEM, CONTRACT REFERENCE, TYPE OF SUBMITTAL	NO. OF COPIES REQUIRED										REQUIRED SUBMISSION DATE	DATE TO CIVIL ENGINEERING	RETURN SUSPENSE DATE	DATE CONTRACTOR NOTIFIED		CONTRACTOR RESUBMITTAL	FINAL APPROVAL	REMARKS
		CERTIFICATION OF COMPLIANCE	SHOP DRAWINGS	SAMPLES	COLOR SELECTION	MANUFACTURER'S RECOMMENDATIONS	MANUFACTURER'S WARRANTY	CATALOG DATA	OPERATING INSTRUCTIONS	DATA	DOCUMENT \ REPORT				APPROVED	DIS-APPROVED			
14	Section 23 21 23 Pumps		3			3			3	3		10 days after NTP							
15	Section 23 64 10 Chiller		3			3			3	3		End of Contract							
16	Section 26 29 23 Adjustable Speed Drives		3			3			3	3		10 days after NTP							
17	Drawing E-2 Disconnects, conduit, wire, breaker									3		10 days after NTP							
18	Drawing E-2 Motor starter									3		10 days after NTP							

SECTION 01670

RECYCLED / RECOVERED MATERIALS

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 in the text by basic designation only.

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

40 CFR 247	Comprehensive Procurement Guideline for Products Containing Recovered Material

1.2 OBJECTIVES

Government procurement policy is to acquire, in a cost effective manner, items containing the highest percentage of recycled and recovered materials practicable consistent with maintaining a satisfactory level of competition without adversely affecting performance requirements or exposing suppliers' employees to undue hazards from the recovered materials. The Environmental Protection Agency (EPA) has designated certain items which must contain a specified percent range of recovered or recycled materials. EPA designated products specified in this contract comply with the stated policy and with the EPA guidelines. The Contractor shall make all reasonable efforts to use recycled and recovered materials in providing the EPA designated products and in otherwise utilizing recycled and recovered materials in the execution of the work.

1.3 EPA DESIGNATED ITEMS INCORPORATED IN THE WORK

Various sections of the specifications contain requirements for materials that have been designated by EPA as being products, which are or can be made with recovered or recycled materials. These items, when incorporated into the work under this contract, shall contain at least the specified percentage of recycled or recovered materials unless adequate justification (non-availability) for non-use is provided. When a designated item is specified as an option to a non-designated item, the designated item requirements apply only if the designated item is used in the work.

1.4 EPA PROPOSED ITEMS INCORPORATED IN THE WORK

The items listed below have been identified by EPA as being products which are still being researched and are being considered for future Comprehensive Procurement Guideline (CPG) designation. It is recommended that these items, when incorporated in the work under this contract, contain the highest practicable percentage of recycled or recovered materials, provided specified requirements are also met.

EPA ITEMS CONSIDERED FOR CPG III DESIGNATION

Carpet Runners
Flooring Materials
Hardboard
Medium Density Fiberboard
Nylon Carpet
Particleboard
Interior Trim and Window Frames
Roofing Materials
Rubberized Asphalt

Building Blocks
Decking Material
Plastic Pipe
Aggregates
Concrete Containing Silica Fume

1.5 EPA LISTED ITEMS USED IN CONDUCT OF THE WORK BUT NOT INCORPORATED IN THE WORK

There are many products listed in 40 CFR 247 which have been designated or proposed by EPA to include recycled or recovered materials that may be used by the Contractor in performing the work but will not be incorporated into the work. These products include office products, temporary traffic control products, and pallets. It is recommended that these non-construction products, when used in the conduct of the work, contain the highest practicable percentage of recycled or recovered materials.

PRODUCT	MATERIAL	POSTCONSUMER CONTENT (%)	RECOVERED MATERIALS CONTENT (%)
BUILDING INSULATION			
Rock Wool	Slag	--	75
Fiberglass	Glass Cullet	--	20-25
Cellulose Loose-Fill and Spray-On	Postconsumer Paper	75	75
Perlite Composite Board	Postconsumer Paper	23	23
Plastic Rigid Foam, Polyisocyanurate/ Polyurethane:			
Rigid Foam	--	--	9
Foam-in-Place	--	--	5
Glass Fiber Reinforced	--	--	6
Phenolic Rigid Foam	--	--	5
Plastic, Non-Woven Batt	Recovered or Postconsumer Plastics	--	100

NOTES: 1. Recovered materials content levels are based on the weight (not volume) of materials in the insulation core only.
2. Glass cullet in fiberglass insulation shall conform to ASTM D5359.

PRODUCT	MATERIAL	POSTCONSUMER CONTENT (%)	RECOVERED MATERIALS CONTENT (%)
CEMENT AND CONCRETE			
Concrete	Coal Fly Ash	--	*As Specified
	Blast Furnace Slag	--	*As Specified

* Content depends upon the mix design.

PRODUCT	MATERIAL	POSTCONSUMER CONTENT (%)	RECOVERED MATERIALS CONTENT (%)
REPROCESSED AND CONSOLIDATED LATEX PAINTS			
Reprocessed Latex Paint			
White, off-white			
Pastel Colors		20	20
Grey, brown, earthtones and other dark colors		50-99	50-99
Consolidated Latex Paint		100	100

NOTE: Percentages apply to reprocessed latex paints used for interior and exterior architectural applications such as wallboard, ceilings, and trim; gutter boards; and concrete, stucco, masonry, wood, and metal surfaces. Percentages apply to consolidated latex paints used for covering graffiti, where color and consistency of performance are not primary concerns.

PRODUCT	MATERIAL	POSTCONSUMER CONTENT (%)	RECOVERED MATERIALS CONTENT (%)
FIBERBOARD / PAPERBOARD			
Structural fiberboard			80-100
Laminated paperboard	Post Consumer Paper	100	100

NOTES: 1. Content levels are based on the weight (not volume) of materials in the insulating core only.
2. Structural fiberboard containing recovered paper shall conform to ASTM C 208.

PRODUCT	MATERIAL	POSTCONSUMER CONTENT (%)	RECOVERED MATERIALS CONTENT (%)
HYDRAULIC MULCH			
Paper based hydr. Mulch	Paper	100	100
Wood based hydr. Mulch	Wood and Paper	100	

NOTE: Content levels are based on the dry weight of the fiber, exclusive of any dyes, wetting agents, seeds, fertilizer, or other non-cellulose additives.

END OF SECTION

Vectrus Systems MAX-BOS	CONTRACTOR'S ENVIRONMENTAL REPORTING ENTRY FORM			
Prepared by:	Date:	Form No:	Revision No.:	Effective:
CEIE	23-NOV-09	**ESH-ESH-FM-003**	**(NEW)**	**23 NOVEMBER 2009**
- UNCONTROLLED DOCUMENT WHEN PRINTED - **May Not Be Current - Check Master Document List on the Vectrus Systems Max-BOS SharePoint for Current Version**				

HAZMO Office, Bldg. 1060, Phone: (334) 953-7155, Fax: (334) 953-4333

Contractor's Signature: _____ Date: _____

1. Contract Number:	2. Contractor Name:	3. HAZMAT Storage Location(s):	4. Reporting Month & Year:

5. Product Name / MSN	6. Manufacturer	7. Application Method	8. Unit of Issue	9. Quantity Brought on Base	10. Quantity Used

See reverse side of form for instructions.
Copy form for additional space, if needed.

1. Contract Number
2. Contractor Name
3. HAZMAT Storage Location: Building number & location/room in building. If multiple locations, please list. If stored off base, please indicate.
4. Date of reporting month (e.g. May 2006)

   (Note: For items 5 – 10 List HAZMAT information in columns provided)
5. Product Name being reported (e.g. latex gloss paint, walnut wood stain) or locally assigned Material Stock Number (MSN)
6. Manufacturer of product
7. Application process/method: How product will be applied to process? (e.g. brush, roller, spray, other)
8. Unit of issue (e.g. 16 oz aerosol can, 3 oz tube, 5 gal pail)
9. Amount of material brought on base during reporting month (e.g. 3 cans, 2 tubes, 1 pail)
10. Amount of material used during reporting month

The Federal Government has targeted the following chemicals for reductions in use. This includes DOD contractor use. Please avoid the use of these items plus any confirmed human carcinogens, sensitizers, teratogens, mutagens or extremely toxic materials when possible.

Benzene
Cadmium (and compounds)
Carbon Tetrachloride
Chloroform (and compounds)
Chromium (and compounds)
Cyanides
Dichloromethane or Methylene Chloride
Lead (and compounds)
Mercury (and compounds)
Methyl Ethyl Ketone
Methyl Isobutyl Ketone
Nickel (and compounds)
Toluene
Trichloroethane
Trichloroethylene
Xylene
Tetrachloroethane
Perchloroethylene

Vectrus Systems MAX-BOS	CONTRACTOR'S HAZARDOUS MATERIAL QUESTIONNAIRE			
Prepared by:	Date:	Form No:	Revision No.:	Effective:
CEIE	23-NOV-09	**ESH-ESH-FM-002**	**(NEW)**	**23 NOVEMBER 2009**
- UNCONTROLLED DOCUMENT WHEN PRINTED - **May Not Be Current - Check Master Document List on the Vectrus Systems Max-BOS SharePoint for Current Version**				

1. Contractor's Company Name: _____

   Name of Contractor: _____

   Phone Number: _____

   Fax Number: _____

   Address: _____

2. Contract Number: _____

3. Date, time and location of pre-performance conference meeting.

   _____

4. Project: _____

5. Quality Assurance Personnel (QAP)/ Contracting Officer (CO)

   _____ Phone#_____

6. Projected contract period: Start Date: _____ End Date: _____

7. Will contractor be using any hazardous material (HAZMAT) during this contract?

   a) If the answer is NO to the above question, sign and date below.

   _____ _____ _____

   Contractor's Name (print) Contractor's Signature Date

   b) If the answer is YES to the above question, sign and date below and complete item 8. Provide QAP/CO a chemical inventory and copies of all Material Safety Data Sheets (MSDS) 5 days prior to contract start date. Provide QAP/CO a monthly HAZMAT usage report (see Contractor's Environmental Reporting Entry Form, ESH-ESH-FM-003) during the contract period no later than 5 days after the end-of-each month.

   _____ _____ _____

   Contractor's Name (print) Contractor's Signature Date

8. Will the contractor be generating a potential waste or hazardous waste during the contract period? **(Yes/No)** If YES, contact the base Hazardous Waste Manager at (334) 953-3892 for proper reporting and disposal procedures.

The point-of-contact is the Hazardous Materials Management Office at (334) 953-7155, Fax: (334) 953-4333.

RECYCLING & LANDFILL REPORT

Please use the form below to report in TONS the amount of debris recycled and sent to the landfill.

Project #:_____

Building #:_____

Project Manager:_____

Company:_____

RECYCLING

MATERIAL RECYCLED	AMOUNT IN TONS

LANDFILL

MATERIAL SENT TO LANDFILL	AMOUNT IN TONS

SECTION 23 05 15

COMMON PIPING & HEAT TRACING FOR HVAC
02/14

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 325	(2017) Steel Construction Manual

AMERICAN WELDING SOCIETY (AWS)

AWS WHB-2.9	(2004) Welding Handbook; Volume 2, Welding Processes, Part 1

ASME INTERNATIONAL (ASME)

ASME B16.1	(2015) Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250
ASME B16.22	(2013) Standard for Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B16.3	(2011) Malleable Iron Threaded Fittings, Classes 150 and 300
ASME B16.39	(2014) Standard for Malleable Iron Threaded Pipe Unions; Classes 150, 250, and 300
ASME B16.5	(2017) Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard
ASME B16.9	(2012) Standard for Factory-Made Wrought Steel Buttwelding Fittings
ASME B31.3	(2016) Process Piping
ASME B40.100	(2013) Pressure Gauges and Gauge Attachments
ASME BPVC SEC IX	(2010) BPVC Section IX-Welding and Brazing Qualifications

ASTM INTERNATIONAL (ASTM)

ASTM A126	(2004; R 2014) Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings

ASTM A183	(2014) Standard Specification for Carbon Steel Track Bolts and Nuts
ASTM A197/A197M	(2000; R 2015) Standard Specification for Cupola Malleable Iron
ASTM A234/A234M	(2018) Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
ASTM A276/A276M	(2017) Standard Specification for Stainless Steel Bars and Shapes
ASTM A278/A278M	(2015) Standard Specification for Gray Iron Castings for Pressure-Containing Parts for Temperatures Up to 650 degrees F (350 degrees C)
ASTM A307	(2014; E 2017) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A563	(2015) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A6/A6M	(2017a) Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
ASTM B62	(2017) Standard Specification for Composition Bronze or Ounce Metal Castings
ASTM B749	(2014) Standard Specification for Lead and Lead Alloy Strip, Sheet and Plate Products
ASTM B88	(2016) Standard Specification for Seamless Copper Water Tube
ASTM C67/C67M	(2018) Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile
ASTM C109/C109M	(2016a) Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens)
ASTM C404	(2011; R 2017) Standard Specification for Aggregates for Masonry Grout
ASTM C476	(2018) Standard Specification for Grout for Masonry

ASTM D2000	(2012; R 2017) Standard Classification System for Rubber Products in Automotive Applications
ASTM D2308	(2007; R 2013) Standard Specification for Thermoplastic Polyethylene Jacket for Electrical Wire and Cable
ASTM E1	(2014) Standard Specification for ASTM Liquid-in-Glass Thermometers
ASTM F104	(2011) Standard Classification System for Nonmetallic Gasket Materials

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 515	(2017) Standard for the Testing, Design, Installation, and Maintenance of Electrical Resistance Heat Tracing for Industrial Applications

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58	(2009) Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation
MSS SP-67	(2017; Errata 1 2017) Butterfly Valves
MSS SP-72	(2010a) Ball Valves with Flanged or Butt-Welding Ends for General Service

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-1922	(Rev A; Notice 3) Shield, Expansion (Caulking Anchors, Single Lead)
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)
CID A-A-55614	(Basic; Notice 2) Shield, Expansion (Non-Drilling Expansion Anchors)
CID A-A-55615	(Basic; Notice 3) Shield, Expansion (Wood Screw and Lag Bolt Self-Threading Anchors

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01305 SUBMITTAL PROCEDURES:

SD-03 Product Data

Pipe and Fittings; G

Piping Specialties; G

Valves; G

Heat trace items; G

Supporting Elements; G

1.3 DELIVERY, STORAGE, AND HANDLING

Handle, store, and protect equipment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer. Replace damaged or defective items.

1.4 ACCESSIBILITY

Install all work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Install concealed valves, expansion joints, controls, dampers, and equipment requiring access, in locations freely accessible through access doors.

PART 2 PRODUCTS

2.1 ELECTRICAL HEAT TRACING

Provide heat trace systems for pipes, valves, and fittings that are in accordance with IEEE 515 and be UL listed. System include all necessary components, including heaters and controls to prevent freezing.

Provide self-regulating heaters consisting of two 16 AWG tinned-copper bus wires embedded in parallel in a self-regulating polymer core that varies its power output to respond to temperature along its length. Ensure heater is able to be crossed over itself without overheating. Obtain approval before used directly on plastic pipe. Cover heater with a radiation cross-linked modified polyolefin dielectric jacket in accordance with ASTM D2308.

Provide heater with self-regulating factor of at least 90 percent, in order to provide energy conservation and to prevent overheating.

Operate heater on line voltages of 120 volts without the use of transformers.

Size Heater according to the following table:

Pipe Size

(Inch, Diameter)	Minus 10 degrees F	Minus 20 degrees F
3 inches or less	5 watts per foot (wpf)	5 wpf
4 inch	5 wpf	8 wpf
6 inch	8 wpf	8 wpf
8 inch	2 strips/5 wpf	2 strips/8 wpf
12 inch	2 strips/8 wpf	2 strips/8 wpf

Control systems by an ambient sensing thermostat set at 40 degrees F either directly or through an appropriate contactor.

2.2 PIPE AND FITTINGS

2.2.1 Type BCS, Black Carbon Steel

Ensure pipe 1/8 through 12 inches is Schedule 40 black carbon steel, conforming to ASTM A53/A53M.

Ensure pipe 1/8 through 10 inches is Schedule 40 seamless or electric-resistance welded black carbon steel, conforming to ASTM A53/A53M, Type E, Grade B (electric-resistance welded) . Grade A should be used for permissible field bending, in both cases.

Ensure pipe 12 through 24 inches is 0.375-inch wall seamless black carbon steel, conforming to ASTM A53/A53M, Type E, Grade B (electric-resistance welded.

Ensure fittings 2 inches and under are 150-pounds per square inch, gage (psig) working steam pressure (wsp) banded black malleable iron screwed, conforming to ASTM A197/A197M and ASME B16.3.

Ensure unions 2 inches and under are 250 pounds per square inch, wsp female, screwed, black malleable iron with brass-to-iron seat, and ground joint, conforming to ASME B16.39.

Ensure fittings 2-1/2 inches and over are Steel butt weld, conforming to ASTM A234/A234M and ASME B16.9 to match pipe wall thickness.

Ensure flanges 2-1/2 inches and over are 150-pound forged-steel conforming to ASME B16.5, welding neck to match pipe wall thickness.

2.2.2 Type CPR, Copper

2.2.2.1 Type CPR-A, Copper Above Ground

Ensure tubing 2 inches and under is seamless copper tubing, conforming to ASTM B88, Type L (hard-drawn for all horizontal and all exposed vertical lines, annealed for concealed vertical lines).

Ensure fittings 2 inches and under are 150-psig wsp wrought-copper solder joint fittings conforming to ASME B16.22.

Ensure unions 2 inches and under are 150-psig wsp wrought-copper solder joint, conforming to ASME B16.22.

2.2.3 Grooved Pipe Couplings and Fittings

Provide housing for all couplings, fabricated in two or more parts, of black, ungalvanized malleable iron castings. Ensure coupling gasket is molded synthetic rubber, conforming to ASTM D2000. Ensure coupling bolts are oval-neck, track-head type, with hexagonal heavy nuts conforming to ASTM A183.

Fabricate all pipe fittings used with couplings of black, ungalvanized malleable iron castings. Where a manufacturer's standard-size malleable iron fitting pattern is not available, approved fabricated fittings may be used.

Fabricate fittings from Schedule 40 or 0.75-inch wall ASTM A53/A53M, Grade B seamless steel pipe; long radius seamless welding fittings with wall thickness to match pipe, conforming to ASTM A234/A234M and ASME B16.9.

2.3 PIPING SPECIALTIES

Submit equipment and performance data for piping specialties consisting of corrosion resistance, life expectancy, gage tolerances, and grade line analysis. Submit design analysis and calculations consisting of surface resistance, rates of flow, head losses, inlet and outlet design, required radius of bend, and pressure calculations. Also include in data pipe size, shape, and dimensions, as well as temperature ratings, vibration and thrust limitations minimum burst pressures, shut-off and non-shock pressures and weld characteristics.

2.3.1 Air Vents

Provide automatic air vents on pumps, mains, and where indicated using ball-float construction. Ensure the vent inlet is not less than 3/4-inch ips and the outlet not less than 1/4-inch ips. Orifice size is 1/8 inch. Provide corrosion-resistant steel trim conforming to ASTM A276/A276M . Fit vent with try-cock. Ensure vent discharges air at any pressure up to 150 psi. Ensure outlet is copper tube routed.

2.3.2 Dielectric Connections

Electrically insulate dissimilar pipe metals from each other by couplings, unions, or flanges commercially manufactured for that purpose and rated for the service pressure and temperature.

2.3.3 Flexible Metallic Pipe

Ensure flexible pipe is the bellows-type with wire braid cover and designed, constructed, and rated in accordance with the applicable requirements of ASME B31.3.

Minimum working pressure rating is 100 psi at 300 degrees F.

2.3.4 Pressure Gages

Ensure pressure gages conform to ASME B40.100 and to requirements specified herein. Pressure-gage size is 3-1/2 inches nominal diameter. Ensure case is corrosion-resistant steel, conforming to any of the AISI 300 series of ASTM A6/A6M, with an ASM No. 4 standard commercial polish or better. Equip gages with adjustable red marking pointer and damper-screw adjustment in inlet connection. Align service-pressure reading at midpoint of gage range. Ensure all gages are Grade B or better and be equipped with gage isolators.

2.3.5 Thermometers

Ensure thermometers conform to ASTM E1, except for being filled with a red organic liquid. Provide an industrial pattern armored glass thermometer, (well-threaded and seal-welded). Ensure thermometers installed 6 feet or higher above the floor have an adjustable angle body. Ensure scale is not less than 7 inches long and the case face is manufactured from manufacturer's standard polished aluminum or AISI 300 series polished corrosion-resistant steel. Thermometer range is appropriate for chilled water. Provide thermometers with nonferrous separable wells. Provide lagging extension to accommodate insulation thickness.

2.4 VALVES

Submit data for valves.

2.4.1 Ball and Butterfly Valves

Ensure ball valves conform to MSS SP-72 for Figure 1A, 1 piece body 1B, vertically split body 1C, top entry 1D, three piece body and are rated for service at not less than 175 psig at 200 degrees F. For valve bodies in sizes 2 inches and smaller, use screwed-end connection-type constructed of Class A copper alloy. For valve bodies in sizes 2-1/2 inches and larger, use flanged-end connection type, constructed of Class D material. Balls and stems of valves 2 inches and smaller are manufacturer's standard with hard chrome plating finish. Balls and stems of valves 2-1/2 inches and larger are manufacturer's standard Class C corrosion-resistant steel alloy with hard chrome plating. Balls of valves 6 inches and larger may be Class D with 900 Brinell hard chrome plating. Ensure valves are suitable for flow from either direction and seal equally tight in either direction. Valves with ball seals held in place by spring washers are not acceptable. Ensure all valves have adjustable packing glands. Seats and seals are fabricated from tetrafluoroethylene.

Ensure butterfly valves conform to MSS SP-67and are the wafer type for mounting between specified flanges. Ensure valves are rated for 150-psig shutoff and nonshock working pressure. Select bodies of cast ferrous metal conforming to ASTM A126, Class B, and to ASME B16.1 for body wall thickness.

Seats and seals are fabricated from resilient elastomer designed for field removal and replacement.

2.4.2 Drain, Vent, and Gage Cocks

Provide T-head drain, vent, and gage cocks, ground key type, with washer and screw, constructed of polished ASTM B62 bronze, and rated 125-psi wsp. Ensure end connections are rated for specified service pressure.

2.5 MISCELLANEOUS MATERIALS

Submit equipment and performance data for miscellaneous materials.

2.5.1 Bolting

Ensure flange and general purpose bolting is hex-head and conforms to ASTM A307, Grade B (bolts, for flanged joints in piping systems where one or both flanges are cast iron). Heavy hex-nuts conform to ASTM A563. Square-head bolts and nuts are not acceptable. Ensure threads are coarse-thread series.

2.5.2 Flashing

Ensure sheet lead conforms to ASTM B749, UNS Alloy Number L50049 (intended for use in laboratories and shops in general application) .

2.5.3 Flange Gaskets

Provide compressed non-asbestos sheets, conforming to ASTM F104, coated on both sides with graphite or similar lubricant, with nitrile composition, binder rated to 750 degrees F.

2.5.4 Grout

Provide shrink-resistant grout as a premixed and packaged metallic-aggregate, mortar-grouting compound conforming to ASTM C404 and ASTM C476.

Ensure shrink-resistant grout is a combination of pre-measured and packaged epoxy polyamide or amine resins and selected aggregate mortar grouting compound conforming to the following requirements:

Tensile strength	1,900 psi, minimum
Compressive strength ASTM C109/C109M	14,000 psi, minimum
Shrinkage, linear	0.00012 inch per inch, maximum
Water absorption ASTM C67/C67M	0.1 percent, maximum
Bond strength to	1,000 psi, minimum steel in shear

2.5.5 Pipe Thread Compounds

Use polytetrafluoroethylene tape not less than 2 to 3 mils thick in potable and process water and in chemical systems for pipe sizes to and including 1-inch ips. Use polytetrafluoroethylene dispersions and other suitable

compounds for all other applications upon approval by the Contracting Officer; however, do not use lead-containing compounds in potable water systems.

2.6 SUPPORTING ELEMENTS

Provide all necessary piping systems and equipment supporting elements, including but not limited to: building structure attachments; supplementary steel; hanger rods, stanchions, and fixtures; vertical pipe attachments; horizontal pipe attachments; anchors; guides; and spring-cushion, variable, or constant supports. Ensure supporting elements are suitable for stresses imposed by systems pressures and temperatures and natural and other external forces normal to this facility without damage to supporting element system or to work being supported.

Ensure supporting elements conform to requirements of ASME B31.3, and MSS SP-58, except as noted.

Ensure attachments welded to pipe are made of materials identical to that of pipe or materials accepted as permissible raw materials by referenced code or standard specification.

Type designations specified herein are based on MSS SP-58. Ensure masonry anchor group-, type-, and style-combination designations are in accordance with CID A-A-1922, CID A-A-1923, CID A-A-1924, CID A-A-1925 , CID A-A-55614, and CID A-A-55615. Provide support elements, except for supplementary steel, that are cataloged, load rated, commercially manufactured products.

2.6.1 Attachments

2.6.1.1 Anchor Devices, Concrete and Masonry

Ensure anchor devices conform to CID A-A-1922, CID A-A-1923, CID A-A-1924, CID A-A-1925 , CID A-A-55614, and CID A-A-55615

For cast-in, floor mounted, equipment anchor devices, provide adjustable positions.
Do not use powder-actuated anchoring devices to support any mechanical systems components.

2.6.1.2 Beam Clamps

Ensure beam clamps are center-loading MSS SP-58 Type 20 .

2.6.1.3 C-Clamps

Do not use C-clamps.

2.6.1.4 Inserts, Concrete

Use concrete MSS SP-58 Type 18 inserts When applied to piping in sizes 2 inches ips and larger and where otherwise required by imposed loads, insert and wire a 1-foot length of 1/2-inch reinforcing rod through wing slots. Submit proprietary-type continuous inserts for approval.

2.6.2 Horizontal Pipe Attachments

2.6.2.1 Single Pipes

Support piping in sizes to and including 2-inch ips by MSS SP-58 Type 6 solid malleable iron pipe rings, except that, use split-band-type rings in sizes up to 1-inch ips.

Support piping in sizes through 8-inch ips inclusive by MSS SP-58 Type 1 attachments.

Use MSS SP-58 Type 1 and Type 6 assemblies on vapor-sealed insulated piping and have an inside diameter larger than pipe being supported to provide adequate clearance during pipe movement.

Where thermal movement of a point in a piping system 4 inches and larger would cause a hanger rod to deflect more than 4 degrees from the vertical or where a horizontal point movement exceeds 1/2 inch, use MSS SP-58 Type 41 pipe rolls.

Support piping in sizes larger than 8-inch ips with MSS SP-58 Type 41 pipe rolls.

Use MSS SP-58 Type 40 shields on all insulated piping. Ensure area of the supporting surface is such that compression deformation of insulated surfaces does not occur. Roll away longitudinal and transverse shield edges from the insulation.

Provide insulated piping without vapor barrier on roll supports with MSS SP-58 Type 39 saddles.

Provide spring supports as indicated.

2.6.2.2 Parallel Pipes

Use trapeze hangers fabricated from structural steel shapes, with U-bolts, in congested areas and where multiple pipe runs occur. Ensure structural steel shapes conform to supplementary steel requirements.

2.6.3 Vertical Pipe Attachments

Ensure vertical pipe attachments are MSS SP-58 Type 8.

Include complete fabrication and attachment details of any spring supports in shop drawings.

2.6.4 Hanger Rods and Fixtures

Use only circular cross section rod hangers to connect building structure attachments to pipe support devices. Use pipe, straps, or bars of equivalent strength for hangers only where approved by the Contracting Officer.

Provide turnbuckles, swing eyes, and clevises as required by support system to accommodate temperature change, pipe accessibility, and adjustment for load and pitch. Rod couplings are not acceptable.

2.6.5 Supplementary Steel

Where it is necessary to frame structural members between existing members or where structural members are used in lieu of commercially rated supports, design and fabricate such supplementary steel in accordance with AISC 325.

PART 3 EXECUTION

3.1 PIPE INSTALLATION

Fabricate and install piping systems in accordance with ASME B31.3, MSS SP-58, and AWS WHB-2.9.

Ensure connections between steel piping and copper piping are electrically isolated from each other with dielectric couplings (or unions) rated for the service.

Make final connections to equipment with flanges provided every 100 feet of straight run. Provide unions in the line downstream of screwed- and welded-end valves.

Ream all pipe ends before joint connections are made.

Make screwed joints with specified joint compound with not more than three threads showing after joint is made up.

Apply joint compounds to the male thread only and exercise care to prevent compound from reaching the unthreaded interior of the pipe.

Provide screwed unions, welded unions, or bolted flanges wherever required to permit convenient removal of equipment, valves, and piping accessories from the piping system for maintenance.

Securely support piping systems with due allowance for thrust forces, thermal expansion and contraction. Do not subject the system to mechanical, chemical, vibrational or other damage as specified in ASME B31.3.

Ensure field welded joints conform to the requirements of the AWS WHB-2.9, ASME B31.3, and ASME BPVC SEC IX.

3.2 VALVES

Provide valves in piping mains and all branches and at equipment where indicated and as specified.

Provide valves to permit isolation of branch piping and each equipment item from the balance of the system.

Provide riser and down-comer drains above piping shutoff valves in piping 2-1/2 inches and larger. Tap and fit shutoff valve body with a 1/2-inch plugged globe valve.

Provide valves unavoidably located in furred or other normally inaccessible places with access panels adequately sized for the location and located so that concealed items may be serviced, maintained, or replaced.

3.3 SUPPORTING ELEMENTS INSTALLATION

Provide supporting elements in accordance with the referenced codes and standards and the drawings.

Support piping from building structure or as shown. Do not support piping from roof deck or from other pipe.

Run piping parallel with the lines of the building. Space and install piping and components so that a threaded pipe fitting may be removed between adjacent pipes and so that there is no less than 1/2 inch of clear space between the finished surface and other work and between the finished surfaces of parallel adjacent piping. Arrange hangars on different adjacent service lines running parallel with each other in line with each other and parallel to the lines of the building.

Install piping support elements at intervals specified hereinafter, at locations not more than 3 feet from the ends of each runout, and not over 1 foot from each change in direction of piping.

Base load rating for all pipe-hanger supports on insulated weight of lines filled with water and forces imposed. Deflection per span is not exceed slope gradient of pipe. Ensure supports are in accordance with the following minimum rod size and maximum allowable hanger spacing for specified pipe. For concentrated loads such as valves, reduce the allowable span proportionately:

PIPE SIZE INCHES	ROD SIZE INCHES	STEEL PIPE FEET	COPPER PIPE FEET
1 and smaller	3/8	8	6
1-1/4 to 1-1/2	3/8	10	8
2	3/8	10	8
2-1/2 to 3-1/2	1/2	12	12
4 to 5	5/8	16	14
6	3/4	16	16
8 to 12	7/8	20	20
14 to 18	1	20	20
20 and over	1-1/4	20	20

Provide vibration isolation supports where needed.

Support vertical risers independently of connected horizontal piping, whenever practicable, with fixed or spring supports at the base and at intervals to accommodate system range of thermal conditions. Ensure risers have guides for lateral stability. For risers subject to expansion, provide only one rigid support at a point approximately one-third down from the top.

Place clamps under fittings unless otherwise specified. Support carbon-steel pipe at each floor and at not more than 15-foot intervals for pipe 2 inches and smaller and at not more than 20-foot intervals for pipe 2-1/2 inches and larger.

3.4 PENETRATIONS

Provide effective sound stopping and adequate operating clearance to prevent structure contact where piping penetrates walls, floors, or ceilings into occupied spaces adjacent to equipment rooms; where similar penetrations occur between occupied spaces; and where penetrations occur from pipe chases into occupied spaces. Occupied spaces include space above ceilings where no special acoustic treatment of ceiling is provided. Finish penetrations to be compatible with surface being penetrated.

3.5 FLASHINGS

Provide flashings at penetrations of building boundaries by mechanical systems and related work.

3.6 HEAT TRACE CABLE INSTALLATION

Field apply heater tape and cut to fit as necessary, linearly along the length of pipe after piping has been pressure tested and approved by the Contracting Officer. Secure the heater to piping with cable ties. Label thermal insulation on the outside, "Electrical Heat Trace."

Install power connection, end seals, splice kits and tee kit components in accordance with IEEE 515 to provide a complete workable system. Terminate connection to the thermostat and ends of the heat tape in a junction box. Ensure cable and conduit connections are rain-tight.

3.7 DISINFECTION

Flush piping with potable water until visible grease, dirt and other contaminants are removed (visual inspection).

3.8 HEAT TRACE CABLE TESTS

Test heat trace cable system in accordance with IEEE 515 after installation and before and after installation of the thermal insulation. Test heater cable using a 1000 vdc megger. Minimum insulation resistance is 20 to 1000 mega ohms regardless of cable length.

-- End of Section --

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC
11/15

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.

ASSOCIATED AIR BALANCE COUNCIL (AABC)

AABC MN-1	(2002; 6th ed) National Standards for Total System Balance

NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)

NEBB MASV	(2006) Procedural Standards for Measurements and Assessment of Sound and Vibration
NEBB PROCEDURAL STANDARDS	(2015) Procedural Standards for TAB (Testing, Adjusting and Balancing) Environmental Systems

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

SMACNA 1780	(2002) HVAC Systems - Testing, Adjusting and Balancing, 3rd Edition
SMACNA 1858	(2004) HVAC Sound And Vibration Manual - First Edition

1.2 DEFINITIONS

a. AABC: Associated Air Balance Council

b. COTR: Contracting Officer's Technical Representative

c. DALT: Duct air leakage test

d. DALT'd: Duct air leakage tested

e. HVAC: Heating, ventilating, and air conditioning; or heating, ventilating, and cooling

f. NEBB: National Environmental Balancing Bureau

g. Out-of-tolerance data: Pertains only to field acceptance testing of Final DALT or TAB report. When applied to DALT work, this phase means When applied to TAB work this phase means "a measurement taken during TAB field acceptance testing which does not fall within the range of

plus 5 to minus 5 percent of the original measurement reported on the TAB Report for a specific parameter."

h. Season of maximum heating load: The time of year when the outdoor temperature at the project site remains within plus or minus 30 degrees Fahrenheit of the project site's winter outdoor design temperature, throughout the period of TAB data recording.

i. Season of maximum cooling load: The time of year when the outdoor temperature at the project site remains within plus or minus 5 degrees Fahrenheit of the project site's summer outdoor design temperature, throughout the period of TAB data recording.

j. Season 1, Season 2: Depending upon when the project HVAC is completed and ready for TAB, Season 1 is defined, thereby defining Season 2. Season 1 could be the season of maximum heating load, or the season of maximum cooling load.

k. Sound measurements terminology: Defined in AABC MN-1, NEBB MASV, or SMACNA 1858 (TABB).

l. TAB: Testing, adjusting, and balancing (of HVAC systems)

m. TAB'd: HVAC Testing/Adjusting/Balancing procedures performed

n. TAB Agency: TAB Firm

r. TABB: Testing Adjusting and Balancing Bureau

1.2.1 Similar Terms

In some instances, terminology differs between the Contract and the TAB Standard primarily because the intent of this Section is to use the industry standards specified, along with additional requirements listed herein to produce optimal results.

The following table of similar terms is provided for clarification only. Contract requirements take precedent over the corresponding AABC, NEBB, or TABB requirements where differences exist.

SIMILAR TERMS			
Contract Term	AABC Term	NEBB Term	TABB Term
TAB Standard	National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems	Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems	International Standards for Environmental Systems Balance
TAB Specialist	TAB Engineer	TAB Supervisor	TAB Supervisor

SIMILAR TERMS			
Contract Term	AABC Term	NEBB Term	TABB Term
Systems Readiness Check	Construction Phase Inspection	Field Readiness Check & Preliminary Field Procedures	Field Readiness Check & Prelim. Field Procedures

1.3 WORK DESCRIPTION

The work includes testing, adjusting, and balancing (TAB) of new and existing chilled water equipment.

Perform TAB in accordance with the requirements of the TAB procedural standard recommended by the TAB trade association that approved the TAB Firm's qualifications. Comply with requirements of AABC MN-1, NEBB PROCEDURAL STANDARDS, or SMACNA 1780 (TABB) as supplemented and modified by this specification section. All recommendations and suggested practices contained in the TAB procedural standards are considered mandatory.

Conduct TAB of the indicated existing systems and equipment and submit the specified TAB reports for approval.

1.3.1 Chilled Water Distribution Systems

TAB systems in compliance with this section.

After completion of work under this section, repair insulation or insulate the flow control valves and devices as specified under Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01305 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Certified Final Report; G

SD-07 Certificates

Independent TAB Agency and Personnel Qualifications; G

TAB Submittal and Work Schedule; G

TAB Pre-Field Engineering Report; G

1.5 QUALITY ASSURANCE

1.5.1 Independent TAB Agency and Personnel Qualifications

To secure approval for the proposed agency, submit information certifying that the TAB agency is a first tier subcontractor who is not affiliated with any other company participating in work on this contract, including design, furnishing equipment, or construction. Further, submit the following, for the agency, to Contracting Officer for approval:

a. Independent AABC or NEBB or TABB TAB agency:

TAB agency: AABC registration number and expiration date of current certification; or NEBB certification number and expiration date of current certification; or TABB certification number and expiration date of current certification.

TAB team supervisor: Name and copy of AABC or NEBB or TABB TAB supervisor certificate and expiration date of current certification.

TAB team field leader: Name and documented evidence that the team field leader has satisfactorily performed full-time supervision of TAB work in the field for not less than 3 years immediately preceding this contract's bid opening date.

TAB team field technicians: Names and documented evidence that each field technician has satisfactorily assisted a TAB team field leader in performance of TAB work in the field for not less than one year immediately preceding this contract's bid opening date.

Current certificates: Registrations and certifications are current, and valid for the duration of this contract. Renew Certifications which expire prior to completion of the TAB work, in a timely manner so that there is no lapse in registration or certification. TAB agency or TAB team personnel without a current registration or current certification are not to perform TAB work on this contract.

b. TAB Team Members: TAB team approved to accomplish work on this contract are full-time employees of the TAB agency. No other personnel is allowed to do TAB work on this contract.

c. Replacement of TAB team members: Replacement of members may occur if each new member complies with the applicable personnel qualifications and each is approved by the Contracting Officer.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 WORK DESCRIPTIONS OF PARTICIPANTS

Comply with requirements of this section.

3.2 PRE-TAB MEETING

Meet with the Contracting Officer's technical representative (COTR) to develop a mutual understanding relative to the details of the TAB work requirements. Ensure that the TAB supervisor is present at this meeting. Requirements to be discussed include required submittals, work schedule, and field quality control.

3.3 TAB PROCEDURES

3.3.1 TAB Field Work

Test, adjust, and balance the HVAC systems until measured flow rates (chilled water flow) are within plus or minus 5 percent of the design flow rates as specified or indicated on the contract documents.

That is, comply with the requirements of AABC MN-1 or SMACNA 1780 (TABB) and SMACNA 1858 (TABB), except as supplemented and modified by this section.

Provide instruments and consumables required to accomplish the TAB work. Calibrate and maintain instruments in accordance with manufacturer's written procedures.

3.3.2 TAB Water Distribution Systems

3.3.2.1 Chilled Water

Chilled water systems including the building distribution pump set and chiller.

3.3.3 Workmanship

Conduct TAB work on the HVAC systems until measured flow rates are within plus or minus 5 percent of the design flow rates as specified or indicated on the contract documents. This TAB work includes adjustment of balancing valves, balancing dampers, and sheaves. Further, this TAB work includes changing out fan sheaves and pump impellers if required to obtain air and water flow rates specified or indicated. If, with these adjustments and equipment changes, the specified or indicated design flow rates cannot be attained, contact the Contracting Officer for direction.

3.3.4 Deficiencies

Strive to meet the intent of this section to maximize the performance of the equipment as designed and installed. However, if deficiencies in equipment design or installation prevent TAB work from being accomplished within the range of design values specified in the paragraph WORKMANSHIP, provide written notice as soon as possible to the Contractor and the Contracting Officer describing the deficiency and recommended correction.

Responsibility for correction of installation deficiencies is the Contractor's. If a deficiency is in equipment design, call the TAB team supervisor for technical assistance. Responsibility for reporting design deficiencies to Contractor is the TAB team supervisor's.

3.3.5 TAB Reports

3.3.6 Quality Assurance - COTR TAB Field Acceptance Testing

3.3.6.1 TAB Field Acceptance Testing

During the field acceptance testing, verify, in the presence of the COTR, random selections of data (water, air quantities, air motion,) recorded in the TAB Report. Points and areas for field acceptance testing are to be selected by the COTR. Measurement and test procedures are the same as approved for TAB work for the TAB Report.

Field acceptance testing includes verification of TAB Report data recorded for the following equipment groups:

Group 1: All air handling units.

Group 2: 25 percent of the VAV terminal boxes and associated diffusers and registers.

Group 3: exhaust fans, relief fans, and pumps.

Further, if any data on the TAB Report for Groups 2 through 3 is found not to fall within the range of plus 5 to minus 5 percent of the TAB Report data, additional group data verification is required in the presence of the COTR. Verify TAB Report data for one additional piece of equipment in that group. Continue this additional group data verification until out-of-tolerance data ceases to be found.

3.3.6.2 Additional COTR TAB Field Acceptance Testing

If any of the acceptance testing measurements for a given equipment group is found not to fall within the range of plus 5 to minus 5 percent of the TAB Report data, terminate data verification for all affected data for that group. The affected data for the given group will be disapproved. Make the necessary corrections and prepare a revised TAB Report. Reschedule acceptance testing of the revised report data with the COTR.

3.3.6.3 Prerequisite for Approval

Compliance with the field acceptance testing requirements of this section is a prerequisite for the final Contracting Officer approval of the TAB Report submitted.

3.4 MARKING OF SETTINGS

Upon the final TAB work approval, permanently mark the settings of HVAC adjustment devices including valves, gauges, splitters, and dampers so that adjustment can be restored if disturbed at any time. Provide permanent markings clearly indicating the settings on the adjustment devices which result in the data reported on the submitted TAB report.

-- End of Section --

SECTION 23 07 00

THERMAL INSULATION FOR MECHANICAL SYSTEMS
02/13

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. At the discretion of the Government, the manufacturer of any material supplied will be required to furnish test reports pertaining to any of the tests necessary to assure compliance with the standard or standards referenced in this specification.

ASTM INTERNATIONAL (ASTM)

ASTM A167	(2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A580/A580M	(2018) Standard Specification for Stainless Steel Wire
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM C1126	(2014) Standard Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation
ASTM C1136	(2017a) Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
ASTM C1710	(2011) Standard Guide for Installation of Flexible Closed Cell Preformed Insulation in Tube and Sheet Form
ASTM C195	(2007; R 2013) Standard Specification for Mineral Fiber Thermal Insulating Cement
ASTM C450	(2008) Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging
ASTM C533	(2017) Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation
ASTM C534/C534M	(2016) Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form

ASTM C547	(2017) Standard Specification for Mineral Fiber Pipe Insulation
ASTM C552	(2017; E 2018) Standard Specification for Cellular Glass Thermal Insulation
ASTM C610	(2015) Standard Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation
ASTM C647	(2008; R 2013) Properties and Tests of Mastics and Coating Finishes for Thermal Insulation
ASTM C795	(2008; R 2013) Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM C921	(2010) Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation
ASTM D2863	(2017a) Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)
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 D882	(2012) Tensile Properties of Thin Plastic Sheeting
ASTM E2231	(2018) Standard Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics
ASTM E84	(2018) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E96/E96M	(2016) Standard Test Methods for Water Vapor Transmission of 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

FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

GREEN SEAL (GS)

GS-36	(2013) Adhesives for Commercial Use

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58	(2009) Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation

MIDWEST INSULATION CONTRACTORS ASSOCIATION (MICA)

MICA Insulation Stds	(8th Ed) National Commercial & Industrial Insulation Standards

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 90A	(2018) Standard for the Installation of Air Conditioning and Ventilating Systems
NFPA 90B	(2018) Standard for the Installation of Warm Air Heating and Air Conditioning Systems

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

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY (TAPPI)

TAPPI T403 OM	(2015) Bursting Strength of Paper

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-A-24179	(1969; Rev A; Am 2 1980; Notice 1 1987) Adhesive, Flexible Unicellular-Plastic Thermal Insulation
MIL-A-3316	(1987; Rev C; Am 2 1990) Adhesives, Fire-Resistant, Thermal Insulation
MIL-PRF-19565	(1988; Rev C) Coating Compounds, Thermal Insulation, Fire- and Water-Resistant, Vapor-Barrier

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings
UL 723	(2018) UL Standard for Safety Test for Surface Burning Characteristics of Building Materials
UL 94	(2013; Reprint Sep 2017) UL Standard for Safety Tests for Flammability of Plastic Materials for Parts in Devices and Appliances

1.2 SYSTEM DESCRIPTION

1.2.1 General

Provide field-applied insulation and accessories on mechanical systems as specified herein to repair or add insulation for work done in this contract by others.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01305C:\USERS\1231394768E\DOCUMENTS\SPECSINTACTWD\JOBS\B1090BX\prntdata\Word\.doc SUBMITTAL PROCEDURES:

SD-03 Product Data

Pipe, Pump, and Accessories Insulation Systems; G

1.4 CERTIFICATIONS

1.4.1 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.

1.5 QUALITY ASSURANCE

1.5.1 Installer Qualification

Qualified installers shall have successfully completed three or more similar type jobs within the last 5 years.

1.6 DELIVERY, STORAGE, AND HANDLING

Materials shall be delivered in the manufacturer's unopened containers. Materials delivered and placed in storage shall be provided with protection from weather, humidity, dirt, dust and other contaminants. The Contracting Officer may reject insulation material and supplies that become dirty, dusty, wet, or contaminated by some other means. Packages or standard containers of insulation, jacket material, cements, adhesives, and coatings delivered for use, and samples required for approval shall have manufacturer's stamp or label attached giving the name of the manufacturer and brand, and a description of the material, date codes, and approximate shelf life (if applicable). Insulation packages and containers shall be asbestos free.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Provide materials which are the standard products of manufacturers regularly engaged in the manufacture of such products and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Submit a complete list of materials, including manufacturer's descriptive technical literature, performance data, catalog cuts, and installation instructions. The product number, k-value, thickness and furnished accessories including adhesives, sealants and jackets for each mechanical system requiring insulation shall be included. The product data must be copyrighted, have an identifying or publication number, and shall have been published prior to the issuance date of this solicitation.

2.1.1 Insulation System

Provide insulation systems in accordance with the approved MICA National Insulation Standards plates as supplemented by this specification. Provide field-applied insulation for heating, ventilating, and cooling (HVAC) air distribution systems and piping systems. Provide CFC and HCFC free insulation.

2.1.2 Surface Burning Characteristics

Unless otherwise specified, insulation must have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84. Flame spread, and smoke developed indexes, shall be determined by ASTM E84 or UL 723. Test insulation in the same density and installed thickness as the material to be used in the actual construction. Prepare and mount test specimens according to ASTM E2231.

2.2 MATERIALS

Provide insulation that meets or exceed the requirements of ASHRAE 90.1. Insulation exterior shall be cleanable, grease resistant, non-flaking and non-peeling. Materials shall be compatible and shall not contribute to corrosion, soften, or otherwise attack surfaces to which applied in either wet or dry state. Materials to be used on stainless steel surfaces shall meet ASTM C795 requirements. Calcium silicate shall not be used on chilled or cold water systems. Materials shall be asbestos free. Provide product recognized under UL 94 (if containing plastic) and listed in FM APP GUIDE.

2.2.1 Adhesives

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 (HVAC duct sealants must meet limit requirements of "Other" category within SCAQMD Rule 1168 sealants table). 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.

2.2.1.1 Mineral Fiber Insulation Cement

Cement shall be in accordance with ASTM C195.

2.2.1.2 Lagging Adhesive

Lagging is the material used for thermal insulation, especially around a cylindrical object. This may include the insulation as well as the cloth/material covering the insulation. To resist mold/mildew, lagging adhesive shall meet ASTM D5590 with 0 growth rating. Lagging adhesives shall be nonflammable and fire-resistant and shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84. Adhesive shall be MIL-A-3316, Class 1, pigmented and be suitable for bonding fibrous glass cloth to faced and unfaced fibrous glass insulation board; for bonding cotton brattice cloth to faced and unfaced fibrous glass insulation board; for sealing edges of and bonding glass tape to joints of fibrous glass board; for bonding lagging cloth to thermal insulation; or Class 2 for attaching fibrous glass insulation to metal surfaces. Lagging adhesives shall be applied in strict accordance with the manufacturer's recommendations for pipe and duct insulation.

2.2.1.3 Contact Adhesive

Adhesives may be any of, but not limited to, the neoprene based, rubber based, or elastomeric type that have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84. The adhesive shall not adversely affect, initially or in service, the insulation to which it is applied, nor shall it cause any corrosive effect on metal to which it is applied. Any solvent dispersing medium or volatile component of the adhesive shall have no objectionable odor and shall not contain any benzene or carbon tetrachloride. The dried adhesive shall not emit nauseous, irritating, or toxic volatile matters or aerosols when the adhesive is heated to any temperature up to 212 degrees F. The dried adhesive shall be nonflammable and fire resistant. Flexible Elastomeric Adhesive: Comply with MIL-A-24179, Type II, Class I. Provide product listed in FM APP GUIDE.

2.2.2 Caulking

ASTM C920, Type S, Grade NS, Class 25, Use A.

2.2.3 Corner Angles

Nominal 0.016 inch aluminum 1 by 1 inch with factory applied kraft backing. Aluminum shall be ASTM B209, Alloy 3003, 3105, or 5005.

2.2.4 Fittings

Fabricated Fittings are the prefabricated fittings for flexible elastomeric pipe insulation systems in accordance with ASTM C1710. Together with the flexible elastomeric tubes, they provide complete system integrity for retarding heat gain and controlling condensation drip from chilled-water and refrigeration systems. Flexible elastomeric, fabricated fittings provide thermal protection (0.25 k) and condensation resistance (0.05 Water Vapor Transmission factor). For satisfactory performance, properly installed protective vapor retarder/barriers and vapor stops shall be used on high relative humidity and below ambient temperature applications to reduce movement of moisture through or around the insulation to the colder interior surface.

2.2.5 Finishing Cement

ASTM C450: Mineral fiber hydraulic-setting thermal insulating and finishing cement. All cements that may come in contact with Austenitic stainless steel must comply with ASTM C795.

2.2.6 Fibrous Glass Cloth and Glass Tape

Fibrous glass cloth, with 20X20 maximum mesh size, and glass tape shall have maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84. Tape shall be 4 inch wide rolls. Class 3 tape shall be 4.5 ounces/square yard. Elastomeric Foam Tape: Black vapor-retarder foam tape with acrylic adhesive containing an anti-microbial additive.

2.2.7 Staples

Outward clinching type ASTM A167, Type 304 or 316 stainless steel.

2.2.8 Jackets

2.2.8.1 Aluminum Jackets

Aluminum jackets shall be corrugated, embossed or smooth sheet, 0.016 inch nominal thickness; ASTM B209, Temper H14, Temper H16, Alloy 3003, 5005, or 3105. Corrugated aluminum jacket shall not be used outdoors. Aluminum jacket securing bands shall be Type 304 stainless steel, 0.015 inch thick, 1/2 inch wide for pipe under 12 inch diameter and 3/4 inch wide for pipe over 12 inch and larger diameter. Aluminum jacket circumferential seam bands shall be 2 by 0.016 inch aluminum matching jacket material. Bands for insulation below ground shall be 3/4 by 0.020 inch thick stainless steel, or fiberglass reinforced tape. The jacket may, at the option of the Contractor, be provided with a factory fabricated Pittsburgh or "Z" type longitudinal joint. When the "Z" joint is used, the bands at the circumferential joints shall be designed by the manufacturer to seal the joints and hold the jacket in place.

2.2.8.2 Polyvinyl Chloride (PVC) Jackets

Polyvinyl chloride (PVC) jacket and fitting covers shall have high impact strength, ultraviolet (UV) resistant rating or treatment and moderate chemical resistance with minimum thickness 0.030 inch.

2.2.8.3 Vapor Barrier/Weatherproofing Jacket

Vapor barrier/weatherproofing jacket shall be laminated self-adhesive, greater than 3 plies standard grade, silver, white, black and embossed or greater than 8 ply (minimum 2.9 mils adhesive); with 0.0000 permeability when tested in accordance with ASTM E96/E96M, using the water transmission rate test method; heavy duty, white or natural; and UV resistant. Flexible Elastomeric exterior foam with factory applied, UV Jacket made with a cold weather acrylic adhesive. Construction of laminate designed to provide UV resistance, high puncture, tear resistance and excellent Water Vapor Transmission (WVT) rate.

2.2.8.4 Vapor Barrier/Vapor Retarder

Apply the following criteria to determine which system is required.

a. On ducts, piping and equipment operating below 60 degrees F or located outside shall be equipped with a vapor barrier.

b. Ducts, pipes and equipment that are located inside and that always operate above 60 degrees F shall be installed with a vapor retarder where required as stated in paragraph VAPOR RETARDER REQUIRED.

2.2.9 Vapor Retarder Required

ASTM C921, Type I, minimum puncture resistance 50 Beach units on all surfaces where a minimum puncture resistance of 25 Beach units is acceptable. Minimum tensile strength, 35 pounds/inch width. ASTM C921, Type II, minimum puncture resistance 25 Beach units, tensile strength minimum 20 pounds/inch width. Jackets used on insulation exposed in finished areas shall have white finish suitable for painting without sizing. Based on the application, insulation materials that require manufacturer or fabricator applied pipe insulation jackets are cellular glass, when all joints are sealed with a vapor barrier mastic, and mineral fiber. All non-metallic jackets shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84. Flexible elastomerics require (in addition to vapor barrier skin) vapor retarder jacketing for high relative humidity and below ambient temperature applications.

2.2.9.1 White Vapor Retarder All Service Jacket (ASJ)

ASJ is for use on hot/cold pipes, ducts, or equipment indoors or outdoors if covered by a suitable protective jacket. The product shall meet all physical property and performance requirements of ASTM C1136, Type I, except the burst strength shall be a minimum of 85 psi. ASTM D2863 Limited Oxygen Index (LOI) shall be a minimum of 31.

In addition, neither the outer exposed surface nor the inner-most surface contacting the insulation shall be paper or other moisture-sensitive material. The outer exposed surface shall be white and have an emittance of not less than 0.80. The outer exposed surface shall be paintable.

2.2.9.2 Vapor Retarder/Vapor Barrier Mastic Coatings

2.2.9.2.1 Vapor Barrier

The vapor barrier shall be self adhesive (minimum 2 mils adhesive, 3 mils embossed) greater than 3 plies standard grade, silver, white, black and embossed white jacket for use on hot/cold pipes. Permeability shall be less than 0.02 when tested in accordance with ASTM E96/E96M. Products shall meet UL 723 or ASTM E84 flame and smoke requirements and shall be UV resistant.

2.2.9.2.2 Vapor Retarder

The vapor retarder coating shall be fire and water resistant and appropriately selected for either outdoor or indoor service. Color shall be white. The water vapor permeance of the compound shall be 0.013 perms or less at 43 mils dry film thickness as determined according to procedure B of ASTM E96/E96M utilizing apparatus described in ASTM E96/E96M. The coating shall be nonflammable, fire resistant type. To resist mold/mildew, coating shall meet ASTM D5590 with 0 growth rating. Coating shall meet MIL-PRF-19565 Type II (if selected for indoor service) and be Qualified Products Database listed. All other application and service properties shall be in accordance with ASTM C647.

2.2.9.3 Laminated Film Vapor Retarder

ASTM C1136, Type I, maximum moisture vapor transmission 0.02 perms, minimum puncture resistance 50 Beach units on all surfaces except concealed ductwork; where Type II, maximum moisture vapor transmission 0.02 perms, a minimum puncture resistance of 25 Beach units is acceptable. Vapor retarder shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84. Flexible Elastomeric exterior foam with factory applied UV Jacket. Construction of laminate designed to provide UV resistance, high puncture, tear resistance and an excellent WVT rate.

2.2.9.4 Polyvinylidene Chloride (PVDC) Film Vapor Retarder

The PVDC film vapor retarder shall have a maximum moisture vapor transmission of 0.02 perms, minimum puncture resistance of 150 Beach units, a minimum tensile strength in any direction of 30 lb/inch when tested in accordance with ASTM D882, and a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84.

2.2.9.5 Polyvinylidene Chloride Vapor Retarder Adhesive Tape

Requirements must meet the same as specified for Laminated Film Vapor Retarder above.

2.2.9.6 Vapor Barrier/Weather Barrier

The vapor barrier shall be greater than 3 ply self adhesive laminate -white vapor barrier jacket- superior performance (less than 0.0000 permeability when tested in accordance with ASTM E96/E96M). Vapor barrier shall meet UL 723 or ASTM E84 25 flame and 50 smoke requirements; and UV resistant. Minimum burst strength 185 psi in accordance with TAPPI T403 OM . Tensile

strength 68 lb/inch width (PSTC-1000). Tape shall be as specified for laminated film vapor barrier above.

2.2.10 Vapor Retarder Not Required

ASTM C921, Type II, Class D, minimum puncture resistance 50 Beach units on all surfaces except ductwork, where Type IV, maximum moisture vapor transmission 0.10, a minimum puncture resistance of 25 Beach units is acceptable. Jacket shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84.

2.2.11 Wire

Soft annealed ASTM A580/A580M Type 302, 304 or 316 stainless steel, 16 or 18 gauge.

2.2.12 Insulation Bands

Insulation bands shall be 1/2 inch wide; 26 gauge stainless steel.

2.2.13 Sealants

Sealants shall be chosen from the butyl polymer type, the styrene-butadiene rubber type, or the butyl type of sealants. Sealants shall have a maximum permeance of 0.02 perms based on Procedure B for ASTM E96/E96M, and a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84.

2.3 PIPE INSULATION SYSTEMS

Conform insulation materials to Table 1 and minimum insulation thickness as listed in Table 2 and meet or exceed the requirements of ASHRAE 90.1. Limit pipe insulation materials to those listed herein and meeting the following requirements:

2.3.1 Recycled Materials

Provide insulation materials containing the following minimum percentage of recycled material content by weight:

Rock Wool: 75 percent slag of weight
Fiberglass: 20 percent glass cullet
Rigid Foam: 9 percent recovered material
Phenolic Rigid Foam: 9 percent recovered material

Provide data identifying percentage of recycled content for insulation materials.

2.3.2 Aboveground Cold Pipeline -30 to 60 deg. F)

Insulation for outdoor, indoor, exposed or concealed applications, shall be as follows:

2.3.2.1 Cellular Glass

ASTM C552, Type II, and Type III. Supply the insulation from the fabricator with (paragraph WHITE VAPOR RETARDER ALL SERVICE JACKET (ASJ)) ASJ vapor retarder and installed with all longitudinal overlaps sealed and all circumferential joints ASJ taped or supply the insulation unfaced from the fabricator and install with all longitudinal and circumferential joints sealed with vapor barrier mastic.

2.3.2.2 Flexible Elastomeric Cellular Insulation

Closed-cell, foam- or expanded-rubber materials containing anti-microbial additive, complying with ASTM C534/C534M, Grade 1, Type I or II. Type I, Grade 1 for tubular materials. Type II, Grade 1, for sheet materials. Type I and II shall have vapor retarder/vapor barrier skin on one or both sides of the insulation, and require an additional exterior vapor retarder covering for high relative humidity and below ambient temperature applications.

PART 3 EXECUTION

3.1 APPLICATION - GENERAL

Repair pipe, duct, and equipment insulation damaged by work or cleaning in this contract.

Insulation shall only be applied to unheated and uncooled piping and equipment. Flexible elastomeric cellular insulation shall not be compressed at joists, studs, columns, ducts, hangers, etc. The insulation shall not pull apart after a one hour period; any insulation found to pull apart after one hour, shall be replaced.

3.1.1 Installation

Except as otherwise specified, material shall be installed in accordance with the manufacturer's written instructions. Insulation materials shall not be applied until tests specified in other sections of this specification are completed. Material such as rust, scale, dirt and moisture shall be removed from surfaces to receive insulation. Insulation shall be kept clean and dry. Insulation shall not be removed from its shipping containers until the day it is ready to use and shall be returned to like containers or equally protected from dirt and moisture at the end of each workday. Insulation that becomes dirty shall be thoroughly cleaned prior to use. If insulation becomes wet or if cleaning does not restore the surfaces to like new condition, the insulation will be rejected, and shall be immediately removed from the jobsite. Joints shall be staggered on multi layer insulation. Mineral fiber thermal insulating cement shall be mixed with demineralized water when used on stainless steel surfaces. Insulation, jacketing and accessories shall be installed in accordance with MICA Insulation Stds plates except where modified herein or on the drawings.

3.1.2 Firestopping

Where pipes and pass through fire walls, fire partitions, above grade floors, and fire rated chase walls, the penetration shall be sealed with fire stopping materials as specified in Section 07 84 00 FIRESTOPPING. The protection of ducts at point of passage through firewalls must be in accordance with NFPA 90A and/or NFPA 90B. All other penetrations, such as

piping, conduit, and wiring, through firewalls must be protected with a material or system of the same hourly rating that is listed by UL, FM, or a NRTL.

3.1.3 Installation of Flexible Elastomeric Cellular Insulation

Install flexible elastomeric cellular insulation with seams and joints sealed with rubberized contact adhesive. Flexible elastomeric cellular insulation shall not be used on surfaces greater than 220 degrees F. Stagger seams when applying multiple layers of insulation. Protect insulation exposed to weather and not shown to have vapor barrier weatherproof jacketing with two coats of UV resistant finish or PVC or metal jacketing as recommended by the manufacturer after the adhesive is dry and cured.

3.1.3.1 Adhesive Application

Apply a brush coating of adhesive to both butt ends to be joined and to both slit surfaces to be sealed. Allow the adhesive to set until dry to touch but tacky under slight pressure before joining the surfaces. Insulation seals at seams and joints shall not be capable of being pulled apart one hour after application. Insulation that can be pulled apart one hour after installation shall be replaced.

3.1.3.2 Adhesive Safety Precautions

Use natural cross-ventilation, local (mechanical) pickup, and/or general area (mechanical) ventilation to prevent an accumulation of solvent vapors, keeping in mind the ventilation pattern must remove any heavier-than-air solvent vapors from lower levels of the workspaces. Gloves and spectacle-type safety glasses are recommended in accordance with safe installation practices.

3.1.4 Welding

No welding shall be done on piping, or without written approval of the Contracting Officer. .

3.2 PIPE INSULATION SYSTEMS INSTALLATION

3.2.1 Pipe Insulation

3.2.1.1 General

Pipe insulation shall be installed on aboveground hot and cold pipeline systems as specified below to form a continuous thermal retarder/barrier, including straight runs, fittings and appurtenances unless specified otherwise. Installation shall be with full length units of insulation and using a single cut piece to complete a run. Cut pieces or scraps abutting each other shall not be used. Pipe insulation shall be omitted on the following:

a. Pipe used solely for fire protection.

b. Chromium plated pipe to plumbing fixtures. However, fixtures for use by the physically handicapped shall have the hot water supply and drain, including the trap, insulated where exposed.

c. Sanitary drain lines.

d. Air chambers.

e. Adjacent insulation.

f. ASME stamps.

g. Access plates of fan housings.

h. Cleanouts or handholes.

3.2.1.2 Pipes Passing Through Walls, Roofs, and Floors

Pipe insulation shall be continuous through the sleeve.

Provide an aluminum jacket or vapor barrier/weatherproofing self adhesive jacket (minimum 2 mils adhesive, 3 mils embossed) less than 0.0000 permeability, greater than 3 ply standard grade, silver, white, black and embossed with factory applied moisture retarder over the insulation wherever penetrations require sealing.

3.2.1.2.1 Penetrate Interior Walls

The aluminum jacket or vapor barrier/weatherproofing - self adhesive jacket (minimum 2 mils adhesive, 3 mils embossed) less than 0.0000 permeability, greater than 3 plies standard grade, silver, white, black and embossed shall extend 2 inches beyond either side of the wall and shall be secured on each end with a band.

3.2.1.2.2 Penetrating Floors

Extend the aluminum jacket from a point below the backup material to a point 10 inches above the floor with one band at the floor and one not more than 1 inch from the end of the aluminum jacket.

3.2.1.3 Pipes Passing Through Hangers

Insulation, whether hot or cold application, shall be continuous through hangers. All horizontal pipes 2 inches and smaller shall be supported on hangers with the addition of a Type 40 protection shield to protect the insulation in accordance with MSS SP-58. Whenever insulation shows signs of being compressed, or when the insulation or jacket shows visible signs of distortion at or near the support shield, insulation inserts as specified below for piping larger than 2 inches shall be installed, or factory insulated hangers (designed with a load bearing core) can be used.

3.2.1.3.1 Horizontal Pipes Larger Than 2 Inches at 60 Degrees F and Above

Supported on hangers in accordance with MSS SP-58

3.2.1.3.2 Horizontal Pipes Larger Than 2 Inches and Below 60 Degrees F

Supported on hangers with the addition of a Type 40 protection shield in accordance with MSS SP-58. An insulation insert of cellular glass, prefabricated insulation pipe hangers, or perlite above 80 degrees F shall be installed above each shield. The insert shall cover not less than the bottom 180-degree arc of the pipe. Inserts shall be the same thickness as the insulation, and shall extend 2 inches on each end beyond the protection shield. When insulation inserts are required in accordance with the above, and the insulation thickness is less than 1 inch, wooden or cork dowels or blocks may be installed between the pipe and the shield to prevent the weight of the pipe from crushing the insulation, as an option to installing insulation inserts. The insulation jacket shall be continuous over the wooden dowel, wooden block, or insulation insert.

3.2.1.3.3 Vertical Pipes

Supported with either Type 8 or Type 42 riser clamps with the addition of two Type 40 protection shields in accordance with MSS SP-58 covering the 360-degree arc of the insulation. An insulation insert of cellular glass or calcium silicate shall be installed between each shield and the pipe. The insert shall cover the 360-degree arc of the pipe. Inserts shall be the same thickness as the insulation, and shall extend 2 inches on each end beyond the protection shield. When insulation inserts are required in accordance with the above, and the insulation thickness is less than 1 inch, wooden or cork dowels or blocks may be installed between the pipe and the shield to prevent the hanger from crushing the insulation, as an option instead of installing insulation inserts. The insulation jacket shall be continuous over the wooden dowel, wooden block, or insulation insert. The vertical weight of the pipe shall be supported with hangers located in a horizontal section of the pipe. When the pipe riser is longer than 30 feet, the weight of the pipe shall be additionally supported with hangers in the vertical run of the pipe that are directly clamped to the pipe, penetrating the pipe insulation. These hangers shall be insulated and the insulation jacket sealed as indicated herein for anchors in a similar service.

3.2.1.3.4 Inserts

Covered with a jacket material of the same appearance and quality as the adjoining pipe insulation jacket, overlap the adjoining pipe jacket 1-1/2 inches, and seal as required for the pipe jacket. The jacket material used to cover inserts in flexible elastomeric cellular insulation shall conform to ASTM C1136, Type 1, and is allowed to be of a different material than the adjoining insulation material.

3.2.1.4 Flexible Elastomeric Cellular Pipe Insulation

Flexible elastomeric cellular pipe insulation shall be tubular form for pipe sizes 6 inches and less. Grade 1, Type II sheet insulation used on pipes larger than 6 inches shall not be stretched around the pipe. On pipes larger than 12 inches, the insulation shall be adhered directly to the pipe on the lower 1/3 of the pipe. Seams shall be staggered when applying multiple layers of insulation. Sweat fittings shall be insulated with miter-cut pieces the same size as on adjacent piping. Screwed fittings shall be insulated with sleeved fitting covers fabricated from miter-cut pieces and shall be overlapped and sealed to the adjacent pipe insulation.

Type II requires an additional exterior vapor retarder/barrier covering for high relative humidity and below ambient temperature applications.

3.2.1.5 Pipe Insulation Material and Thickness

Pipe insulation materials must be as listed in Table 1 and must meet or exceed the requirements ofASHRAE 90.1.

TABLE 1					
Insulation Material for Piping					
Service					
	Material	Specification	Type	Class	VR/VB Req'd
Chilled Water (Supply & Return, Dual Temperature Piping, 40 F nominal)					
	Cellular Glass	ASTM C552	II	2	Yes
	Flexible Elastomeric Cellular	ASTM C534/C534M	I		Yes
Heating Hot Water Supply & Return, Heated Oil (Max 250 F)					
	Mineral Fiber	ASTM C547	I	1	No
	Calcium Silicate	ASTM C533	I		No
	Cellular Glass	ASTM C552	II	2	No
	Faced Phenolic Foam	ASTM C1126	III		Yes
	Perlite	ASTM C610			No
	Flexible Elastomeric Cellular	ASTM C534/C534M	I	2	No

TABLE 2
Piping Insulation Thickness (inch) Do not use integral wicking material in Chilled water applications exposed to outdoor ambient conditions in climatic zones 1 through 4.
Service

	Material	Tube And Pipe Size (inch)				
		<1	1-<1.5	1.5-<4	4-<8	> or = >8
Chilled Water (Supply & Return, Dual Temperature Piping, 40 Degrees F nominal)						
	Cellular Glass	1.5	2	2	2.5	3
	Flexible Elastomeric Cellular	0.5	1	1	N/A	N/A
Heating Hot Water Supply & Return, Heated Oil (Max 250 F)						
	Mineral Fiber	1.5	1.5	2	2	2
	Cellular Glass	2	2.5	3	3	3
	Flexible Elastomeric Cellular	1	1	1	N/A	N/A

3.2.2 Aboveground Cold Pipelines

The following cold pipelines for minus 30 to plus 60 degrees F, shall be insulated in accordance with Table 2 except those piping listed in subparagraph Pipe Insulation in PART 3 as to be omitted. This includes but is not limited to the following:

a. Make-up water.

b. Horizontal and vertical portions of interior roof drains.

c. Refrigerant suction lines.

d. Chilled water.

e. Dual temperature water, i.e. HVAC hot/chilled water.

f. Air conditioner condensate drains.

g. Brine system cryogenics

h. Exposed lavatory drains and domestic water lines serving plumbing fixtures for handicap persons.

3.2.2.1 Insulation Material and Thickness

Insulation thickness for cold pipelines shall be determined using Table 2.

3.2.2.2 Field applied Jacket

Insulation inside the building, to be protected with an aluminum jacket or greater than 3ply vapor barrier/weatherproofing self-adhesive (minimum 2 mils adhesive, 3 mils embossed) product, less than 0.0000 permeability, standard grade, Embossed Silver, White & Black, shall have the insulation

and vapor retarder jacket installed as specified herein. The aluminum jacket or greater than 3ply vapor barrier/weatherproofing self-adhesive (minimum 2 mils adhesive, 3 mils embossed) product, less than 0.0000 permeability, standard grade, embossed silver, White & Black, shall be installed as specified for piping exposed to weather, except sealing of the laps of the aluminum jacket is not required. In high abuse areas such as janitor closets and traffic areas in equipment rooms, kitchens, and mechanical rooms, aluminum jackets or greater than 3ply vapor barrier/weatherproofing self-adhesive (minimum 2 mils adhesive, 3 mils embossed) product, less than 0.0000 permeability, standard grade, embossed silver, white & black, shall be provided for pipe insulation to the 6 ft level. Other areas that specifically require protection to the 6 ft level are none.

3.2.2.3 Installing Insulation for Straight Runs Hot and Cold Pipe

Apply insulation to the pipe with tight butt joints. Seal all butted joints and ends with joint sealant and seal with a vapor retarder coating, greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape or PVDC adhesive tape.

3.2.2.3.1 Longitudinal Laps of the Jacket Material

Overlap not less than 1-1/2 inches. Provide butt strips 3 inches wide for circumferential joints.

3.2.2.3.2 Laps and Butt Strips

Secure with adhesive and staple on 4-inch centers if not factory self-sealing. If staples are used, seal in accordance with paragraph STAPLES below. Note that staples are not required with cellular glass systems.

3.2.2.3.3 Factory Self-Sealing Lap Systems

May be used when the ambient temperature is between 40 and 120 degrees F during installation. Install the lap system in accordance with manufacturer's recommendations. Use a stapler only if specifically recommended by the manufacturer. Where gaps occur, replace the section or repair the gap by applying adhesive under the lap and then stapling.

3.2.2.3.4 Staples

Coat all staples, including those used to repair factory self-seal lap systems, with a vapor retarder coating or PVDC adhesive tape or greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape. Coat all seams, except those on factory self-seal systems, with vapor retarder coating or PVDC adhesive tape or greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape.

3.2.2.3.5 Breaks and Punctures in the Jacket Material

Patch by wrapping a strip of jacket material around the pipe and secure it with adhesive, staple, and coat with vapor retarder coating or PVDC adhesive tape or greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape. Extend the patch not less than 1-1/2 inches past the break.

3.2.2.3.6 Penetrations Such as Thermometers

Fill the voids in the insulation and seal with vapor retarder coating or PVDC adhesive tape or greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape.

3.2.2.3.7 Flexible Elastomeric Cellular Pipe Insulation

Install by slitting the tubular sections and applying them onto the piping or tubing. Alternately, whenever possible slide un-slit sections over the open ends of piping or tubing. Secure all seams and butt joints and seal with adhesive. When using self-seal products only the butt joints shall be secured with adhesive. Push insulation on the pipe, never pulled. Stretching of insulation may result in open seams and joints. Clean cut all edges. Rough or jagged edges of the insulation are not be permitted. Use proper tools such as sharp knives. Do not stretch Grade 1, Type II sheet insulation around the pipe when used on pipe larger than 6 inches. On pipes larger than 12 inches, adhere sheet insulation directly to the pipe on the lower 1/3 of the pipe.

3.2.2.4 Insulation for Fittings and Accessories

a. Pipe insulation shall be tightly butted to the insulation of the fittings and accessories. The butted joints and ends shall be sealed with joint sealant and sealed with a vapor retarder coating or PVDC adhesive tape or greater than 3 ply laminate jacket - less than 0.0000 perm adhesive tape.

b. Anchors attached directly to the pipe shall be insulated for a sufficient distance to prevent condensation but not less than 6 inches from the insulation surface.

c. Insulation shall be marked showing the location of unions, strainers, and check valves.

3.2.2.5 Optional PVC Fitting Covers

At the option of the Contractor, premolded, one or two piece PVC fitting covers may be used in lieu of the vapor retarder and embedded glass tape. Factory precut or premolded insulation segments shall be used under the fitting covers for elbows. Insulation segments shall be the same insulation as the pipe insulation including same density, thickness, and thermal conductivity. The covers shall be secured by PVC vapor retarder tape, adhesive, seal welding or with tacks made for securing PVC covers. Seams in the cover, and tacks and laps to adjoining pipe insulation jacket, shall be sealed with vapor retarder tape to ensure that the assembly has a continuous vapor seal.

3.2.3 Piping Exposed to Weather

Piping exposed to weather shall be insulated and jacketed as specified for the applicable service inside the building. After this procedure, a laminated self-adhesive (minimum 2 mils adhesive, 3 mils embossed) vapor barrier/weatherproofing jacket - less than 0.0000 permeability (greater than 3 ply, standard grade, silver, white, black and embossed aluminum jacket or PVC jacket shall be applied. PVC jacketing requires no factory-applied

jacket beneath it, however an all service jacket shall be applied if factory applied jacketing is not furnished. Flexible elastomeric cellular insulation exposed to weather shall be treated in accordance with paragraph INSTALLATION OF FLEXIBLE ELASTOMERIC CELLULAR INSULATION in PART 3.

3.2.3.1 Aluminum Jacket

The jacket for hot piping may be factory applied. The jacket shall overlap not less than 2 inches at longitudinal and circumferential joints and shall be secured with bands at not more than 12 inch centers. Longitudinal joints shall be overlapped down to shed water and located at 4 or 8 o'clock positions. Joints on piping 60 degrees F and below shall be sealed with metal jacketing/flashing sealant while overlapping to prevent moisture penetration. Where jacketing on piping 60 degrees F and below abuts an un-insulated surface, joints shall be caulked to prevent moisture penetration. Joints on piping above 60 degrees F shall be sealed with a moisture retarder.

3.2.3.2 Insulation for Fittings

Flanges, unions, valves, fittings, and accessories shall be insulated and finished as specified for the applicable service. Two coats of breather emulsion type weatherproof mastic (impermeable to water, permeable to air) recommended by the insulation manufacturer shall be applied with glass tape embedded between coats. Tape overlaps shall be not less than 1 inch and the adjoining aluminum jacket not less than 2 inches. Factory preformed aluminum jackets may be used in lieu of the above. Molded PVC fitting covers shall be provided when PVC jackets are used for straight runs of pipe. PVC fitting covers shall have adhesive welded joints and shall be weatherproof laminated self-adhesive (minimum 2 mils adhesive, 3 mils embossed) vapor barrier/weatherproofing jacket - less than 0.0000 permeability, (greater than 3 ply, standard grade, silver, white, black and embossed, and UV resistant.

3.2.3.3 PVC Jacket

PVC jacket shall be ultraviolet resistant and adhesive welded weather tight with manufacturer's recommended adhesive. Installation shall include provision for thermal expansion.

-- End of Section --

SECTION 23 21 23

HYDRONIC PUMPS
08/17

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 MECHANICAL ENGINEERS (ASME)

ASME B1.1	(2003; R 2018) Unified Inch Screw Threads (UN and UNR Thread Form)
ASME B4.1	(1967; R 1994; R 2004; R 2009; R 2020) Preferred Limits and Fits for Cylindrical Parts
ASME B4.2	(1978; R 1994; R 2004, R 2009; R 2020) Preferred Metric Limits and Fits
ASME B16.1	(2020) Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA E103	(2015) Horizontal and Vertical Line-Shaft Pumps

ASTM INTERNATIONAL (ASTM)

ASTM A48/A48M	(2003; R 2021) Standard Specification for Gray Iron Castings
ASTM A53/A53M	(2020) 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 A159	(1983; R 2020) Standard Specification for Automotive Gray Iron Castings
ASTM A307	(2021) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60

	000 PSI Tensile Strength
ASTM A536	(1984; R 2019; E 2019) Standard Specification for Ductile Iron Castings
ASTM A582/A582M	(2012; R 2017) Standard Specification for Free-Machining Stainless Steel Bars
ASTM B584	(2014) Standard Specification for Copper Alloy Sand Castings for General Applications

HYDRAULIC INSTITUTE (HI)

HI 1.1-1.2	(2014) Rotodynamic (Centrifugal) Pump for Nomenclature and Definitions
HI 1.3	(2013) Rotodynamic (Centrifugal) Pump Applications
HI 9.6.4	(2009) Rotodynamic Pumps for Vibration Analysis and Allowable Values
HI ANSI/HI 2.1-2.2	(2014) Rotodynamic Vertical Pumps of Radial, Mixed, and Axial Flow Types for Nomenclature and Definitions
HI ANSI/HI 9.6.3	(2017) Rotodynamic Pumps - Guideline for Operating Regions - B120
HI ANSI/HI 14.6	(2011) Rotodynamic Pumps for Hydraulic Performance Acceptance Tests - A136

INTERNATIONAL CODE COUNCIL (ICC)

ICC IgCC	(2018) International Green Construction Code

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1	(2018) Motors and Generators
NEMA Z535.4	(2011; R 2017) Product Safety Signs and Labels

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

NSF INTERNATIONAL (NSF)

NSF 372	(2016) Drinking Water System Components - Lead Content

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 21	(1982; E 2004) White or Colored Silicone Alkyd Paint (Type I, High Gloss and Type II, Medium Gloss)
SSPC Paint 25	(1997; E 2004) Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel, Type I and Type II

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

29 CFR 1910.219	Mechanical Power Transmission Apparatus

UNDERWRITERS LABORATORIES (UL)

UL 778	(2016; Reprint Jun 2021) UL Standard for Safety Motor-Operated Water Pumps

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 01305 SUBMITTAL PROCEDURES:

SD-03 Product Data

Equipment Data; G

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals; G

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Hydronic pumps used for heating and air conditioning applications are defined by the type of impeller, number of impellers, type of casing, method of connection to the driver, and mounting position. Provide centrifugal water pumps of the types indicated and specified. Use an electric motor driving unit for each pump as indicated and specified.

2.1.1 Safety Requirements

Fully enclose or guard couplings, projecting set-screws, keys, and other rotating parts, that pose an entangling hazards..

2.2 MATERIALS AND EQUIPMENT

2.2.1 Nameplates

Securely affix a standard nameplate to pumps and motors in a conspicuous place showing the manufacturer's name, address, type or style, model, serial number, and catalog number. In addition, for each pump show the capacity in gpm at rated speed in rpm and total head in feet of water. For each electric motor show at least the minimum information required by

NEMA MG 1. Show such other information as the manufacturer may consider necessary to complete identification on the nameplate. Pumps must be listed and labeled by UL, and comply with UL 778 for pumps not using universal motors rated more than 250 volts such as circulating pumps.

2.3 HYDRONIC PUMPS

Provide centrifugal, single-stage type, designed for HVAC service in the following configurations:

2.3.2 Small In-Line

Provide pumps with capacities as indicated, suitable for 225 degrees F operation at 175 psig working pressure. The pump must be single stage, in-line design, in cast iron bronze fitted construction. The pump internals must be capable of being serviced without disturbing piping connections.

2.3.2.1 Pump Shaft

The pump must have a solid steel shaft with a coupler between the pump and motor shafts. For non-stainless steel shafts, employ a non-ferrous shaft sleeve to completely cover the wetted area under the seal.

2.3.2.2 Bearing

The bearing assembly must house maintenance-free permanently lubricated bearings.

2.3.2.3 Seal Assembly

Equip the pump with an internal self-flushing mechanical seal assembly. Seal assembly must have Buna bellows and seat gasket, stainless steel spring, and be of a carbon ceramic design with the carbon face rotating against a stationary ceramic face.

2.3.2.4 Impeller

Provide impeller of cast bronze or brass material. Impeller must be hydraulically and dynamically balanced to HI 9.6.4 balance grade G6.3, keyed to the shaft and secured by a locking capscrew or nut.

2.3.2.5 Volute

Pump volute must be of cast iron. The connection style on cast iron pumps must be flanged.

2.3.2.6 Motor Mount

To ensure alignment, mount the motor to the bearing assembly via a bolted motor bracket assembly. Use a replaceable resilient rubber motor mount to assist in aligning the motor shaft with the pump shaft.

2.3.2.7 Motors

NEMA MG 1; premium efficiency; non-overloading at any point on the pump

curve; maintenance free with permanently lubricated bearings; and resilient mounted for smaller sizes, rigid mounted otherwise.

2.4 ELECTRICAL EQUIPMENT

Provide electrical motor driven equipment herein specified complete with motors, motor starters, and controls. Motor controls, equipment, and wiring must be in accordance with NFPA 70.

2.4.1 Electric Motors

Drive each electric motor-driven pump by a continuous-duty electric motor with enclosure type for specific service as defined in paragraph HYDRONIC PUMPS. Motor must have a 1.5 service factor. Provide squirrel-cage induction motors having normal-starting-torque and low-starting-current characteristics, and of sufficient size so that the nameplate horsepower rating will not be exceeded throughout the entire published pump characteristic curve. Integral size motors must be the premium efficiency type in accordance with NEMA MG 1. Pump electric motor efficiencies must meet or exceed the requirements of the ICC IgCC standard. Motor bearings must provide smooth operations under the conditions encountered for the life of the motor. Provide adequate thrust bearing in the motor to carry the weight of all rotating parts plus the hydraulic thrust and be capable of withstanding upthrust imposed during pump starting. Motors must be rated 460 volts, 3 phase, 60 Hz and such rating must be stamped on the nameplate. Provide motors in conformance with NEMA MG 1.

2.4.2 Control Equipment

Automatically controlled pumps must have three-position "MANUAL-OFF-AUTOMATIC" selector switch in cover. Provide additional controls or protective devices as indicated.

2.5 EQUIPMENT APPURTENANCES

2.5.1 Attachments

Furnish all necessary bolts, nuts, washers, bolt sleeves, and other types of attachments with the equipment for the installation of the equipment. Bolts conform to the requirements of ASTM A307 and hexagonal nuts of the same quality as the bolts used. Threads must be clean-cut and conform to ASME B1.1. Bolts, nuts, and washers specified to be galvanized or not otherwise indicated or specified, must be zinc coated after being threaded, by the hot-dip process conforming to ASTM A123/A123M as appropriate. Bolts, nuts, and washers specified or indicated to be stainless steel must be Type 316.

2.5.2 Equipment Guards

Provide equipment driven by open shafts, belts, chains, or gears with all-metal guards enclosing the drive mechanism. Secure guards in position with steel braces or straps that permit easy removal for servicing the equipment. Coupler guards must comply with current national safety standards including 29 CFR 1910.219 and NEMA Z535.4. Provide guards with gaps no greater than 0.250 inches, safety orange in color, and have an NEMA Z535.4 compliant warning label.

2.6 FINISHES

All motors, pump casings, and similar parts of equipment must be thoroughly cleaned, primed, and given two finish coats of paint at the factory in accordance with the recommendations of the manufacturer. Give ferrous surfaces not to be painted a shop coat of grease or other suitable rust-resistant coating.

PART 3 EXECUTION

3.1 EXAMINATION

After becoming familiar with all details of the work, verify all dimensions in the field and advise the Contracting Officer of any discrepancy before performing the work.

3.2 INSTALLATION

Install each pump and motor in accordance with the written instructions of the manufacturer. Provide access space around the device for servicing no less than the minimum recommended by the manufacturer.

3.3 FIELD PAINTING

Do not paint stainless steel, galvanized steel, and nonferrous surfaces.

3.3.1 Touch-up painting

Factory painted items requiring touching up in the field must be thoroughly cleaned of all foreign material, and primed and topcoated with the manufacturer's standard factory finish.

3.3.2 Exposed Ferrous Surfaces

Paint exposed ferrous surfaces with two coats of enamel paint conforming to SSPC Paint 21. Solvent clean factory primed surfaces before painting. Surfaces that have not been factory primed must be prepared and primed with one coat of SSPC Paint 25 or in accordance with the enamel paint manufacturer's recommendations.

-- End of Section --

SECTION 23 64 10

WATER CHILLERS, VAPOR COMPRESSION TYPE
11/16

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 550/590 I-P	(2015; ERTA 2016) Performance Rating Of Water-Chilling and Heat Pump Water-Heating Packages Using the Vapor Compression Cycle

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

ANSI/ASHRAE 15 & 34	(2016) ANSI/ASHRAE Standard 15-Safety Standard for Refrigeration Systems and ANSI/ASHRAE Standard 34-Designation and Safety Classification of Refrigerants

AMERICAN WELDING SOCIETY (AWS)

AWS Z49.1	(2012) Safety in Welding and Cutting and Allied Processes

ASTM INTERNATIONAL (ASTM)

ASTM B117	(2016) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM D520	(2000; R 2011) Zinc Dust Pigment
ASTM E84	(2018) Standard Test Method for Surface Burning Characteristics of Building Materials

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1	(2016; SUPP 2016) Motors and Generators
NEMA MG 11	(1977; R 2012) Energy Management Guide for Selection and Use of Single Phase Motors

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that

will review the submittal for the Government. Submit the following in accordance with Section 01305 SUBMITTAL PROCEDURES:

SD-03 Product Data

Water Chiller; G

SD-06 Test Reports

Water Chiller - Field Acceptance Test Report

SD-08 Manufacturer's Instructions

Water Chiller - Installation Instructions; G

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals; G

1.3 SAFETY REQUIREMENTS

Exposed moving parts, parts that produce high operating temperature, parts which may be electrically energized, and parts that may be a hazard to operating personnel must be insulated, fully enclosed, guarded, or fitted with other types of safety devices. Safety devices must be installed so that proper operation of equipment is not impaired. Welding and cutting safety requirements must be in accordance with AWS Z49.1.

1.4 DELIVERY, STORAGE, AND HANDLING

Stored items must be protected from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Proper protection and care of all material both before and during installation will be the Contractor's responsibility. Any materials found to be damaged must be replaced at the Contractor's expense. During installation, piping and similar openings must be capped to keep out dirt and other foreign matter.

1.5 PROJECT REQUIREMENTS

1.5.1 Verification of Dimensions

The Contractor must become familiar with all details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

PART 2 PRODUCTS

2.1 STANDARD COMMERCIAL PRODUCTS

The chiller will be standard commercial cataloged product of Trane.

2.2 MANUFACTURER'S STANDARD NAMEPLATES

The chiller must have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to it. Plates must

be durable and legible throughout equipment life. Plates must be fixed in prominent locations with nonferrous screws or bolts.

2.3 ELECTRICAL WORK

a. Provide motors, controllers, integral disconnects, contactors, and controls with their respective pieces of equipment, except controllers indicated as part of motor control centers. Manual or automatic control and protective or signal devices required for the operation specified and control wiring required for controls and devices specified, but not shown, must be provided. For packaged equipment, the manufacturer must provide controllers including the required monitors and timed restart.

b. For single-phase motors, provide high-efficiency type, fractional-horsepower alternating-current motors, including motors that are part of a system, in accordance with NEMA MG 11.

c. For polyphase motors, provide squirrel-cage medium induction motors, including motors that are part of a system, and that meet the efficiency ratings for premium efficiency motors in accordance with NEMA MG 1.

d. Provide motors in accordance with NEMA MG 1 and of sufficient size to drive the load at the specified capacity without exceeding the nameplate rating of the motor. Motors must be rated for continuous duty with the enclosure specified. Motor duty requirements must allow for maximum frequency start-stop operation and minimum encountered interval between start and stop. Motor torque must be capable of accelerating the connected load within 20 seconds with 80 percent of the rated voltage maintained at motor terminals during one starting period. Provide motor starters complete with thermal overload protection and other necessary appurtenances. Motor enclosure type may be either TEAO or TEFC.

2.4 SELF-CONTAINED WATER CHILLERS, VAPOR COMPRESSION TYPE

Unless necessary for delivery purposes, units must be assembled, leak-tested, charged (refrigerant and oil), and adjusted at the factory. In lieu of delivery constraints, a chiller may be assembled, leak-tested, charged (refrigerant and oil), and adjusted at the job site by a factory representative. Unit components delivered separately must be sealed and charged with a nitrogen holding charge. Parts weighing 50 pounds or more which must be removed for inspection, cleaning, or repair, such as motors, gear boxes, cylinder heads, casing tops, condenser, and cooler heads, must have lifting eyes or lugs. Chiller must be provided with a single point wiring connection for incoming power supply. Chiller's condenser and water cooler must be provided with standard water boxes with grooved mechanical connections.

2.4.1 Scroll, Reciprocating, or Rotary Screw Type

Chiller must be certified for performance per AHRI 550/590 I-P. If specified performance is outside of the Application Rating Conditions of AHRI 550/590 I-P, Table 2 then the chiller's performance must be rated in

accordance with AHRI 550/590 I-P. Chiller must conform to ANSI/ASHRAE 15 & 34. As a minimum, chiller must include the following:

a. Refrigerant and oil

b. Structural base

c. Chiller refrigerant circuit

d. Controls package

e. Scroll, reciprocating, or rotary screw compressor

f. Compressor driver, electric motor

g. Compressor driver connection

h. Water cooler (evaporator)

i. Air-cooled condenser coil

j. Buffer tank if scheduled in the drawings

k. Dual pumps if scheduled in the drawings

l. Vibration-reducing mounting if scheduled in the drawings

m. Architectural coil guards if scheduled in the drawings

n. Five-year warranty if scheduled in the drawings

2.5 BASIC CHILLER COMPONENTS

2.5.1 Refrigerant and Oil

Refrigerants must be one of the fluorocarbon gases. Refrigerants must have number designations and safety classifications in accordance with ANSI/ASHRAE 15 & 34. CFC-based refrigerants are prohibited. Refrigerants must have an Ozone Depletion Potential (ODP) no greater than 0.0, with the exception of R-123. Provide SDS sheets for all refrigerants.

2.5.2 Structural Base

Chiller and individual chiller components must be provided with a factory-mounted structural steel base (welded or bolted) or support legs. Chiller and individual chiller components must be isolated from the building structure by means of molded neoprene isolation pads.

2.5.3 Chiller Refrigerant Circuit

Chiller refrigerant circuit must be completely piped and factory leak tested in accordance with ANSI/ASHRAE 15 & 34. Circuit must include as a minimum a combination sight glass and moisture indicator, an electronic or thermostatic expansion valve with external equalizer or float valve, charging ports, compressor service valves for field-serviceable compressors, and superheat adjustment.

2.5.4 Controls Package

Provide chillers with a complete factory-mounted , microprocessor based operating and safety control system. Controls package must contain as a minimum a digital display, an on-auto-off switch, motor starters, variable frequency motor controller, power wiring, and control wiring. Controls package must provide operating controls, monitoring capabilities, programmable setpoints, safety controls, and interfaces as defined below.

2.5.4.1 Operating Controls

Chiller must be provided with the following adjustable operating controls as a minimum.

a. Leaving chilled water temperature control

b. Adjustable timer or automated controls to prevent a compressor from short cycling

c. Automatic lead/lag controls (adjustable) for multi-compressor units

d. Load limiting

e. System capacity control to adjust the unit capacity in accordance with the system load and the programmable setpoints. Controls must automatically re-cycle the chiller on power interruption.

f. Startup and head pressure controls to allow system operation at all ambient temperatures down to 40 degrees F.

g. Automatic lead/lag controls for dual pumps and variable speed pump controls if pumps are scheduled in the drawings.

2.5.4.2 Monitoring Capabilities

During normal operations, the control system must be capable of monitoring and displaying the following operating parameters. Access and operation of display must not require opening or removing any panels or doors.

a. Entering and leaving chilled water temperatures

b. Chilled water flow

c. Deleted.

d. Self diagnostic

e. Operation status

f. Operating hours

g. Number of starts

h. Compressor status (on or off)

i. Compressor load (percent)

j. Refrigerant discharge and suction pressures

k. Magnetic bearing levitation status (if applicable)

l. Magnetic bearing temperatures (if applicable)

m. Oil pressure

2.5.4.3 Configurable Setpoints

The control system must be capable of being configured directly at the unit's interface panel. The programmable setpoints must include the following as a minimum:

a. Leaving Chilled Water Temperature

2.5.4.4 Safety Controls with Manual Reset

Chiller must be provided with the following safety controls which automatically shut down the chiller and which require manual reset.

a. Low chilled water temperature protection

b. High condenser refrigerant discharge pressure protection

c. Low evaporator pressure protection

d. Chilled water flow detection

e. High motor winding temperature protection

f. Low oil flow protection if applicable

g. Magnetic bearing controller (MBC), Internal fault (if applicable)

h. MBC, High bearing temperature (if applicable)

i. MBC, Communication fault (if applicable)

j. MBC, Power supply fault (if applicable)

k. Motor current overload and phase loss protection

2.5.4.5 Safety Controls with Automatic Reset

Chiller must be provided with the following safety controls which automatically shut down the chiller and which provide automatic reset.

a. Over/under voltage protection

b. Chilled water flow interlock

c. MBC, Vibration (if applicable)

d. MBC, No levitation (if applicable)

e. Phase reversal protection

2.5.4.6 Remote Alarm

During the initiation of a safety shutdown, a chiller's control system must be capable of activating a remote alarm bell. If specified under controls, in coordination with the chiller, the Contractor must provide an alarm circuit (including transformer if applicable) and a minimum 4 inch diameter alarm bell. Alarm circuit must activate bell in the event of machine shutdown due to the chiller's monitoring of safety controls. The alarm bell must not sound for a chiller that uses low-pressure cutout as an operating control.

2.5.4.7 Utility Monitoring and Control System Interface

Provide a Utility Monitoring and Control System (UMCS) interface meeting the requirements of Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC and the requirements of Section 23 09 23 LONWORKS DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL SYSTEMS. The interface must provide all system operating conditions, capacity controls, and safety shutdown conditions as network points. In addition, the following points must be overridable via the network interface:

a. Unit Start/Stop

b. Leaving Chilled Water Temperature Setpoint

2.5.5 Compressor(s)

2.5.5.1 Scroll Compressor(s)

Compressors must be of the hermetically sealed design. Compressors must be mounted on vibration isolators to minimize vibration and noise. Rotating parts must be statically and dynamically balanced at the factory to minimize vibration. Lubrication system must be centrifugal pump type equipped with a means for determining oil level and an oil charging valve. Crankcase oil heater must be provided. Provide continuous compressor unloading to 15 percent of full-load capacity by way of variable speed compressor motor controller or variable unloading of the scroll.

2.5.6 Water Cooler (Evaporator)

Cooler must be of the shell-and-coil or shell-and-tube type design. Cooler shell must be constructed of seamless or welded steel. Coil bundles must be totally removable and arranged to drain completely. Tubes must be seamless copper, plain, integrally finned with smooth bore or integrally finned with enhanced bore. Each tube must be individually replaceable. Tubes must be installed into carbon mild steel tube sheets by rolling. Tube baffles must be properly spaced to provide adequate tube support and cross flow. Performance must be based on a water velocity not less than 3 fps nor more than 12 fps and a fouling factor per AHRI 550/590 I-P.

Brazed plate heat exchanger must be constructed of 304 or 316 stainless steel, designed to a refrigerant-side working pressure of 430 psig and a

waterside working pressure of 150 psig. Evaporator must be factory tested at 1.1 times maximum allowable refrigerant side working pressure and 1.5 times maximum allowable water side working pressure. Provide cooler heaters to protect the evaporator to an ambient of minus 20 degrees F. Provide cooler with factory-installed flow switches. All water connections must use either flanged or grooved-pipe connections. Factory insulate all cold surfaces.

2.5.7 Air-Cooled Condenser Coil

Condenser coil must be of the extended-surface fin-and-tube type and must be constructed of seamless copper tubes with compatible aluminum fins. Fins must be soldered or mechanically bonded to the tubes and installed in a metal casing. Coils must be circuited and sized for a minimum of 5 degrees F subcooling and full pump down capacity. Coil must be factory leak and pressure tested after assembly in accordance with ANSI/ASHRAE 15 & 34.

2.5.8 Tools

One complete set of special tools, as recommended by the manufacturer for field maintenance of the system, must be provided. Tools must be mounted on a tool board in the equipment room or contained in a toolbox as directed by the Contracting Officer.

2.6 FABRICATION

2.6.1 Factory Coating

Unless otherwise specified, equipment and component items, when fabricated from ferrous metal, must be factory finished with the manufacturer's standard finish, except that items located outside of buildings must have weather resistant finishes that will withstand 125 hours exposure to the salt spray test specified in ASTM B117 using a 5 percent sodium chloride solution. Immediately after completion of the test, the specimen must show no signs of blistering, wrinkling, cracking, or loss of adhesion and no sign of rust creepage beyond 1/8 inch on either side of the scratch mark. Cut edges of galvanized surfaces where hot-dip galvanized sheet steel is used must be coated with a zinc-rich coating conforming to ASTM D520, Type I.

2.6.2 Factory Applied Insulation

Chiller must be provided with factory installed insulation on surfaces subject to sweating including the water cooler, suction line piping, economizer, and cooling lines. Insulation on heads of coolers may be field applied, however it must be installed to provide easy removal and replacement of heads without damage to the insulation. Where motors are the gas-cooled type, factory installed insulation must be provided on the cold-gas inlet connection to the motor per manufacturer's standard practice. Factory insulated items installed outdoors are not required to be fire-rated. As a minimum, factory insulated items installed indoors must have a flame spread index no higher than 75 and a smoke developed index no higher than 150. Factory insulated items (no jacket) installed indoors and which are located in air plenums, in ceiling spaces, and in attic spaces must have a flame spread index no higher than 25 and a smoke developed index no higher than 50. Flame spread and smoke developed indexes must be determined by ASTM E84. Insulation must be tested in the same density and installed

thickness as the material to be used in the actual construction. Material supplied by a manufacturer with a jacket must be tested as a composite material. Jackets, facings, and adhesives must have a flame spread index no higher than 25 and a smoke developed index no higher than 50 when tested in accordance with ASTM E84.

PART 3 EXECUTION

3.1 INSTALLATION

Installation of water chiller systems including materials, installation, workmanship, fabrication, assembly, erection, examination, inspection, and testing must be in accordance with the manufacturer's written installation instructions.

3.1.1 Installation Instructions

Provide manufacturer's standard catalog data, at least 2 weeks prior to the purchase or installation of a particular component, highlighted to show features such as materials, dimensions, options, performance and efficiency. Data must include manufacturer's recommended installation instructions and procedures. Data must be adequate to demonstrate compliance with contract requirements.

3.1.2 Vibration Isolation

If vibration isolation is specified for a unit, vibration isolator literature must be included containing catalog cuts and certification that the isolation characteristics of the isolators provided meet the manufacturer's recommendations.

3.1.3 Verification of Dimensions

Provide a letter including the date the site was visited, conformation of existing conditions, and any discrepancies found.

3.1.4 System Performance Test Schedules

Provide a schedule, at least 2 weeks prior to the start of related testing, for the system performance tests. The schedules must identify the proposed date, time, and location for each test.

3.1.5 Certificates

Where the system, components, or equipment are specified to comply with requirements of AGA, NFPA, ARI, ASHRAE, ASME, or UL, proof of such compliance must be provided. The label or listing of the specified agency must be acceptable evidence. In lieu of the label or listing, a written certificate from an approved, nationally recognized testing organization equipped to perform such services, stating that the items have been tested and conform to the requirements and testing methods of the specified agency may be submitted. When performance requirements of this project's drawings and specifications vary from standard ARI rating conditions, computer printouts, catalog, or other application data certified by ARI or a nationally recognized laboratory as described above must be included. If ARI does not have a current certification program that encompasses such

application data, the manufacturer may self-certify that his application data complies with project performance requirements in accordance with the specified test standards.

3.1.6 Operation and Maintenance Manuals

Provide electronic pdf files and two complete copies of an operation manual in bound 8 1/2 by 11 inch booklets listing step-by-step procedures required for system startup, operation, abnormal shutdown, emergency shutdown, and normal shutdown at least one weeks prior to the first training course. The booklets must include the manufacturer's name, model number, and parts list. The manuals must include the manufacturer's name, model number, service manual, and a brief description of all equipment and their basic operating features. Two complete copies of maintenance manual in bound 8 1/2 by 11 inch booklets listing routine maintenance procedures, possible breakdowns and repairs, and a trouble shooting guide. The manuals must include piping and equipment layouts and simplified wiring and control diagrams of the system as installed.

3.1.7 Connections to Existing Systems

Notify the Contracting Officer in writing at least 15 calendar days prior to the date the connections are required. Obtain approval before interrupting service. Furnish materials required to make connections into existing systems and perform excavating, backfilling, compacting, and other incidental labor as required. Furnish labor and tools for making actual connections to existing systems.

3.1.8 Refrigeration System

3.1.8.1 Equipment

Refrigeration equipment and the installation thereof must conform to ANSI/ASHRAE 15 & 34. Necessary supports must be provided for all equipment, appurtenances, and pipe as required, including frames or supports for compressors, pumps, cooling towers, condensers, water coolers, and similar items. Compressors must be isolated from the building structure. If mechanical vibration isolators are not provided, vibration absorbing foundations must be provided. Each foundation must include isolation units consisting of machine and floor or foundation fastenings, together with intermediate isolation material. Other floor-mounted equipment must be set on not less than a 6 inch concrete pad doweled in place. Concrete foundations for floor mounted pumps must have a mass equivalent to three times the weight of the components, pump, base plate, and motor to be supported. In lieu of concrete pad foundation, concrete pedestal block with isolators placed between the pedestal block and the floor may be provided. Concrete pedestal block must be of mass not less than three times the combined pump, motor, and base weights. Isolators must be selected and sized based on load-bearing requirements and the lowest frequency of vibration to be isolated. Isolators must limit vibration to 25 percent at lowest equipment rpm. Lines connected to pumps mounted on pedestal blocks must be provided with flexible connectors. Foundation drawings, bolt-setting information, and foundation bolts must be furnished prior to concrete foundation construction for all equipment indicated or required to have concrete foundations. Equipment must be properly leveled, aligned, and secured in place in accordance with manufacturer's instructions.

3.1.8.2

Field Refrigerant Charging

a. Initial Charge: Upon completion of all the refrigerant pipe tests, the vacuum on the system must be broken by adding the required charge of dry refrigerant for which the system is designed, in accordance with the manufacturer's recommendations. Contractor must provide the complete charge of refrigerant in accordance with manufacturer's recommendations. Upon satisfactory completion of the system performance tests, any refrigerant that has been lost from the system must be replaced. After the system is fully operational, service valve seal caps and blanks over gauge points must be installed and tightened.

b. Refrigerant Leakage: If a refrigerant leak is discovered after the system has been charged, the leaking portion of the system must immediately be isolated from the remainder of the system and the refrigerant must be pumped into the system receiver or other suitable container. The refrigerant must not be discharged into the atmosphere.

c. Contractor's Responsibility: The Contractor must, at all times during the installation and testing of the refrigeration system, take steps to prevent the release of refrigerants into the atmosphere. The steps must include, but not be limited to, procedures which will minimize the release of refrigerants to the atmosphere and the use of refrigerant recovery devices to remove refrigerant from the system and store the refrigerant for reuse or reclaim. At no time must more than 3 ounces of refrigerant be released to the atmosphere in any one occurrence. Any system leaks within the first year must be repaired in accordance with the specified requirements including material, labor, and refrigerant if the leak is the result of defective equipment, material, or installation.

3.1.8.3 Oil Charging

Except for factory sealed units, two complete charges of lubricating oil for each compressor crankcase must be furnished. One charge must be used during the performance testing period, and upon the satisfactory completion of the tests, the oil must be drained and replaced with the second charge.

3.1.9 Field Applied Insulation

Field installed insulation must be as specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS, except as defined differently herein.

3.1.10 Field Painting

Painting required for surfaces not otherwise specified, and finish painting of items only primed at the factory are specified in Section 09 90 00 PAINTS AND COATINGS.

3.2 MANUFACTURER'S FIELD SERVICE

The services of a factory-trained representative must be provided for two days. The representative shall advise on the following:

a. Hermetic machines:

(1) Testing hermetic water-chilling unit under pressure for refrigerant leaks; evacuation and dehydration of machine to an absolute pressure of not over 300 micrometers.

(2) Charging the machine with refrigerant.

(3) Starting the machine.

3.3 CLEANING AND ADJUSTING

Equipment must be wiped clean, with all traces of oil, dust, dirt, or paint spots removed. Provide temporary filters for all fans that are operated during construction. Perform and document that proper Indoor Air Quality During Construction procedures have been followed; this includes providing documentation showing that after construction ends, and prior to occupancy, new filters were provided and installed. System must be maintained in this clean condition until final acceptance. Bearings must be properly lubricated with oil or grease as recommended by the manufacturer. Belts must be tightened to proper tension. Control valves and other miscellaneous equipment requiring adjustment must be adjusted to setting indicated or directed. Fans must be adjusted to the speed indicated by the manufacturer to meet specified conditions. At least one week before the official equipment warranty start date, all condenser coils on air-cooled water chillers and split-system water chillers must be cleaned in accordance with the chiller manufacturer's instructions. This work covers two coil cleanings. The condenser coils must be cleaned with an approved coil cleaner by a service technician, factory trained by the chiller manufacturer. The condenser coil cleaner must not have any detrimental affect on the materials or protective coatings on the condenser coils. Testing, adjusting, and balancing must be as specified in Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC.

3.4 SYSTEM PERFORMANCE TESTS

Two copies of the report must be provided in bound 8 1/2 by 11 inch booklets.

3.4.1 General Requirements

Before each refrigeration system is accepted, tests to demonstrate the general operating characteristics of all equipment must be conducted by the manufacturer's approved start-up representative experienced in system start-up and testing, at such times as directed. Tests must cover a period of not less than 48 hours for each system and must demonstrate that the entire system is functioning in accordance with the drawings and specifications. Corrections and adjustments must be made as necessary and tests must be re-conducted to demonstrate that the entire system is functioning as specified. Prior to acceptance, service valve seal caps and blanks over gauge points must be installed and tightened. Any refrigerant lost during the system startup must be replaced. If tests do not demonstrate satisfactory system performance, deficiencies must be corrected and the system must be retested. Tests must be conducted in the presence of the Contracting Officer. Water and electricity required for the tests will be furnished by the Government. Any material, equipment, instruments, and personnel required for the test

must be provided by the Contractor. Field tests must be coordinated with Section 23 05 93 TESTING, ADJUSTING, AND BALANCING FOR HVAC.

3.4.2 Test Report

The report must document compliance with the specified performance criteria upon completion and testing of the system. The report must indicate the number of days covered by the tests and any conclusions as to the adequacy of the system. The report must also include the following information and must be taken at least three different times at outside dry-bulb temperatures that are at least 5 degrees F apart:

a. Date and outside weather conditions.

b. The load on the system based on the following:

(1) The refrigerant used in the system.
(2) Condensing temperature and pressure.
(3) Suction temperature and pressure.
(4) Running current, voltage and proper phase sequence for each phase of all motors.
(5) The actual on-site setting of all operating and safety controls.
(6) Chilled water pressure, flow and temperature in and out of the chiller.
(7) The position of the capacity-reduction gear at machine off, one-third loaded, one-half loaded, two-thirds loaded, and fully loaded.

3.5 DEMONSTRATIONS

Contractor must conduct a training course for the operating staff as designated by the Contracting Officer. The training period must consist of a total of 1 hour of normal working time and start after the system is functionally completed but prior to final acceptance tests. The training course must cover all of the items contained in the approved operation and maintenance manuals as well as demonstrations of routine maintenance operations.

Provide a schedule, at least 2 weeks prior to the date of the proposed training course, which identifies the date, time, and location for the training.

-- End of Section --

SECTION 26 29 23

ADJUSTABLE SPEED DRIVE (ASD) SYSTEMS UNDER 600 VOLTS
02/20, CHG 1: 05/21

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.

EUROPEAN COMMITTEE FOR STANDARDIZATION (CEN/CENELEC)

EN 61800-3	(2017) Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 519	(2014) Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
IEEE C62.41.1	(2002; R 2008) Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits
IEEE C62.41.2	(2002) Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

IEC 61000-3-12	(2012) Electromagnetic Compatibility (EMC) - Part 3-12: Limits - Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current >16 A and </=75 A per phase

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2020) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA ICS 1	(2000; R 2015) Standard for Industrial Control and Systems: General Requirements
NEMA ICS 3.1	(2019) Guide for the Application, Handling, Storage, Installation and Maintenance of Medium-Voltage AC Contactors, Controllers and Control Centers
NEMA ICS 6	(1993; R 2016) Industrial Control and Systems: Enclosures

NEMA ICS 7	(2020) Adjustable-Speed Drives
NEMA ICS 7.2	(2015) Application Guide for AC Adjustable Speed Drive Systems
NEMA ICS 61800-2	(2005) Adjustable Speed Electrical Power Drive Systems Part 2: General Requirements - Rating Specifications for Low Voltage Adjustable Frequency A.C. Power Drive Systems
NEMA MG 1	(2018) Motors and Generators

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

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

47 CFR 15	Radio Frequency Devices

UNDERWRITERS LABORATORIES (UL)

UL 489	(2016; Rev 2019) UL Standard for Safety Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
UL 61800-5-1	(2016) Adjustable Speed Electrical Power Drive Systems - Part 5-1: Safety Requirements - Electrical, Thermal and Energy

1.2 SYSTEM DESCRIPTION

1.2.1 Performance Requirements

1.2.1.1 Electromagnetic Interference Suppression

Computing devices, as defined by 47 CFR 15 and EN 61800-3 rules and regulations, must be certified to comply with the requirements for class A computing devices and labeled.

1.2.1.2 Electromechanical and Electrical Components

Ensure electrical and electromechanical components of the Adjustable Speed Drive (ASD) do not cause electromagnetic interference to adjacent electrical or electromechanical equipment while in operation.

1.2.2 Electrical Requirements

1.2.2.1 Power Line Surge Protection

IEEE C62.41.1 and IEEE C62.41.2, IEEE 519, IEC 61000-3-12 Control panel must have surge protection, included within the panel to protect the unit from damaging transient voltage surges. Surge protective device must be

mounted near the incoming power source and properly wired to all three phases and ground. Fuses must not be used for surge protection.

1.2.2.2 Sensor and Control Wiring Surge Protection

I/O functions as specified must be protected against surges induced on control and sensor wiring installed outdoors and as shown. Test the inputs and outputs in both normal mode and common mode using the following two waveforms:

a. A 10 microsecond by 1000 microsecond waveform with a peak voltage of 1500 volts and a peak current of 60 amperes.

b. An 8 microsecond by 20 microsecond waveform with a peak voltage of 1000 volts and a peak current of 500 amperes.

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 Contractor Quality Control approval. Submit the following in accordance with Section 01305 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Schematic Diagrams; G

As-Built Drawings; G

SD-03 Product Data

Adjustable Speed Drives; G

SD-06 Test Reports

ASD Test

Performance Verification Tests

SD-08 Manufacturer's Instructions

Installation instructions

SD-10 Operation and Maintenance Data

Adjustable Speed Drives

1.4 QUALITY ASSURANCE

1.4.1 Schematic Diagrams

Submit diagrams showing circuits and device elements for each replaceable module. Schematic diagrams of printed circuit boards are permitted to group functional assemblies as devices, provided that sufficient information is provided for government maintenance personnel to verify proper operation of the functional assemblies.

1.4.2 Installation Instructions

Provide installation instructions issued by the manufacturer of the equipment, including notes and recommendations, prior to shipment to the site. Provide operation instructions prior to acceptance testing.

1.4.3 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship and:

a. Have been in satisfactory commercial or industrial use for 2 years prior to bid opening including applications of equipment and materials under similar circumstances and of similar size.

b. Have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period.

c. Where two or more items of the same class of equipment are required, provide products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

1.5 DELIVERY AND STORAGE

Store delivered equipment to protect from the weather, humidity and temperature variations, dirt and dust, or other contaminants.

1.6 WARRANTY

The complete system must be warranted by the manufacturer for a period of 1 year. Repair or replace any component failing to perform its function as specified and documented at no additional cost to the Government. Items repaired or replaced must be warranted for an additional period of at least one year from the date that it becomes functional again, as specified in FAR 52.246-21 Warranty of Construction.

1.7 MAINTENANCE

1.7.1 Spare Parts

Manufacturers provide spare parts in accordance with recommended spare parts list.

1.7.2 Operation and Maintenance Data

Provide service and maintenance information including preventive maintenance, assembly, and disassembly procedures. Include electrical drawings from electrical general sections. Provide additional information necessary to provide complete operation, repair, and maintenance information, detailed to the smallest replaceable unit. Include copies of as-built submittals. Provide routine preventative maintenance instructions, and equipment required. Provide instructions on how to modify program settings, and modify the control program. Provide instructions on drive adjustment, trouble-shooting, and configuration. Provide instructions on process tuning and system calibration.

1.7.3 Maintenance Support

During the warranty period, provide on-site, on-call maintenance services by drive manufacturer's personnel on the following basis: The service must be on a per-call basis with 36 hour response. Contractor is responsible for the maintenance of all hardware and software of the system during the warranty period. Various personnel of different expertise must be sent on-site depending on the nature of the maintenance service required. Costs must include travel, local transportation, living expenses, and labor rates of the service personnel while responding to the service request. The provisions of this Section are not in lieu of, nor relieve the Contractor of, warranty responsibilities covered in this specification. Should the result of the service request be the uncovering of a system defect covered under the warranty provisions, all costs for the call, including the labor necessary to identify the defect, must be borne by the Contractor.

1.7.4 Technical Support

Provide the ASDs with manufacturer's technical telephone support in English, readily available during normal working hours.

PART 2 PRODUCTS

2.1 ADJUSTABLE SPEED DRIVES (ASD)

Provide adjustable speed drive to control the speed of induction motor(s). The ASD must include the following minimum functions, features and ratings.

a. Input circuit breaker per UL 489 with a minimum of 10,000 amps symmetrical interrupting capacity and door interlocked external operator.

b. A converter stage per UL 61800-5-1 must change fixed voltage, fixed frequency, ac line power to a fixed dc voltage. The converter must utilize a full wave bridge design incorporating diode rectifiers. Silicon Controlled Rectifiers (SCR) are not acceptable. The converter must be insensitive to three phase rotation of the ac line and must not cause displacement power factor of less than .95 lagging under any speed and load condition.

c. An inverter stage must change fixed dc voltage to variable frequency, variable ac voltage for application to a standard NEMA MG 1 Part 30 motor designed for use with adjustable frequency power supplies. Switch the inverter to produce a sine coded pulse width modulated (PWM) output waveform.

d. The ASD shall be capable of supplying 110 percent of rated full load current for one minute at maximum ambient temperature.

e. The ASD must be designed to operate from a 460 volt, plus or minus 10 percent, three phase, 60 Hz supply, and control motors with a corresponding voltage rating.

f. Acceleration and deceleration time must be independently adjustable from one second to 60 seconds.

Required deceleration time may be achieved using not only dynamic braking

resistor but with other methods described in NEMA ICS 7.2-2015 paragraph 5.2.5.

g. Adjustable full-time current limiting must limit the current to a preset value which must not exceed 110 percent of the controller rated current. The current limiting action must maintain the V/Hz ratio constant so that variable torque can be maintained. Short time starting override must allow starting current to reach 175 percent of controller rated current to maximum starting torque.

h. The controllers must be capable of producing an output frequency over the range of 3 Hz to 60 Hz (20 to one speed range), without low speed cogging. Over frequency protection must be included such that a failure in the controller electronic circuitry must not cause frequency to exceed 110 percent of the maximum controller output frequency selected.

i. Minimum and maximum output frequency must be adjustable over the following ranges: 1) Minimum frequency 3 Hz to 50 percent of maximum selected frequency; 2) Maximum frequency 40 Hz to 60 Hz.

j. The controller efficiency at any speed must not be less than 96 percent.

k. The controllers must be capable of being restarted into a motor coasting in the forward direction without tripping.

l. Protection of power semiconductor components must be accomplished without the use of fast acting semiconductor output fuses. Subjecting the controllers to any of the following conditions must not result in component failure or the need for fuse replacement:

(1) Short circuit at controller output

(2) Ground fault at controller output

(3) Open circuit at controller output

(4) Input undervoltage

(5) Input overvoltage

(6) Loss of input phase

(7) AC line switching transients

(8) Instantaneous overload

(9) Sustained overload exceeding 115 percent of controller rated current

(10) Over temperature

(11) Phase reversal

m. Solid state motor overload protection must be included such that current exceeding an adjustable threshold must activate a 60 second timing circuit. Should current remain above the threshold continuously

for the timing period, the controller will automatically shut down.

n. Include slip compensation circuit that will sense changing motor load conditions and adjust output frequency to provide speed regulation of NEMA MG 1 Part 30 designed for use with adjustable frequency power supplies motors to within plus or minus 0.5 percent of maximum speed without the necessity of a tachometer generator.

o. The ASD must be factory set for manual restart after the first protective circuit trip for malfunction (overcurrent, undervoltage, overvoltage or overtemperature) or an interruption of power. The ASD must be capable of being set for automatic restart after a selected time delay. If the drive faults again within a specified time period (adjustable 0-60 seconds), a manual restart will be required.

p. The ASD must include external fault reset capability. All the necessary logic to accept an external fault reset contact must be included.

q. Provide critical speed lockout circuitry to prevent operating at frequencies with critical harmonics that cause resonant vibrations. The ASD must have a minimum of three user selectable bandwidths.

r. Provide properly sized NEMA rated by-pass and isolation contactors to enable operation of motor in the event of ASD failure and for safety transfers motor between power converter output and bypass circuit using a field-selectable automatic and manual bypass mode. Install mechanical and electrical interlocks between the by-pass and isolation contactors. Provide a selector switch and transfer delay timer. Motor overload and short circuit protective features must remain in use during the bypass mode.

s. Each individual ASD must meet the following Total Harmonic Distortion (THD) requirements at the input terminals to the factory assembly of the ASD or at the load disconnecting means serving the ASD and filter assembly. These measurements should be taken with the drive set at 90 percent frequency (rpms) and the motor under a minimum of 50 percent demand.

(1) The Voltage THD should not exceed 2.0 percent THD.

(2) The Current THD should not exceed 15.0 percent THD.

(3) If the standard factory ASD does not meet or exceed these requirements the factory must install appropriate equipment (Harmonic Traps, Filters, different Drive technology, etc.) to mitigate the distortion to assure performance of the VFD is within the limits.

(4) These tests should be performed at the Manufacturers Laboratory facilities and submitted as part of the Product Data Submittals, in order to prevent the necessity of adding mitigation equipment in the field. If the requirements listed above are met, IEEE 519 will also be met.

t. Minimum Operating Conditions. Designed and constructed ASD's to operate within the following service conditions:

(1) Ambient Temperature Rating: 0 to 120 degrees F.

(2) Non-condensing relative humidity rating: less than 95 percent.

(3) Ambient rating: Not exceed 3,300 feet.

2.1.1 ASD for HVAC Application

ASDs must have the following features:

a. A local operator control providing the following functions:

(1) Remote/Local operator selection with password access.

(2) Run/Stop and manual speed commands.

(3) All programming functions.

(4) Scrolling through all display functions.

b. A local operator control panel with the following data displayed:

(1) ASD status.

(2) Frequency.

(3) Motor RPM.

(4) Phase current.

(5) Scrolling through all display functions.

(6) Fault diagnostics in descriptive text.

(7) All programmed parameters.

c. Standard PI loop controller with input terminal for controlled variable and parameter settings.

d. User interface terminals for remote control of ASD speed, speed feedback, and an isolated form C SPDT relay, which energizes on a drive fault condition.

e. An isolated form C SPDT auxiliary relay which energizes on a run command.

f. An adjustable carrier frequency with 16 KHz minimum upper limit.

g. A built-in or external line reactor with 3 percent minimum impedance to protect the DC bus capacitors and rectifier section diodes, reduce power line transient voltage, line notching, DC bus over-voltage tripping and improve the inverter over-current and over-voltage conditions.

h. Historical logging information and displays:

(1) Real-time clock with current time and date.

(2) Running log of total power versus time.

(3) Total run time.

(4) Fault log, maintaining last four faults with time and data stamp for each.

(5) Deleted..

i. The ASD must be capable of automatic control by a remote 4-20 mA signal, by BACnet network command, or manually by the ASD control panel.

j. ASDs must include the following operator programmable parameters:

(1) Upper and lower limit frequency.

(2) Acceleration and deceleration rate.

(3) Variable torque volts per Hertz curve.

(4) Starting voltage level.

(5) Starting frequency level.

(6) Display speed scaling.

(7) Enable/disable soft stall feature.

(8) Motor overload level.

(9) Motor stall level.

(10) Jump frequency and hysteresis band.

(11) PWM carrier frequency.

k. ASD must have the following protective features:

(1) An electronic adjustable inverse time current limit with consideration for additional heating of the motor at frequencies below 45Hz, for the protection of the motor.

(2) An electronic adjustable soft stall feature, allowing the ASD to lower the frequency to a point where the motor will not exceed the full-load amperage when an overload ASD will automatically return to the requested frequency when load conditions permit.

(3) A separate electronic stall at 110 percent ASD rated current, and a separate hardware trip at 190 percent current.

(4) The ability to shut down if inadvertently started into a rotating load without damaging the ASD or the motor.

(5) The ability to keep a log of a minimum of four previous fault

conditions, indicating the fault type and time of occurrence in descriptive text.

(6) The ability to sustain 110 percent rated current for 60 seconds.

(7) The ability to shutdown safely or protect against and record the following fault conditions:

(a) Over current (and an indication if the over current was during acceleration, deceleration, or running).

(b) Over current internal to the drive.

(c) Motor overload at start-up.

(d) Over voltage from utility power.

(e) Motor running overload.

(f) Over voltage during deceleration.

(g) ASD over heat.

(h) Load and ground fault.

(h) Abnormal parameters or data in ASD EEPROM.

2.2 ENCLOSURES

Provide equipment enclosures conforming to NEMA 250, NEMA ICS 7, and NEMA ICS 6, with a heater if located outdoors. An HMCP device shall provide the disconnecting means. The operating handle shall protrude through the door, but the disconnect shall not be mounted on the door. The handle shall indicate ON, OFF, and tripped conditions. The handle shall have provisions to accommodate a minimum of three padlocks in the OFF position. Interlocks shall prevent unauthorized opening or closing of the ASD door with the disconnect handle in the ON position. The door handle interlock should have provisions to be defeated by qualified maintenance personnel.

2.3 WIRES AND CABLES

All wires and cables must conform to NEMA 250, NEMA ICS 7, NFPA 70.

2.4 NAMEPLATES

Provide manufacturer's standard, permanent nameplates for internal areas of enclosures.

2.5 SOURCE QUALITY CONTROL

2.5.1 ASD Test Report

To ensure quality, each ASD must be subject to a series of in-plant quality control inspections before approval for shipment from the manufacturer's facilities. Provide test reports.

PART 3 EXECUTION

3.1 INSTALLATION

Per NEMA ICS 3.1, install equipment in accordance with the approved manufacturer's printed installation drawings, instructions, wiring diagrams, and as indicated on project drawings and the approved shop drawings. A field representative of the drive manufacturer must supervise the installation of all equipment, and wiring.

3.2 GROUNDING

Per NEMA ICS 7.2, ASD must be solidly grounded to the main distribution.

3.3 FIELD QUALITY CONTROL

Specified products must be tested as a system for conformance to specification requirements prior to scheduling the acceptance tests. Conduct performance verification tests in the presence of Government representative, observing and documenting complete compliance of the system to the specifications. Submit a signed copy of the test results, certifying proper system operation before scheduling tests.

3.3.1 ASD Test

A proposed test plan must be submitted to the contracting officer at least 28 calendar days prior to proposed testing for approval. The tests must conform to NEMA ICS 1, NEMA ICS 7, and all manufacturer's safety regulations. The Government reserves the right to witness all tests and review any documentation. Inform the Government at least 14 working days prior to the dates of testing. Perform the ASD test with the assistance of a factory-authorized service representative.

3.3.2 Performance Verification Tests

"Performance Verification Test" plan must provide the step by step procedure required to establish formal verification of the performance of the ASD. Compliance with the specification requirements must be verified by inspections, review of critical data, demonstrations, and tests. The Government reserves the right to witness all tests, review data, and request other such additional inspections and repeat tests as necessary to ensure that the system and provided services conform to the stated requirements. Inform the Government 14 calendar days prior to the date the test is to be conducted.

-- End of Section --