A NEW CITY HALL
and
MUNICIPAL OFFICE FACILITY
for the
City of Centre, Alabama
350 E. Main Street
Centre, Alabama

Mark Mansfield, Mayor

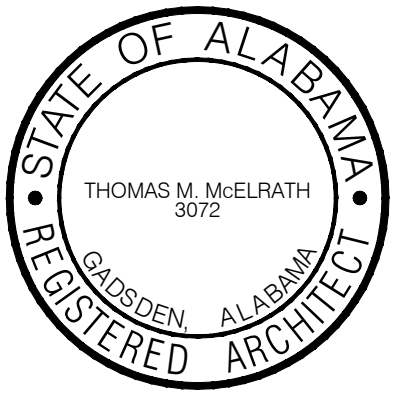
Prepared By:

THOMAS M. McELRATH, ARCHITECT
717 Merit Springs Road
Gadsden, Alabama 35901

Architect's Project No. 2022-06

Date: February 28, 2024

PROJECT MANUAL



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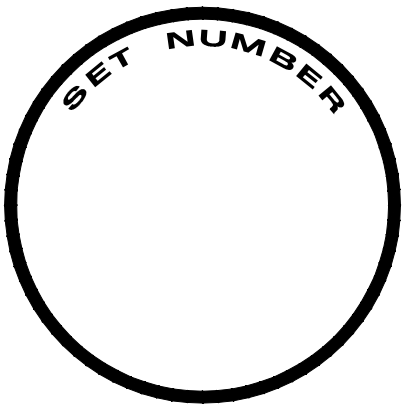

INDEX TO SPECIFICATIONS
for
A NEW CITY HALL
and
MUNICIPAL OFFICE FACILITY
for the
CITYof CENTRE, ALABAMA
350 E. Main Street

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END OF INDEX

ADVERTISEMENT FOR CONSTRUCTION BIDS
for
A NEW CITY HALL and MUNICIPAL OFFICE FACILITY
for the
CITY of CENTRE, ALABAMA
located at 350 E. MAIN STREET
Centre, Alabama 35960

Sealed construction proposals, in duplicate, will be received at the office of the City Clerk, Centre City Hall, 100 Park Street, Centre, Alabama, 35960 until 2:00 p.m., Tuesday, April 30, 2024 at which time and place they will be publicly opened and read aloud.

Bids submitted prior to the bid opening by mail shall be directed to "City Clerk, 100 Park Street, Centre, Alabama 35960" or in person delivered to the office of the City Clerk, 100 Park Street, Centre, Alabama. Bids will be publicly opened and read at the above-stated time and place.

A cashier's check or bid bond payable to the City of Centre, in an amount not less than five (5) percent (maximum $10,000.00) of the amount of the bid must accompany the bidder's proposal. Performance and Payment Bonds and evidence of insurance required in the bid documents will be required at the signing of the Contract.

Bid Documents may be examined at the City Hall, 100 Park Street, Centre, Alabama, Alabama AGC / ISQFT Plan Room; Dodge Project Data; and Construct Connect. Electronic copies of Bid Documents may be obtained from the Architect upon request of same by email. No printed hard copies of bid documents will be issued. Plan requests should be submitted to tom@tmm-architect.com. Only email requests will be accepted. The same process is applicable to sub-contractors and vendors.

General Contractors who obtain bid documents and wish to withdraw from the Official Bidders List must do so in writing to the Architect prior to the bid date. Bids received from General Contractors who are not on the Official Bidders List will not be accepted or opened. Thomas M. McElrath, Architect, makes no guarantee of bid documents obtained by Contractors and Vendors from sources other than the issued documents provided by the Architect. Contractors and Vendors who base their pricing from bid documents obtained otherwise, either in part or whole, do so at their own risk.

A Mandatory Attendance Pre-Bid Meeting will be held at 10:00 a.m., Monday, April 22, 2024 at the Project Site. All General Contractor Bidders expecting to submit a bid shall have a knowledgeable representative present at this meeting.

Scope of Work includes but is not limited to, construction of the new facility located on the City's Property at 350 E. Main Street, Centre, AL. The Work generally consists of site utilities relative to tying in the new building to existing sanitary, gas, electric and water services, site improvements relative to new construction, utility improvements, demolition of the existing Centre Middle School and other existing onsite buildings indicated, New work will consist of, but is not limited to, structural steel framing, metal stud in-fill, metal stud and drywall partitions, masonry veneer, light-gage metal roof trusses, composition shingle roofing, soft tile and hard tile floor finishes, lay-in and gyp. board ceilings, hollow metal doors and frames, pre-finished wood doors, hardware, HVAC, Electrical, toilet compartments and toilet accessories, mobile file system, casework/millwork and new commercial kitchen facilities. Facility size is approximately 8,300 s.f.

In accordance with TITLE 49, Code of Federal Regulations, all bidders are hereby notified that it will be affirmatively ensured that in the contract entered into pursuant to this advertisement, minority business enterprises will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, religion, sex or national origin in consideration for an award.

The successful bidder will be required to furnish and pay for the satisfactory Performance and Payment Bond or Bonds in the amount required by Section 39-1-1(a), Code of Alabama 1975, and evidence of insurance as required by the bid documents within ten (10) days after being notified that he has been awarded the contract.

No bidder may withdraw his bid within six (60) days after the actual date of the opening thereof. The bidder must comply with all requirements of the public works bid law Section 39-2-1 et seq., Code of Alabama 1975.

The right to reject any or all bids and to disregard any minor irregularities is reserved by the owner.

Any bidder, whether a resident or non-resident of the State of Alabama, must comply with all applicable provisions of Section 34-8-1, et. seq., Code of Alabama, 1975, including requirements for licensing as a general contractor and the necessity to show evidence of license, before the bid will be considered by the awarding authority. A current license number must be included on the bid or a statement that is has been applied for.

Bidders must comply with the President's Nos. 11246 and 11375 which prohibit discrimination in employment regarding race, creed, color, sex, or national origin. Bidders must also comply with Title IV of the Civil Rights Act of 1964, Title VIII of the Civil Rights Act of1968, and Section III of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 170lu.

By signing this contract, the contracting parties affirm, for the duration of the agreement, that they will not violate federal immigration law or knowingly employ, hire for employment, or continue to employ an unauthorized alien within the state of Alabama. Furthermore, a contracting party found to be in violation of this provision shall be deemed in breach of the agreement and shall be responsible for all damages resulting therefrom. The successful bidder will provide proof of

enrollment in the Federal E-Verify Program and in compliance with the Beason-Hammond Act (Act 2011-535).

Bidders must certify that they do not and will not maintain or provide for their employees any facilities that are segregated on a basis of race creed, color, sex, or national origin. Bidders must also certify they will make facilities handicap accessible to the extent required by law.

Bids must be submitted on proposal forms furnished by the Architect or copies thereof. The Owner reserves the right to reject any or all proposals and to waive technical errors if, in the Owner's judgment, the best interests of the Owner will thereby be promoted.

CITY of CENTRE, ALABAMA
100 Park Street, Centre, Alabama
(256) 927-5222

THOMAS M. McELRATH, ARCHITECT.
717 Merit Springs Road, Gadsden, AL 35901
(256) 490-8244

AIA® Document A701™ – 1997

Instructions to Bidders

for the following PROJECT:
(Name and location or address)
"

THE OWNER:
(Name, legal status and address)

THE ARCHITECT:
(Name, legal status and address)

TABLE OF ARTICLES

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement or Invitation to Bid, Instructions to Bidders, Supplementary Instructions to Bidders, the bid form, and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications and all Addenda issued prior to execution of the Contract.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201, or in other Contract Documents are applicable to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect prior to the execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or from which Work may be deleted for sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment or services or a portion of the Work as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 The Bidder by making a Bid represents that:

§ 2.1.1 The Bidder has read and understands the Bidding Documents or Contract Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, and for other portions of the Project, if any, being bid concurrently or presently under construction.

§ 2.1.2 The Bid is made in compliance with the Bidding Documents.

§ 2.1.3 The Bidder has visited the site, become familiar with local conditions under which the Work is to be performed and has correlated the Bidder's personal observations with the requirements of the proposed Contract Documents.

§ 2.1.4 The Bid is based upon the materials, equipment and systems required by the Bidding Documents without exception.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 COPIES

§ 3.1.1 Bidders may obtain complete sets of the Bidding Documents from the issuing office designated in the Advertisement or Invitation to Bid in the number and for the deposit sum, if any, stated therein. The deposit will be refunded to Bidders who submit a bona fide Bid and return the Bidding Documents in good condition within ten days after receipt of Bids. The cost of replacement of missing or damaged documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the Bidding Documents and the Bidder's deposit will be refunded.

§ 3.1.2 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the Advertisement or Invitation to Bid, or in supplementary instructions to bidders.

§ 3.1.3 Bidders shall use complete sets of Bidding Documents in preparing Bids; neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

§ 3.1.4 The Owner and Architect may make copies of the Bidding Documents available on the above terms for the purpose of obtaining Bids on the Work. No license or grant of use is conferred by issuance of copies of the Bidding Documents.

§ 3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

§ 3.2.1 The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions, and shall at once report to the Architect errors, inconsistencies or ambiguities discovered.

§ 3.2.2 Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request which shall reach the Architect at least seven days prior to the date for receipt of Bids.

§ 3.2.3 Interpretations, corrections and changes of the Bidding Documents will be made by Addendum. Interpretations, corrections and changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon them.

§ 3.3 SUBSTITUTIONS

§ 3.3.1 The materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.

§ 3.3.2 No substitution will be considered prior to receipt of Bids unless written request for approval has been received by the Architect at least ten days prior to the date for receipt of Bids. Such requests shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the Work, including changes in the work of other contracts that incorporation of the proposed substitution would require, shall be included. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.3 If the Architect approves a proposed substitution prior to receipt of Bids, such approval will be set forth in an Addendum. Bidders shall not rely upon approvals made in any other manner.

§ 3.3.4 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.4 ADDENDA

§ 3.4.1 Addenda will be transmitted to all who are known by the issuing office to have received a complete set of Bidding Documents.

§ 3.4.2 Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.

§ 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Each Bidder shall ascertain prior to submitting a Bid that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 PREPARATION OF BIDS

§ 4.1.1 Bids shall be submitted on the forms included with the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and figures. In case of discrepancy, the amount written in words shall govern.

§ 4.1.4 Interlineations, alterations and erasures must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change."

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall make no additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name of the Bidder and the nature of legal form of the Bidder. The Bidder shall provide evidence of legal authority to perform within the jurisdiction of the Work. Each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

§ 4.2 BID SECURITY

§ 4.2.1 Each Bid shall be accompanied by a bid security in the form and amount required if so stipulated in the Instructions to Bidders. The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and will, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. The amount of the bid security shall not be forfeited to the Owner in the event the Owner fails to comply with Section 6.2.

§ 4.2.2 If a surety bond is required, it shall be written on AIA Document A310, Bid Bond, unless otherwise provided in the Bidding Documents, and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney.

§ 4.2.3 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until either (a) the Contract has been executed and bonds, if required, have been furnished, or (b) the specified time has elapsed so that Bids may be withdrawn or (c) all Bids have been rejected.

§ 4.3 SUBMISSION OF BIDS

§ 4.3.1 All copies of the Bid, the bid security, if any, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.2 Bids shall be deposited at the designated location prior to the time and date for receipt of Bids. Bids received after the time and date for receipt of Bids will be returned unopened.

§ 4.3.3 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.4 Oral, telephonic, telegraphic, facsimile or other electronically transmitted bids will not be considered.

§ 4.4 MODIFICATION OR WITHDRAWAL OF BID

§ 4.4.1 A Bid may not be modified, withdrawn or canceled by the Bidder during the stipulated time period following the time and date designated for the receipt of Bids, and each Bidder so agrees in submitting a Bid.

§ 4.4.2 Prior to the time and date designated for receipt of Bids, a Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the

signature of the Bidder. Written confirmation over the signature of the Bidder shall be received, and date- and time-stamped by the receiving party on or before the date and time set for receipt of Bids. A change shall be so worded as not to reveal the amount of the original Bid.

§ 4.4.3 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders.

§ 4.4.4 Bid security, if required, shall be in an amount sufficient for the Bid as resubmitted.

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 OPENING OF BIDS

At the discretion of the Owner, if stipulated in the Advertisement or Invitation to Bid, the properly identified Bids received on time will be publicly opened and will be read aloud. An abstract of the Bids may be made available to Bidders.

§ 5.2 REJECTION OF BIDS

The Owner shall have the right to reject any or all Bids. A Bid not accompanied by a required bid security or by other data required by the Bidding Documents, or a Bid which is in any way incomplete or irregular is subject to rejection.

§ 5.3 ACCEPTANCE OF BID (AWARD)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest qualified Bidder provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's own best interests.

§ 5.3.2 The Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the low Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 CONTRACTOR'S QUALIFICATION STATEMENT

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request, a properly executed AIA Document A305, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted as a prerequisite to the issuance of Bidding Documents.

§ 6.2 OWNER'S FINANCIAL CAPABILITY

The Owner shall, at the request of the Bidder to whom award of a Contract is under consideration and no later than seven days prior to the expiration of the time for withdrawal of Bids, furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. Unless such reasonable evidence is furnished, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 SUBMITTALS

§ 6.3.1 The Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, after notification of selection for the award of a Contract, furnish to the Owner through the Architect in writing:

.1 a designation of the Work to be performed with the Bidder's own forces;

.2 names of the manufacturers, products, and the suppliers of principal items or systems of materials and equipment proposed for the Work; and

.3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder in writing if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, (1)

withdraw the Bid or (2) submit an acceptable substitute person or entity with an adjustment in the Base Bid or Alternate Bid to cover the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 BOND REQUIREMENTS

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Bonds may be secured through the Bidder's usual sources.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 If the Owner requires that bonds be secured from other than the Bidder's usual sources, changes in cost will be adjusted as provided in the Contract Documents.

§ 7.2 TIME OF DELIVERY AND FORM OF BONDS

§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to be commenced prior thereto in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond. Both bonds shall be written in the amount of the Contract Sum.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

ARTICLE 8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment Is a Stipulated Sum.

SPECIAL INSTRUCTIONS TO BIDDERS

1.00 The following are Special Instructions to Bidders and supplement the Instructions to Bidders.

1.01 General Contractors are encouraged to utilize as many sub-contractors and purchase as many materials from within Cherokee County as possible.

1.02 EXAMINATION OF BID DOCUMENTS & THE SITE OF THE WORK: A Pre-Bid Conference will be conducted **at the Project Site on Monday, April 22th at 10:00 a.m.** All General Contractors expecting to submit a bid shall have a knowledgeable representative at this meeting. Attendance is mandatory.

1.03 PREPARATION & DELIVERY OF BIDS: The Contractor's Base Bid and all Alternate Bids submitted on the Proposal Form **shall include** the costs of all required taxes including sales and use taxes. The City of Centre is not a Tax-Exempt Entity.

1.04 CONSIDERATION OF BIDS: The successful bidder shall furnish to the Architect a written LIST OF SUBCONTRACTORS within 24 hours of the date and closing time set for the receipt of bids.

END OF SPECIAL INSTRUCTIONS

BID FORM

1. The undersigned, having examined the proposed Contract Documents titled:

A NEW CITY HALL
and
MUNICIPAL OFFICE FACILITY
for the
CITY of CENTRE, ALABAMA
350 E. Main Street

and having visited the site and examined the conditions affecting the Work, hereby proposes and agrees to furnish all labor, materials, equipment and appliances, and to perform operations necessary to complete the Work as required by said proposed Contract Documents, for the stipulated sum of:

(A) BASE BID: _____

_____ DOLLARS ($ _____)

(B) ADDITIVE ALTERNATE:

Alternate No. 1 – Mobile High Density File System: ADD $ _____

The above-stipulated sum is for the work as indicated on the Contract Documents and identified in the "Bid Quantities" below. In the event the estimated quantities of the Work are increased or decreased to meet unforeseen requirements, the Unit Prices associated with each Bid Quantity are given as a price per unit of measure for materials, labor or services to be added to or deducted from the Contract Sum by Change Order. Unit prices shall include all overhead and profit.

UNIT PRICE #1 – UNSUITABLE SOILS (SPOILS) DISPOSAL: This bid item shall apply to all material required to be cut to meet grade and required to be removed due to poor material as determined by the Engineer. Contractor shall load, haul and dispose of off-site. Basis of payment shall be per cubic yard of spoil material based on a loose truck load measurement.

BID QUANTITY TO BE INCLUDED IN BASE BID (10,300 CY) UNIT PRICE $ _____ /CY

UNIT PRICE #2 – FILL MATERIAL: This bid item shall apply to chert (engineered fill) to be placed on-site to replace removed unsuitable soils (spoils) material and as required to meet the design subgrade. Basis of payment shall be per cubic yard of fill material based on a loose truck load measurement.

BID QUANTITY TO BE INCLUDED IN BASE BID (8,900 CY) UNIT PRICE $ _____ /CY

UNIT PRICE #3 - TOPSOIL: On-site topsoil shall be stockpiled and used to cover all areas required to receive sod or grass. Topsoil shall be brought on-site only when, in the opinion of the Engineer, the topsoil on-site is not sufficient. Basis of payment shall be per cubic yard of topsoil based on a loose truck load measurement.

BID QUANTITY TO BE INCLUDED IN BASE BID (1,100 CY) UNIT PRICE $ _____ /CY

CERTIFICATIONS: The undersigned understands and agrees to comply with and be bound by Instructions to Bidders issued for this Work. The undersigned certifies that he is authorized to execute contracts on behalf of the Bidder as legally named, that this proposal is submitted in good faith without fraud or collusion with any other Bidder, that the data indicated below is true and completed, and that the bid is made in good faith and in full accord with State law. Notice of acceptance may be sent to the undersigned at the address set forth below.

The undersigned acknowledges receipt of Addenda numbers:

_____

Enclosed with this bid is bid security in the amount of not less than 5% of the Bidder's proposed contract sum.

BIDDER:

_____

By _____

CORPORATE Address _____

_____

SEAL License Number _____

License Type _____

Bid dated this _____ day of _____, 2024

AIA® Document A310™ – 2010

Bid Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

OWNER:
(Name, legal status and address)

BOND AMOUNT: $

PROJECT:
(Name, location or address, and Project number, if any)
"DRAFT"

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this day of ,

	(Contractor as Principal) *(Seal)*
(Witness)	*(Title)*
	(Surety) *(Seal)*
(Witness)	*(Title)*

PART I - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

1.01 AIA DOCUMENT A201 - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, 2017 Edition, as published by the American Institute of Architects, hereinafter referred to as the "AIA General Conditions" or the "General Conditions", is hereby made a part of these Contract Documents, as fully as if here set forth entirely.

1.02 A copy for the personal use of any contractor preparing a bid for this Project may be obtained from the Architect at no cost.

1.03 These General Conditions apply to Work under all Sections of this Project Manual

END

SPECIAL CONDITIONS TO GENERAL CONDITIONS OF THE CONTRACT

1.01 **CONSTRUCTION DURATION:** The Contractor shall commence the Work on or before the date established in the written Notice to Proceed, and shall complete the Work within **Four Hundred Eighty (480) consecutive calendar days thereafter.**

1.02 **LIQUIDATED DAMAGES** for which the Contractor and its Surety (if any) shall be liable and may be required to pay the Owner in accordance with the Contract Documents shall be equal to six percent interest per annum on the total Contract Sum.

END OF SECTION

SUPPLEMENTARY GENERAL CONDITIONS

1. The following supplements modify, change, delete from, or add to the General Conditions of the Contract for Construction," AIA Document A201, 2017 Edition. Where any Article of the General Conditions is modified, or any Paragraph, Subparagraph, or Clause thereof is modified or deleted by these Supplementary Conditions, the unaltered provisions of that Article, Paragraph, Subparagraph, or Clause shall remain in effect.

2. **ARTICLE 1: GENERAL PROVISIONS:**

1.1.8 The term "product" includes material, systems, and equipment.

1.1.9 The term "provide" includes furnishing and installing a product, complete in place, operating, tested, and approved.

1.1.10 The term "building code" and the term "code", refer to regulations of governmental agencies having jurisdiction.

1.1.11 The terms "approved", "required", and "as directed" refer to and indicate the work or materials that may be approved, required, or directed by the Architect acting as the agent of the Owner.

1.1.12 The term "similar" means in its general sense and not necessarily identical.

1.1.13 The terms "shown", "indicated", "detailed", "noted", "scheduled" and terms of similar import, refer to requirements contained in the Contract Documents.

3. **ARTICLE 2: OWNER:**

A. Subparagraph 2.2.5: Delete in its entirety and insert the following in lieu thereof:

2.2.5 The Contractor will be furnished by the Architect, free of charge, five copies of prints of Drawings and Project Manual. The Contractor may secure additional copies of prints of Drawings and Project Manual from the Architect at the Architect's usual charge for reproduction and handling.

4. **ARTICLE 3: CONTRACTOR:**

A. At the end of subparagraph 3.4.1, add the following:

"Testing": The Owner shall pay for all construction and materials testing required in the Specifications except specifically identified as the Contractor's responsibility.

B. At the end of subparagraph 3.7.1, add:

The Owner will submit Drawings and Specifications to the appropriate public authorities for approval. The Owner will pay all fees for plan checking.

C. At the end of paragraph 3.12, add the following:

3.12.11 After the Contract has been executed, the Owner and Architect will consider a formal request for the substitution of products in place of those specified, under the following conditions:

(a) The request is accompanied by complete data on the proposed substitution substantiating compliance with the Contract Documents including product identification and description, performance and test data, references and samples where applicable, and an itemized comparison of the proposed substitution with the products specified or named by Addenda, with data relating to Contract Time Schedule, Design and Artistic effect where applicable, and its relationship to separate contracts.

(b) The request is accompanied by accurate cost data on the proposed substitution in comparison with the product specified, whether or not modification of the Contract Sum is to be a consideration.

3.12.12 Request for substitution based on Clause 3.12.11 above, when forwarded by the Contractor to the Architect, are understood to mean that the Contractor:

(a) represents that he has personally investigated the proposed substitute product and determined that it is equal to superior in all respects to that specified.

(b) will provide the same guarantee for the substitution that he would for that specified.

(c) certifies that the cost data presented is complete and includes all related costs under this Contract, but excludes costs under separate contracts and the Architect's redesign costs, and that he waives all claims for additional costs related to the substitution which subsequently become apparent and,

(d) will coordinate the installation of the accepted substitute, making such changes as may be required for the work to be complete in all respects.

3.12.13 Substitution will not be considered if:

(a) they are indicated or implied on shop drawings submissions without the formal request required in Clause 3.12.11 above or,

(b) for their implementation they require a substantial revision of the Contract documents in order to accommodate their use.

3.12.14 Unless otherwise specified, the number of shop drawings and the number of samples which the Contractor shall submit and, if necessary, resubmit, is the number that the Contractor requires to be returned plus 2 copies which will be retained by the Architect.

5. **ARTICLE 8: TIME:**

A. At Paragraph 8.1, Definitions, add the following:

8.1.5 **CONTRACT TIME: FOUR HUNDRED EIGHTY (480) CONSECUTIVE CALENDAR DAYS**, from the date of the Notice to Proceed, issued by the Owner.

6. **ARTICLE 9: PAYMENTS AND COMPLETION:**

A. At subparagraph 9.2.1 add the following sentence:

The schedule of values shall be prepared in such a manner that each major item of Work and each subcontracted item of Work is shown as a single line item of AIA Document G702A, Application and Certificate for Payment, Continuation Sheet.

B. At subparagraph 9.3.1 add the following sentences:

(a) The form of Application for Payment shall be AIA Document G702, Application and Certification for Payment supported by AIA Document G702A, Continuation Sheet.

(b) Until final acceptance of the Work, the Owner will pay Ninety (90) Percent of the amount due on account of progress payments.

C. Add the following subparagraph:

9.8.4 Liquidated Damages

The owner will suffer financial loss if the Project is not substantially complete on the date set forth in the Contract Documents. The Contractor (and his surety) shall be liable for and shall pay to the Owner the sums hereinafter stipulated as agreed and liquidated damages for each calendar day of delay until the work is Substantially Complete: SIX PERCENT INTEREST (6%) PER ANNUM OF THE TOTAL CONTRACT PRICE.

7. **ARTICLE 11: INSURANCE AND BONDS:** Delete Article 11 in its entirety and substitute therefore, the following:

A. Article 11: INDEMNIFICATION AGREEMENT, delete Article 31 in its entirely and substitute the following:

1. To the fullest extent permitted by law, the Contractor shall defend, indemnify, and hold harmless the Owner, Architect, Architect's consultants, and their agents, employees, and consultants (hereinafter collectively referred to as the "Indemnitees") from and against all claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of, related to, or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property, including loss of use resulting therefrom, and is caused in whole or in part by negligent acts or omissions of the Contractor, a Subcontractor, anyone directly employed by them, or anyone for whose acts they may be liable, regardless of whether such claim, damage, loss or expense is caused in part, or is alleged established to have been caused in whole or in part by the negligence or other fault of a part indemnified hereunder.
   A. This indemnification shall extent to all claims, damages, losses and expenses for injury or damage to adjacent or neighboring property, or persons injured thereon, that arise out of, relate to, or result from performance of the work.
   B. This indemnification does not extend to the liability of the Architect, or the Architect's Consultants, agents, or employees, arising out of (1) the preparation or approval of maps, shop drawings, opinions, reports, surveys, field orders, change orders, drawings or specifications, or (2) the giving of or the failure to give directions or instructions, provided such giving or failure to give instructions if the primary cause of the injury or damage.
   C. This indemnification does not apply to the extent of the sole negligence of the indemnitees.

B. Article 11: CONTRACTOR'S AND SUBCONTRACTORS' INSURANCE, delete Article 11 in its entirety and substitute the following:

A. <u>GENERAL</u>

(1) RESPONSIBILITY. The Contractor shall be responsible to the Owner from the time of the signing of the Construction Contract or from the beginning of the first work, whichever shall be earlier, for all injury or damage of any kind resulting from any negligent act or omission or breach, failure or other default regarding the work by the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of who may be the Owner of the property.

(2) INSURANCE PROVIDERS. Each of the insurance coverages required below shall be issued by an insurer licensed by the Insurance Commissioner to transact the business of insurance in the State of Alabama for the applicable line of insurance, and such insurer (or, for qualified self-insureds or group self-insured, a specific excess insurer providing statutory limits) must have a Best Policyholders Rating of "A-" or better and a financial size rating of Class V or larger.

(3) NOTIFICATION ENDORSEMENT. Each policy shall be endorsed to provide that the insurance company agrees that the policy shall not be canceled, changed, allowed to lapse or allowed to expire for any reason until thirty days after the Owner has received written notice by certified mail as evidenced by return receipt or until such time as other insurance coverage providing protection equal to protection called for in the Contract Documents shall have been received, accepted and acknowledged by the Owner. Such notice shall be valid only as to the Project as shall have been designated by Project Name and Number in said notice.

(4) **INSURANCE CERTIFICATES.** The Contractor shall procure the insurance coverages identified below, or as otherwise required in the Contract Documents, at the Contractor's own expense, and to evidence that such insurance coverages are in effect, the Contractor shall furnish the Owner an insurance certificate(s) acceptable to the Owner and listing the Owner as the certificate holder. The insurance certificate(s) must be delivered to the Owner with the Construction Contract and Bonds for final approval and execution of the Construction Contract. The insurance certificate must provide the following:

(1) Name and address of authorized agent of the insurance company
(2) Name and address of insured
(3) Name of insurance company or companies
(4) Description of policies
(5) Policy Number(s)
(6) Policy Period(s)
(7) Limits of liability
(8) Name and address of Owner as certificate holder.
(9) Project Name and Number, if any
(10) Signature of authorized agent of the insurance company
(11) Telephone number of authorized agents of the insurance company
(12) **Mandatory thirty-day notice of cancellation/non-renewal/change**.

(5) MAXIMUM DEDUCTIBLE. Self-insured retention, except for qualified self-insurers or group self-insurers, in any policy shall not exceed $25,000.00

B. INSURANCE COVERAGES Unless otherwise provided in the Contract Documents, the Contractor shall purchase the types of insurance coverages with liability limits not less than as follows:

(1) WORKERS' COMPENSATION AND EMPLOYER'S LIABILITY INSURANCE

(a) Workers' Compensation coverage shall be provided in accordance with the statutory coverage required in Alabama. A group insurer must submit a certificate of authority from the Alabama Department of Industrial Relations approving the group insurance plan. A self-insurer must submit a certificate from the Alabama Department of Industrial Relations stating the Contractor qualifies to pay its own worker's compensation claims.

(2) Employer's Liability Insurance limits shall be at least:

.1 Bodily Injury by Accident - $1,000,000 each accident
.2 Bodily Injury by Disease - $1,000,000 each employee

(2) COMMERCIAL GENERAL LIABILITY INSURANCE

(a) Commercial General Liability Insurance, written on an ISO Occurrence Form (current edition as of the date of Invitation for Bids) or equivalent, shall include, but need not be limited to, coverage for bodily injury and property damage arising from premises and operations liability, products and completed operations liability, blasting and explosion, collapse of structures, underground damage, personal injury liability and contractual liability. The commercial General Liability Insurance shall provide at minimum the following limits:

	Coverage	Limit
.1	General Aggregate	$2,000,000.00 per Project
.2	Products, Completed operations Aggregate	$2,000,000.00 per Project
.3	Personal and Advertising Injury	$1,000,000.00 per Occurrence
.4	Each Occurrence	$1,000,000.00

(b) Additional Requirements for Commercial General Liability Insurance:

.1 The Policy shall name the Owner, Architect, and their agents, consultants and employees as additional insureds, state that this coverage shall be primary insurance for the additional insureds; and contain no exclusions of the additional insureds relative to job accidents.

.2 The Policy must include separate per project aggregate limits.

(3) COMMERCIAL BUSINESS AUTOMOBILE LIABILITY INSURANCE

(a) Commercial Business Automobile Liability Insurance which shall include coverage for bodily injury and property damage arising from the operation of any owned, non-owned or hired automobile. The Commercial Business Automobile Liability Insurance Policy shall provide not less than $1,000,000 Combined Single Limits for each occurrence.

(b) The Policy shall name the Owner, Architect and their agents, consultants, and employees as additional insured.

(4) COMMERCIAL UMBRELLA LIABILITY INSURANCE

(a) Commercial Umbrella Liability Insurance to provide excess coverage above the Commercial General Liability, Commercial Business Automobile Liability and the Workers' Compensation and Employers' Liability to satisfy the minimum limits set forth herein.

(b) Minimum Combined Primary Commercial General Liability and Commercial/Excess Umbrella Limits of:

.1 $5,000,000 per occurrence

.2 $5,000,000 aggregate

(c) Additional Requirements for Commercial Umbrella Liability Insurance:

.1 The policy shall name the Owner, Architect, and their agents, consultants, and employees as additional insured.

.2 The policy must be on an "occurrence" basis.

(5) BUILDERS RISK INSURANCE

(a) The Builder's Risk Policy shall be made payable to the Owner and Contractor, as their interests may appear. The policy amount shall be equal to 100% of the Contract Sum, written on a Causes of Loss-Special Form (current edition as of the date of Invitation for Bids), or its equivalent. All deductibles shall be sole responsibility of the Contractor.

(b) The policy shall be endorsed as follows:

"The following may occur without diminishing, changing, altering or otherwise affecting the coverage and protection afforded the insured under this policy:

(I) Furniture and equipment may be delivered to the insured premises and installed in place ready for use; or

(II) Partial or complete occupancy by Owner; or

(III) Performance of work in connection with construction operations insured by the Owner, by agents or lessees or other contractors of the Owner, or by contractors of the lessee of the Owner."

C. SUBCONTRACTORS' INSURANCE

(1) WORKERS' COMPENSATION AND EMPLOYER'S LIABILITY INSURANCE. The Contractor shall require each Subcontractor to obtain and maintain Workers' Compensation and Employer's Liability Insurance coverages as described in preceding Paragraph E, or to be covered by the Contractor's Workers' Compensation and Employer's Liability Insurance while performing work

under the Contract.

(2) LIABILITY INSURANCE. The Contractor shall require each Subcontractor to obtain and maintain adequate General Liability, Automobile Liability, and Umbrella Liability Insurance coverages similar to those described in preceding Paragraph E. Such coverage shall be in effect at all times that a Subcontractor is performing work under the Contract.

(3) ENFORCEMENT RESPONSIBILITY. The Contractor shall have responsibility to enforce its Subcontractors' compliance with these or similar insurance requirements; however, the Contractor shall, upon request, provide the Architect or Owner acceptable evidence of insurance for any Subcontractor.

D. TERMINATION OF OBLIGATION TO INSURE: Unless otherwise expressly provided in the Contract Documents, the obligation to insure as provided herein shall continue as follows:

(1) BUILDER'S RISK INSURANCE. The obligation to insure under Subparagraph E (5) shall remain in effect until the Date of Substantial Completion as shall be established in the Certificate of Substantial Completion. In the event that multiple Certificates of Substantial Completion covering designated portions of the work are issued, Builder's Risk coverage shall remain in effect until the Date of Substantial Completion as shall be established in the last issued Certificate of Substantial Completion. However, in the case that the work involves separate buildings, Builder's Risk coverage of each separate building may terminate on the Date of Substantial Completion as established in the Certificate of Substantial Completion issued for each building.

(2) PRODUCTS AND COMPLETED OPERATIONS. The obligation to carry Products and Completed Operations coverage specified under Subparagraph E (2) shall remain in effect for two years after the Date(s) of Substantial Completion.

(3) ALL OTHER INSURANCE. The obligation to carry other insurance coverages specified under Subparagraphs E (1) through E (4) and Paragraph F shall remain in effect after the Date(s) of Substantial Completion until such time as all Work required by the Contract Documents is completed. Equal or similar insurance coverages shall remain in effect, if, after completion of the Work, the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, returns to the Project to perform warranty or maintenance work pursuant to the terms of the Contract Documents.

E. WAIVERS OF SUBROGATION

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors performing construction or operations related to the Project, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by builder's risk insurance or other property insurance applicable to the work or to other property located within or adjacent to the Project, except such rights as they may have to proceeds of such insurance held by the Owner or Contractor as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors, if any, and the subcontractor, sub-subcontractors, suppliers, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The Policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to the person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged. The waivers provided for in this paragraph shall survive final acceptance and continue to apply to insured losses to the Work or other property on or adjacent to the Project.

END OF SUPPLEMENTARY CONDITIONS

PART I – STANDARD FORM of AGREEMENT between OWNER and CONTRACTOR

1.01 AIA DOCUMENT A101 – STANDARD FORM of AGREEMENT between OWNER and CONTRACTOR, 2017 Edition, as published by the American Institute of Architects, hereinafter referred to as the "AIA Construction Contract", is hereby made a part of these Contract Documents, as fully as if here set forth entirely.

1.02 A copy for the personal use of the successful contractor preparing a contract for this Project may be obtained from the Architect at no cost.

END

REQUIRED BY THE STATE OF ALABAMA IMMIGRATION ACT
Act No. 2011-535

"Under penalty of perjury, I _____
PRINT NAME

the undersigned do hereby declare that I am a United States Citizen or that I am a lawfully present alien of the United States of America.

_____
DECLARANT'S SIGNATURE

_____
DATE

AIA® Document A312™ – 2010

Performance Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

OWNER:
(Name, legal status and address)

CONSTRUCTION CONTRACT
Date:
Amount: $
Description:
(Name and location)
"DRAFT"

BOND
Date:
(Not earlier than Construction Contract Date)

Amount: $
Modifications to this Bond: ☐ None ☐ See Section 16

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	

(Any additional signatures appear on the last page of this Performance Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

.1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

.2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

.3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

.2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and

.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 Contractor Default. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:		Name and Title:	
Address:		Address:	

AIA® Document A312™ – 2010

Payment Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

OWNER:
(Name, legal status and address)

CONSTRUCTION CONTRACT
Date:
Amount: $
Description:
(Name and location)
"DRAFT"

BOND
Date:
(Not earlier than Construction Contract Date)

Amount: $
Modifications to this Bond: ☐ None ☐ See Section 18

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:	_____	Signature:	_____
Name and Title:		Name and Title:	

(Any additional signatures appear on the last page of this Payment Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

.2 have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- **.1** the name of the Claimant;
- **.2** the name of the person for whom the labor was done, or materials or equipment furnished;
- **.3** a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- **.4** a brief description of the labor, materials or equipment furnished;
- **.5** the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- **.6** the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- **.7** the total amount of previous payments received by the Claimant; and
- **.8** the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:	_____	Signature:	_____
Name and Title:		Name and Title:	
Address:		Address:	

APPLICATION AND CERTIFICATE FOR PAYMENT *AIA DOCUMENT G702* (Instructions on reverse side) PAGE ONE OF PAGES

TO (OWNER):

PROJECT:

APPLICATION NO:

Distribution to:
☐ OWNER
☐ ARCHITECT
☐ CONTRACTOR

PERIOD TO:

FROM (CONTRACTOR):

VIA (ARCHITECT):

ARCHITECT'S PROJECT NO: ☐

CONTRACT FOR:

CONTRACT DATE:

CONTRACTOR'S APPLICATION FOR PAYMENT

CHANGE ORDER SUMMARY			
Change Orders approved in previous months by Owner TOTAL		ADDITIONS	DEDUCTIONS
Approved this Month			
Number	Date Approved		
TOTALS			
Net change by Change Orders			

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

Application is made for Payment, as shown below, in connection with the Contract. **Continuation Sheet, AIA Document G703,** is attached.

1. **ORIGINAL CONTRACT SUM** ..... $ _____
2. **Net change by Change Orders** ..... $ _____
3. **CONTRACT SUM TO DATE** (Line 1 ± 2) ..... $ _____
4. **TOTAL COMPLETED & STORED TO DATE** ..... $ _____
   (Column G on G703)
5. **RETAINAGE:**
   a. ____ % of Completed Work $ _____
   (Column D + E on G703)
   b. ____ % of Stored Material $ _____
   (Column F on G703)
   Total Retainage (Line 5a + 5b or Total in Column I of G703) ..... $ _____
6. **TOTAL EARNED LESS RETAINAGE** ..... $ _____
   (Line 4 less Line 5 Total)
7. **LESS PREVIOUS CERTIFICATES FOR PAYMENT** (Line 6 from prior Certificate) ..... $ _____
8. **CURRENT PAYMENT DUE** ..... $ _____
9. **BALANCE TO FINISH, PLUS RETAINAGE** ..... $ _____
   (Line 3 less Line 6)

State of: County of:
Subscribed and sworn to before me this day of ,19
Notary Public:
My Commission expires:

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising the above application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED ..... $ _____
(Attach explanation if amount certified differs from the amount applied for.)
ARCHITECT:

By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

CONTINUATION SHEET

AIA DOCUMENT G703 (Instructions on reverse side) PAGE OF PAGES

AIA Document G702, APPLICATION AND CERTIFICATE FOR PAYMENT, containing Contractor's signed Certification is attached.

In tabulations below, amounts are stated to the nearest dollar.

Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NUMBER:
APPLICATION DATE:
PERIOD TO:
ARCHITECT'S PROJECT NO:

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D + E + F)	% (G ÷ C)	BALANCE TO FINISH (C − G)	RETAINAGE
			FROM PREVIOUS APPLICATION (D + E)	THIS PERIOD					

INVENTORY OF STORED MATERIALS

Project: _____

Contractor:

For Estimate No. _____

For Period Ending _____

Project No. _____

A	B	C	D	E	F
DESCRIPTION	MATERIALS STORED LAST PERIOD	PURCHASED THIS PERIOD	TOTAL COLUMNS B + C	MATERIALS USED THIS PERIOD	MATERIALS PRESENTLY STORED

To be used as documentation to support value of Stored Materials reported on APPLICATION AND CERTIFICATE FOR PAYMENT.

PROGRESS SCHEDULE AND REPORT	CONTRACTOR:	DATE OF REPORT
PROJECT		PROCEED DATE
	ARCHITECT:	PROJECTED COMPLETION DATE

WORK DIVISION	%	AMOUNT													
1. GENERAL REQUIREMENTS															
2. SITEWORK															
3. CONCRETE															
4. MASONRY															
5. METALS															
6. WOOD AND PLASTIC															
7. THERMAL AND MOISTURE PROTECTION															
8. DOORS AND WINDOWS															
9. FINISHES															
10. SPECIALTIES															
11. EQUIPMENT															
12. FURNISHINGS															
13. SPECIAL CONSTRUCTION															
14. CONVEYING SYSTEMS															
15. MECHANICAL															
16. ELECTRICAL															
TOTAL ORIG. CONTRACT	100%														
ANTICIPATED DRAW IN $1,000															
ACTUAL DRAW IN $1,000															

100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%

LEGEND: ANTICIPATED ACTIVITY ACTUAL ACTIVITY ANTICIPATED CASH FLOW ACTUAL CASH FLOW

USE ADDITIONAL SHEETS IF JOB IS SCHEDULED MORE THAN 12 MONTHS

PRIOR APPROVAL

1. **SUBSTITUTIONS**: Prior approval shall be required for proposed substitutions for equals to items as specified in these Specifications. Bidders shall submit written requests at least ten (10) calendar days before the opening of bids for general contract. Requests received after this time shall not be considered. Request shall clearly describe the product for which approval is asked, including all data necessary to demonstrate acceptability. Base request shall also include a confirmation that product will be ready for delivery to job site in accordance with the need of general contractor or sub-contractors. If the substitution is acceptable, the Architect shall approve the product in an Addendum.

2. **SUBMISSION**: Following is a form to be used for submission of request to Architect for approval of substitutes and/or unspecified products. Submission shall be made on bidder's letterhead and submitted to Architect. Make separate submission for each substitute item.

REQUEST FOR PRIOR APPROVAL OF SUBSTITUTE

Project No. **2022-06**

Title: **A NEW CITY HALL**
and
MUNICIPAL OFFICE FACILITY
for the
CITY of CENTRE, ALABAMA
350 E. Main Street

Location: **Centre, Alabama 35960**

Bidders License No. _____(If applicable)

Specifications or Drawings Reference: Section No. _____ Page No. _____

Paragraph _____ Drawing No. _____

Specified Item: _____

Submitted Item: _____

List of three installations:

1. _____

2. _____

3. _____

(Give Project Name and Location) _____

_____

State differences between specified item and submitted item, if any:

_____

_____

_____

Signed: _____ Date: _____

END

ASBESTOS-FREE CERTIFICATION

PROJECT

A NEW CITY HALL
and
MUNICIPAL OFFICE FACILITY
for the
CITY of CENTRE, ALABAMA
350 E. Main Street

Upon completion of this construction provide three (3) original copies of this form transmitting two (2) directly to the Owner by certified mail and one (1) to the Project Architect. This action shall be taken prior to request for final payment.

I, _____

_ hereby certify that the construction known as _____

_____

_____

_____

does not contain friable or non-friable asbestos and that any removal and/ or abatement conducted during this project was done so in accordance with all required ordinances, regulations and mandates as required by law.

Contractor _____

Principal Officer (signature) _____

Principal Officer (typed name and title) _____

Sworn and subscribed before me this _____day of _____, 20____.

_____ L.S.

My Commission expires _____

FORM OF ADVERTISEMENT OF COMPLETION

LEGAL NOTICE

In accordance with Chapter 1, Title 39, Code of Alabama, 1975, notice is hereby given that

_____
(Contractor)

Contractor, has completed the Contract for Construction of

A NEW CITY HALL
and
MUNICIPAL OFFICE FACILITY
for the
CITY of CENTRE, ALABAMA
350 E. Main Street

at _____
(Insert location in County or City)

for the City of Centre, Alabama, 100 Park Street, Centre, Alabama, Owner, and have made request for final settlement of said Contract. All persons having any claim for labor, materials, or otherwise in connection with this project should immediately notify:

Thomas M. McElrath, Architect, 717 Merit Springs Road, Gadsden, Alabama 35901
(Architect)

_____
(Contractor)

_____
(Business Address)

Note: This notice must be run once a week for four (4) successive weeks or, for projects of less than $20,000.00, run one (1) time only. Proof of publication is required.

TITLE SHEET

CIVIL

SURVEY

C1.0	OF	12	BOUNDARY SURVEY
C2.0	OF	12	TOPOGRAPHIC SURVEY
C3.0	OF	12	DEMOLITION PLAN
C4.0	OF	12	SITE GRADING AND STORM DRAINAGE PLAN #1
C5.0	OF	12	SITE GRADING AND STORM DRAINAGE PLAN #2
C6.0	OF	12	UTILITY PLAN
C7.0	OF	12	PAVING PLAN
C8.0	OF	12	EROSION CONTROL PLAN #1
C9.0	OF	12	EROSION CONTROL PLAN #2
C10.0	OF	12	MISCELLANEOUS DETAILS
C11.0	OF	12	MISCELLANEOUS DETAILS
C12.0	OF	12	EROSION CONTROL NOTES AND DETAILS

ARCHITECTURAL

A2.0	OF	20	LIFE SAFETY PLAN
A2.1	OF	20	ARCHITECTURAL NOTES-FLOOR PLAN
A2.2	OF	20	DIMENSIONS-FLOOR PLAN
A2.3	OF	20	REFLECTED CEILING PLAN
A3.0	OF	20	SCHEDULES AND DETAILS-SHEET ONE
A3.1	OF	20	SCHEDULES AND DETAILS-SHEET TWO
A4.0	OF	20	ELEVATIONS
A5.0	OF	20	ROOF PLAN
A5.1	OF	20	ROOF DETAILS
A5.2	OF	20	CANOPY DETAILS
A6.0	OF	20	CROSS SECTIONS-SHEET ONE
A6.1	OF	20	CROSS SECTIONS-SHEET TWO
A7.0	OF	20	WALL SECTIONS – SHEET ONE
A7.1	OF	20	WALL SECTIONS – SHEET TWO
A7.2	OF	20	WALL SECTIONS – SHEET THREE
A8.0	OF	20	SECTIONS AND DETAILS
A8.1	OF	20	LARGE SCALE TOILET PLANS, ELEVATIONS AND SECTIONS
A9.0	OF	20	CASEWORK SCHEDULE, SIGNAGE AND FULL SIZE DETAILS
A9.1	OF	20	MILLWORK AND CASEWORK ELEVATIONS
A9.2	OF	20	LARGE SCALE DAIS PLAN AND DETAILS

STRUCTURAL

S1.0	OF	07	GENERAL NOTES
S1.1	OF	07	TYPICAL DETAILS
S2.0	OF	07	TYPICAL DETAILS
S2.1	OF	07	FOUNDATION & FLOOR & MECHANICAL MEZZANINE FRAMING PLANS
S2.2	OF	07	ROOF FRAMING PLAN
S3.0	OF	07	BRACED BAYS & TYPICAL DETAILS
S7.0	OF	07	SECTIONS

PLUMBING

FP0.1	OF	06	FIRE PROTECTION-SCHEDULES AND DETAILS
FP1.1	OF	06	FIRE PROTECTION-FLOOR PLAN
P0.1	OF	06	PLUMBING-SCHEDULES, NOTES AND DETAILS
P1.1	OF	06	NON-PRESSURE FLOOR PLANS & SANITARY RISER
P2.1	OF	06	PRESSURE FLOOR PLANS & PRESSURE RISER
P3.1	OF	06	NATURAL GAS RISER

MECHANICAL

M0.1	OF	06	MECHANICAL LEGEND AND SCHEDULES
M0.2	OF	06	MECHANICAL EQUIPMENT SCHEDULES
M0.3	OF	06	MECHANICAL DETAILS & CONTROLS
M0.4	OF	06	MECHANICAL DETAILS
M1.1	OF	09	HVAC-FLOOR PLANS
M1.2	OF	09	PIPING-FLOOR PLANS

ELECTRICAL

E1.0	OF	10	SITE PLAN-ELECTRICAL DEMOLITION
E1.1	OF	10	SITE PLAN-ELECTRICAL
E2.0	OF	10	ELECTRICAL LEGEND AND SCHEDULES
E3.1	OF	10	ELECTRICAL DETAILS-1
E3.2	OF	10	AUXILIARY DETAILS-1
E3.3	OF	10	AUXILIARY DETAILS-2
E4.0	OF	10	SINGLE LINE DIAGRAM
E4.1	OF	10	FLOOR PLAN-LIGHTING
E4.2	OF	10	FLOOR PLAN-POWER
E4.3	OF	10	M&P EQUIPMENT CONNECTIONS

END OF SCHEDULE OF DRAWINGS

SECTION 01020 - ALLOWANCES

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements governing the handling and processing of allowances.

(1) Types of Allowances required include the following:

(a) **LUMP SUM ALLOWANCES**

(2) Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. Additional requirements, if necessary, will be issued by Change Order.

B. At Project Close-out, credit any unused amounts remaining in each Allowance to the Owner by Change Order. Approved amounts in excess of the Allowance will be added by Change Order.

(1) Any credits or additions to the Contract Sum will be calculated using the Contractor's Unit Prices, as quoted on the Bid Form.

C. Related Sections:

(1) BID FORM, for Unit Prices to be included in the bid.
(2) Section 01026 "Unit Prices" for administrative and procedural requirements for unit prices.
(3) Section 01400 "Quality Control Services" for administrative and procedural requirements for quality control services.

1.03 SELECTION AND PURCHASE

A. At the earliest feasible date after Contract award, advise the Architect of the date when the final selection and purchase of each product or system described by an allowance must be completed in order to avoid delay in performance of the work.

1.04 SUBMITTALS

A. When requested by the Architect, obtain proposals for each Allowance for use in making final decisions; include recommendations that are relevant to performance of the Work.

B. Submit invoices to indicate actual quantities of materials or services provided, in fulfillment of each Allowance.

PART 2 - PRODUCTS (not used)

PART 3 – EXECUTION

3.01 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance items is completely integrated and interfaced with related construction activities, including coordination required for phased construction.

3.02 SCHEDULE OF ALLOWANCES

ALLOWANCE NO. 1 – NEW GABLE WALL CLOCK AND MECHANISM, as follows:

Include in the Base Bid a lump sum amount of **$7,500.00** dollars to cover furnishing, shipping and installation of a fully functional +/- 3' diameter "Skeleton Dial Clock" equal to that as manufactured by Americlock, Inc., St. Louis, Missouri. Clock will be mounted on Main Front Gable as shown on elevations. Final clock style will be as selected by the Owner from manufacturer's available products.

ALLOWANCE NO. 2 – TYPE PD1 LIGHT FIXTURE AS SHOWN ON ELECTRICAL, as follows:

Include in the Base Bid a lump sum amount of **$2,500.00** dollars per fixture for each of the two PD1 fixture as indicated on the electrical Floor Plan-Lighting

END OF SECTION 01020

SECTION 01026 - UNIT PRICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and other Division 1 Specification sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements for unit prices.

(1) A unit price is an amount proposed by Bidders and stated on the Bid Form as a price per unit of measurement for materials or services that will be added to or deducted from the Contract Sum by Change Order in the event the estimated quantities of Work required by the Contract Documents are increased or decreased.

(2) Refer to the individual Specification Sections for construction activities requiring the establishment of unit prices.

B. Schedule: A "Unit Price Schedule" is included on the Bid Form. Specification Sections contain requirements for materials and methods described under each unit price.

(1) The Owner reserves the right to reject the Contractor's measurement of work-in-place that involves use of established unit prices, and to have this Work measured by an independent surveyor acceptable to the Contractor at the Owner's expense.

PART 2 - PRODUCTS (not applicable)

PART 3 - EXECUTION

3.01 UNIT PRICE SCHEDULE

A. SEE BID FORM

END OF SECTION 01026

SECTION 01030 - ALTERNATES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and other part 1 Specification sections, apply to this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements for Additive Alternates.

B. Determination of Low Bidder by use of Alternates:
(1) See Article 5 of the Instructions to Bidders.

C. Definition: A Proposal Additive Alternate is an amount proposed by Bidders and stated on the Form for certain construction activities defined in the Bidding Requirements that may be added to Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems or installation methods described in Contract Documents.

D. Coordination: Coordinate related Work and modify or adjust adjacent Work as necessary to ensure that Work affected by each accepted Alternate is complete and fully integrated into the project.

E. Notification: Immediately following the award of the Contract, prepare and distribute to each party involved, notification of the status of each Alternate. Indicate whether Alternates have been accepted, rejected or deferred for consideration at a later date. Include a complete description of negotiated modifications to Alternates.

F. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials and methods necessary to achieve the Work described under each Alternate.

PART 2 - PRODUCTS (not applicable)

PART 3 - EXECUTION

3.01 SCHEDULE OF ALTERNATES

A. **ADDITIVE ALTERNATE NO. 1 – MECHANICAL ASSIST HIGH-DENSITY MOBILE STORAGE SYSTEM**, as follows:
(1) Provide and install complete Mobile High Density File Storage System as indicated on the Drawings. Complete product and execution requirements are included in Division 10, Section10670 “Mechanical Assist High-Density Mobile Storage System”,

END OF SECTION 01030

SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and other Division 1 Specification Sections, apply to work of this Section.

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements for project meetings including but not limited to:

(1) Pre-Construction Conference.
(2) Pre-Installation Conferences.
(3) Progress Meetings.

1.03 PRE-CONSTRUCTION CONFERENCE

A. Schedule a pre-construction conference and organizational meeting at the Project site or other convenient location no later than 15 days after execution of the Agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.

B. Attendees: The Owner, Architect and their consultants, the Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the work.

C. Agenda: Discuss items of significance that could affect progress including such topics as:

Tentative construction schedule.
Critical work sequencing.
Designation of responsible personnel.
Procedures for processing field decisions and Change Orders.
Procedures for processing Applications for Payment.
Distribution of Contract Documents.
Submittal of Shop Drawings, Product Data and Samples.
Preparation of record documents.
Use of the premises.
Office, Work and Storage areas.
Equipment deliveries and priorities.
Safety procedures.
First Aid.
Security.
Housekeeping.
Working Hours.

1.04 PRE-INSTALLATION CONFERENCES

A. Conduct a pre-installation conference at the site before each major construction activity that requires coordination with other construction. The Installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the Owner and Architect of scheduled meeting dates.

B. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for:

Contract Documents.
Options.
Related Change Orders.
Purchases.
Deliveries.
Shop Drawings, Product Data and quality control samples.
Possible conflicts.
Compatibility problems.
Time schedules.
Weather limitations.
Manufacturer's recommendations.
Compatibility of materials.
Acceptability of substrates.
Temporary facilities.
Space and access limitations.
Governing regulations.
Safety.
Inspection and testing requirements.
Required performance results.
Recording requirements.
Protection.

C. Record significant discussions and agreements and disagreements of each conference, along with the approved schedule. Distribute the record of the meeting to everyone concerned, promptly, including the Owner and Architect.

D. Do not proceed if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of work and reconvene the conference at the earliest feasible date.

1.05 PROGRESS MEETINGS

A. Conduct monthly progress meetings at the Project Site. Notify the Owner and Architect of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.

B. Attendees: In addition to representatives of the Owner and Architect, each subcontractor, supplier or other entity concerned with current progress or involved in

planning, coordination or performance of future activities shall be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress.

C. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

(1) Review the present and future needs of each entity present.

D. Reporting: No later than 3 days after each monthly progress meeting date, distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

(1) Schedule Updating: Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

END OF SECTION 01200

SECTION 01300 - SUBMITTALS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Division 1 Specification Sections, apply to work of this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including:

Contractor's construction schedule.
Daily construction reports.
Shop Drawings.
Product Data.
Samples.

1.03 SUBMITTAL PROCEDURES

A. ELECTRONIC SUBMITTAL PROCEDURES

1. Summary:
   a. Shop drawing and product data submittals may be transmitted to Architect in electronic (PDF) format.
   b. The intent of electronic submittals is to expedite the construction process by reducing paperwork, improving information flow, and decreasing turnaround time.
   c. The electronic submittal process is not intended for color samples, color charts, or physical material samples.
2. Procedures:
   a. Submittal preparation – Contractor may use any or all of the following options:
      1. Subcontractors and Suppliers may provide electronic (PDF) submittals to the Contractor via email.
      2. Subcontractors and Suppliers provide paper submittals to General Contractor who electronically scans and converts to PDF format.
   b. Contractor shall review and apply electronic stamps certifying that the submittal complies with the requirements of the Contract Documents including verification of manufacturer / product, dimensions and coordination of information with other parts of the work.
   c. Contractor may transmit each submittal to Architect in electronic format.
   d. Architect / Engineer review comments will be made in electronic format and returned to the General Contractor with an electronic I.O.
   e. Distribution of reviewed submittals to subcontractors and suppliers is the responsibility of the Contractor.
   f. Submit paper copies of reviewed submittals at project closeout for record purposes in accordance with Section 07100 – Project Closeout.

3. Section 01300 - Administrative Requirements - Electronic Submittal Requirements as defined above are applicable to all technical sections of the specifications that require submittals.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
   (1) Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
   (2) Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.

      a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for re-submittals.

1.04 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Schedule: Prepare a fully developed, CPM-type Contractor's construction schedule. Submit within 30 days of the date established in the "Notice to Proceed" for commencement of the Work.

B. Distribution: Following response to the initial submittal, print and distribute copies to the Architect, Owner's Representative, Subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.

   (1) When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

C. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.05 DAILY CONSTRUCTION REPORTS

A. Prepare a daily construction report, recording the following information concerning events at the site; and submit duplicate copies to the Architect and Owner's Representative at bi-weekly intervals:
List of subcontractors at the site.
Approximate count of personnel at the site.
High and low temperatures; General weather conditions.
Accidents and unusual events.
Meetings and significant decisions.
Stoppages, delays, shortages, losses.
Meter readings and similar recordings.

Emergency procedures.
Orders and requests of governing authorities.
Change Orders received, implemented.
Services connected, disconnected.
Equipment or system tests and start-ups.
Partial Completion, occupancies.
Substantial Completions authorized.

1.06 SHOP DRAWINGS

A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.

B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:
Dimensions.
Identification of products and materials included.
Compliance with specified standards.
Notation of coordination requirements.
Notation of dimensions established by field measurement.

C. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

1.07 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product Data included printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings".

B. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities.
(1) Do not permit use of unmarked copies of Product Data in connection with construction.

1.08 SAMPLES

A. Submit fully-fabricated samples (full-size where appropriate) cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture and pattern.

B. Where variation in color, pattern, texture or other characteristics are inherent in the material or product represented, submit multiple units (not less than 3), that show approximate limits of the variations.

C. Maintain sets of samples, as returned, at the Project Site, for quality comparisons throughout the course of the construction.

1.09 ARCHITECT'S ACTION

A. Action Stamp: The Architect will stamp each copy of each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, to indicate the action taken.

B. Do not permit submittals marked "Revise and Resubmit" to be used at the Project Site, or elsewhere where Work is in progress.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION (Not Applicable).

END OF SECTION 01300

SECTION 01400 - QUALITY CONTROL SERVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements for quality control services.

B. Quality control services include inspections and tests and related actions including reports performed by independent agencies and governing authorities. They do not include Contract enforcement activities performed by the Architect.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.

(1) Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities.
(2) Inspections, tests and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.

1.03 RESPONSIBILITIES

A. Owner Responsibilities: The Owner will provide inspections, tests and similar quality control services specified to be performed by independent agencies and not by the Contractor, except where they are specifically indicated as the Contractor's responsibility or are provided by another identified entity. Costs for these services are not included in the Contract Sum.
(1) The Owner will employ and pay for the services of an independent agency, testing laboratory or other qualified firm to perform all inspections and tests specified, with the following exception:
(a) The Contractor will employ and pay for the services of an independent testing/balance agency, to provide testing, balancing and adjusting of HVAC equipment, as specified in a Division 15 Section.

B. Coordination: The Contractor and each agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition, the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

(1) The agency will not perform any duties of the Contractor.
(2) The Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

C. Retesting: The Contractor is responsible for the cost of retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.

D. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:

(1) Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.
(2) Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.
(3) Providing facilities for storage and curing of test samples.
(4) Providing the agency with a concrete design mix proposed for use for material mixes that require control by the testing agency.
(5) Security and protection of samples and test equipment at the Project site.

1.04 SUBMITTALS

A. The independent testing agency shall submit a certified written report of each inspection, test or similar service, to the Owner, Architect, and Contractor.

(1) Submit additional copies of each written report directly to the governing authority, when the authority so directs.
(2) Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to:

- Date of issue.
- Project title and number.
- Name, address and telephone number of testing agency.
- Dates and locations of samples and tests or inspections.
- Names of individuals making the inspection or test.
- Designation of the Work and test method.
- Identification of project and Specification Section.
- Complete inspection or test data.
- Test results and an interpretation of test results.
- Ambient conditions at the time of sample-taking and testing.
- Comments or professional opinion as to whether inspected or tested work complies with Contract Document requirements.
- Name and signature of laboratory inspector.
- Recommendations on retesting.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

A. General: Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes. Comply with Contract Document requirements for ACutting and Patching.@

B. Protect construction exposed by or for quality control service activities, and protect repaired construction.

C. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION 01400

SECTION 014100 – STRUCTURAL TESTS AND SPECIAL INSPECTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements required for compliance with the International Building Code, Chapter 17, Structural Tests and Special Inspections.

B. Structural testing and special inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve contractor of responsibility for compliance with other construction document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the construction document requirements.
3. Requirements for contractor to provide quality-assurance and -control services required by architect, owner, or authorities having jurisdiction are not limited by provisions of this section.

C. The owner will engage one or more qualified special inspectors and / or testing agencies to conduct structural tests and special inspections specified in this section and related sections and as maybe specified in other divisions of these specifications.

D. Related Sections include but are not limited to the following:
1. 02300 EARTHWORK
2. 03300 CAST-IN-PLACE CONCRETE.
3. 04810 UNIT MASONRY ASSEMBLIES.
4. 05120 STRUCTURAL STEEL.
5. 05310 STEEL DECK.
6. 05400 COLD-FORMED METAL FRAMING.

1.3 DEFINITIONS

A. Approved Agency: An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved by the building official.

B. Construction Documents: Written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building permit. Construction Documents include all supplemental instructions, sketches, addenda, and revisions to the drawings and specifications issued by the registered design professional beyond those issued for a building permit.

C. Shop Drawings / Submittal Data: Written, graphic and pictorial documents prepared and / or assembled by the contractor based on the Construction Documents.

D. Structural Observation: Visual observation of the structural system by a representative of the registered design professional's office for general conformance to the approved construction documents. Structural observations are not considered part of the structural tests and special inspections and do not replace inspections and testing by the testing agency or special inspector.

E. Special Inspector: A qualified person who demonstrating competence, to the satisfaction of the code enforcement official and registered design professional in responsible charge, for inspection of the particular type of construction or operation requiring special inspection. The special inspector shall be a licensed professional engineer or engineering intern or a qualified representative from the testing agency.

F. Special Inspection, Continuous: The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.

G. Special Inspection, Periodic: The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work has been or is being performed and at the completion of the work.

H. Testing Agency: A qualified materials testing laboratory under the responsible charge of a licensed professional engineer, approved by the code enforcement official and the registered design professional in responsible charge, to measure, examine, test, calibrate, or otherwise determine the characteristics or performance of construction materials and verify confirmation with construction documents.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications:
   1. Minimum qualifications of inspection and testing agencies and their personnel shall comply with ASTM E329-03 Standard Specification for Agencies in the Testing and / or Inspection of Materials Used in Construction.
      a. Inspectors and individuals performing tests shall be certified for the work being performed as outlined in the appendix of the ASTM E329. Certification by organizations other than those listed must be submitted to the building official for consideration before proceeding with work.

2. In addition to these requirements, local jurisdiction may have additional requirements. It is the responsibility of the testing and inspection agencies to meet local requirements and comply with local procedures.

1.5 CONFLICTING REQUIREMENTS, REPORTS, AND TEST RESULTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to the registered design professional in responsible charge for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to the registered design profession in responsible charge for a decision before proceeding.

C. The special inspector's reports and testing agencies results shall have precedence over reports and test results provided by the contractor.

D. Where a conflict exists between the construction documents and approved shop drawings / submittal data, the construction documents shall govern unless the shop drawings / submittal data are more restrictive. All conflicts shall be brought to the attention of the registered design professional in responsible charge.

1.6 SUBMITTALS BY SPECIAL INSPECTOR AND / OR TESTING AGENCY

A. Special inspectors shall keep and distribute records of inspections. The special inspector shall furnish inspection reports to the building official, and to the registered design professional in responsible charge, contractor, architect, and owner. Reports shall indicate that work inspected was done in conformance to approved construction documents. Discrepancies shall be brought to the immediate attention of the contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the building official and to the registered design professional in responsible charge prior to the completion of that phase of the work. A final report documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted at a point in time agreed upon by the permit applicant and the building official prior to the start of work.
   1. Special inspection reports and test results shall include, but not be limited to, the following:
      a. Date of inspection.
      b. Description of inspections or tests performed including location (reference grid lines, floors, elevations, etc.).
      c. Statement noting that the work, material, and / or product conforms or does not conform to the construction document requirements.

1) Name and signature of contractor's representative who was notified of work, material, and / or products that do not meet the construction document requirements.

d. Name and signature of special inspector and / or testing agency representative performing the work.

B. Schedule of Non-Compliant Work: Each agent shall maintain a log of work that does not meet the requirements of the construction documents. Include reference to original inspection / test report and subsequent dates of re-inspection / retesting.

C. Reports and tests shall be submitted within 1 week of inspection or test. Schedule of Non-Compliant Work shall be updated daily and submitted at monthly intervals.

D. Final Report of Special Inspections. Submitted by each agent listed in the schedule of Structural Testing and Special Inspections.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION

3.1 CONTRACTOR'S RESPONSIBILITY

A. The contractor shall coordinate the inspection and testing services with the progress of the work. The contractor shall provide sufficient notice to allow proper scheduling of all personnel. The contractor shall provide safe access for performing inspection and on site testing.

B. The contractor shall submit schedules to the owner, registered design professionals and testing and inspecting agencies. Schedules will note milestones and durations of time for materials requiring structural tests and special inspections.

C. Each contractor responsible for the construction of a seismic-force-resisting system, designated seismic system, or component listed in the quality assurance plan shall submit a written contractor's statement of responsibility to the building official and to the owner prior to the commencement of work on the system or component. The contractor's statement of responsibility shall contain the following:

1. Acknowledgment of awareness of the special requirements contained in the quality assurance plan.
2. Acknowledgment that control will be exercised to obtain conformance with the construction documents approved by the building official.
3. Procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of the reports.
4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.

D. Each contractor responsible for the construction of a main windforce-resisting system or a wind-resisting component listed in the quality assurance plan shall submit a written statement of responsibility to the building official and the owner prior to the commencement of work on the system or component. The contractor's statement of responsibility shall contain the following:
   1. Acknowledgment of awareness of the special requirements contained in the quality assurance plan.
   2. Acknowledgment that control will be exercised to obtain conformance with the construction documents approved by the building official.
   3. Procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of the reports.
   4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.

E. The contractor shall repair and / or replace work that does not meet the requirements of the construction documents.
   1. Contractor shall engage an engineer / architect to prepare repair and / or replacement procedures.
   2. Engineer / architect shall be registered in the state in which the project is located. Engineer shall be acceptable to the registered design professional in responsible charge, code enforcement official, and owner.
   3. Procedures shall be submitted for review and acceptance by the registered design professional in responsible charge, code enforcement official, and owner before proceeding with corrective action.

F. The contractor shall be responsible for costs of:
   1. Re-testing and re-inspection of materials, work, and / or products that do not meet the requirements of the construction documents and shop drawings / submittal data.
   2. Review of proposed repair and / or replacement procedures by the registered design professional in responsible charge and the inspectors and testing agencies.
   3. Repair or replacement of work that does not meet the requirements of the construction documents.

3.2 STRUCTURAL OBSERVATIONS

A. Structural observations may be made periodically as determined by the registered design professional in responsible charge.

3.3 TESTING AND INSPECTION

A. Testing and inspection shall be in accordance with the attached Schedule of Special Inspections.

B. Reference related specifications for the minimum level of inspections and testing. Provide additional inspections and testing as necessary to determine compliance with the construction drawings.

PART 4 - SCHEDULES AND FORMS (ATTACHED)

4.1 STATEMENT OF SPECIAL INSPECTIONS.

4.2 SCHEDULE OF SPECIAL INSPECTIONS.

4.3 FINAL REPORT OF SPECIAL INSPECTIONS.

END OF SECTION 01410

STATEMENT OF SPECIAL INSPECTIONS

Project:

Project Address:

Permit Applicant:

Applicant Address:

Owner:

Owner Address:

Registered Design Professionals (RDP):

Architect:

Geotechnical Engineer: MBA Engineers

Structural Engineer: MBA Engineers

Mechanical Engineer:

Electrical Engineer:

This statement of special inspections is submitted as a condition for permit issuance in accordance with Chapter 17 of the International Building Code. It includes a *Schedule of Special Inspections* applicable to the above referenced project as well as the identity of the individuals, agencies, or firms intended to be retained for conducting these inspections.

The Special Inspector(s) shall keep records of all inspections and shall furnish interim inspection reports to the building official and to the registered design professional in responsible charge at a frequency agreed upon by the permit applicant and building official prior to the start of work. Discrepancies shall be brought to the immediate attention of the contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the building official and the registered design professional in responsible charge prior to completion of that phase of work. A *Final Report of Special Inspections* documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted by each agent at the completion of that phase of work.

Maximum frequency of interim report submittals shall not be less than_____.

The Special Inspection program does not relieve the contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Owner's Acknowledgement:

_____

Signature Date

Building Official's Acceptance:

_____

Signature Date

_____

Permit No.

Frequency of interim report submittals to building official:

☐ Monthly ☐ Bi-Monthly ☐ Upon Completion ☐ Per Attached Schedule

RDP in Responsible Charge

MBA ENGINEERS, INC.
STRUCTURAL CIVIL GEOTECHNICAL

MBA ENGINEERS, INC.
CIVIL AND STRUCTURAL ENGINEERS

Required Special Inspections

Project Name_____ Project Address_____

During construction of the referenced project, it is intended that special inspection as outlined in Chapter 17 of the 2016_ International Building Code be provided for by the owner. The following areas of work will require special inspection:

MATERIAL / ACTIVITY	FREQUENCY OF INSPECTION	INSPECTOR
A. Inspection of Wood Fabrication Process per 1704.2.1 & 1704.6.1	--------	Testing Agent
B. Inspection of Steel Fabrication Process per 1704.2.1 (Not required if fabricator is registered and approved per Section 1704.2.2)	--------	Testing Agent
C. Inspection of Steel per 1704.3 – 1704.3.3.3 & Table 1704.3		
1. Material verification of high-strength bolts, nuts and washers:		
a. Identification markings to conform to ASTM standards specified in the approved construction documents.	Periodic	Testing Agent
b. Manufacturer's certificate of compliance required.		Testing Agent
2. Inspection of high-strength bolting:		
a. Bearing-type connections.	Periodic	Testing Agent
b. Slip-critical connections.	Periodic	Testing Agent
3. Material verification of structural steel:		
a. Identification markings to conform to ASTM standards specified in the approved construction documents.	--------	Testing Agent
b. Manufacturers' certified mill test reports.	--------	Testing Agent
4. Material verification of weld filler materials:		
a. Identification markings to conform to AWS specification in the approved construction documents.	--------	Testing Agent
b. Manufacturer's certificate of compliance required.	--------	Testing Agent
5. Inspection of welding: a. Structural Steel:		
1) Complete and partial penetration groove welds.	Continuous	Testing Agent
2) Multipass fillet welds.	Continuous	Testing Agent
3) Single-pass fillet welds > 5/16"	Continuous	Testing Agent
4) Single-pass fillet welds ≤ 5/16"	Periodic	Testing Agent
5) Floor and deck welds.	Periodic	Testing Agent
b. Reinforcing steel:		
1) Verification of weldability of reinforcing steel other than ASTM A 706.	Periodic	Testing Agent
2) Reinforcing steel-resisting flexural and axial forces in intermediate and special moment frames, and boundary elements of special reinforced concrete shear walls and shear reinforcement.	Continuous	Testing Agent
3) Shear reinforcement.	Continuous	Testing Agent
4) Other reinforcing steel.	Periodic	Testing Agent
6. Inspection of steel frame joint details for compliance with approved construction documents:		
a. Details such as bracing and stiffening.	Periodic	Engineer
b. Member locations.	Periodic	Engineer
c. Application of joint details at each connection.	Periodic	Engineer

MATERIAL / ACTIVITY	FREQUENCY OF INSPECTION	INSPECTOR
D. Inspection of Concrete per 1704.4 – 1704.4.1 & Table 1704.4		
1. Inspection of reinforcing steel, including prestressing tendons, and placement.	Periodic	Engineer
2. Inspection of reinforcing steel welding in accordance with Table 1704.3, Item 5B.	--------	Testing Agent
3. Inspect bolts to be installed in concrete prior to and during placement of concrete where allowable loads have been increased.	Continuous	Testing Agent
4. Verifying use of required design mix.	Periodic	Testing Agent
5. At the time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	Continuous	Testing Agent
6. Inspection of concrete and shotcrete placement for proper application techniques.	Continuous	Testing Agent
7. Inspection for maintenance of specified curing temperature and techniques.	Periodic	Testing Agent
8. Inspection of prestressed concrete:		
a. Application of prestressing forces	Continuous	Testing Agent
b. Grouting of bonded prestressing tendons in the seismic-force-resisting system.	Continuous	Testing Agent
9. Erection of precast concrete members.	Periodic	Testing Agent
10. Verification of in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs.	Periodic	Testing Agent

MATERIAL / ACTIVITY	FREQUENCY OF INSPECTION	INSPECTOR
E. Inspection of Masonry per 1704.5 (Level 1)		
1. As masonry construction begins, the following shall be verified to ensure compliance:		
a. Proportions of site-prepared mortar.	Periodic	Testing Agent
b. Construction of mortar joints.	Periodic	Testing Agent
c. Location of reinforcement and connectors.	Periodic	Engineer
d. Prestressing technique.	Periodic	Testing Agent
e. Grade and size of prestressing tendons and anchorages.	Periodic	Engineer
2. The inspection program shall verify.		
a. Size and location of structural elements.	Periodic	Engineer
b. Type, size and location of anchors, including other details of anchorage of masonry to structural members, frames or other construction.	Periodic	Engineer
c. Specified size, grade and type of reinforcement.	Periodic	Testing Agent
d. Welding of reinforcing bars.	Continuous	Testing Agent
e. Protection of masonry during cold weather (temperature below 40°F) or hot weather (temperature above 90°F).	Periodic	Testing Agent
f. Application and measurement of prestressing force.	Periodic	Testing Agent
3. Prior to grouting, the following shall be verified to ensure compliance.		
a. Grout space is clean.	Periodic	Testing Agent
b. Placement of reinforcement and connectors and prestressing tendons and anchorages.	Periodic	Engineer
c. Proportion of site-prepared grout and prestressing grout for bonded tendons.	Periodic	Testing Agent
d. Construction of mortar joints.	Periodic	Testing Agent
4. Grout placement shall be verified to ensure compliance with code and construction documents provisions.	Continuous	Testing Agent
5. Grouting of prestressing bonded tendons.	Continuous	Testing Agent
6. Preparations of any required grout specimens, mortar specimens and/or prisms shall be observed.	Continuous	Testing Agent
7. Compliance with required inspection provisions of the construction documents and the approved submittals shall be verified.	Periodic	Testing Agent

MATERIAL / ACTIVITY	FREQUENCY OF INSPECTION	INSPECTOR
E. Inspection of Masonry per 1704.5 (Level 2)		
1. From the beginning of masonry construction, the following shall be verified to ensure compliance:		
a. Proportions of site-prepared mortar, grout and prestressing grout for bonded tendons.	Periodic	Testing Agent
b. Placement of masonry units and construction of mortar joints.	Periodic	Testing Agent
c. Placement of reinforcement, connectors and prestressing tendons and anchorages.	Periodic	Engineer
d. Grout space prior to grouting.	Continuous	Testing Agent
e. Placement of grout.	Continuous	Testing Agent
f. Placement of prestressing grout.	Continuous	Testing Agent
2. The inspection program shall verify:		
a. Size and location of structural elements.	Periodic	Engineer
b. Type, size and location of anchors, including other details of anchorage of masonry to structural members, framed or other construction.	Continuous	Engineer
c. Specified size, grade and type of reinforcement.	Periodic	Testing Agent
d. Welding of reinforcement.	Continuous	Testing Agent
e. Protection of masonry during cold weather (temperature below 40°F) or hot weather (temperature above 90°F).	Periodic	Testing Agent
f. Application and measurement of prestressing force.	Continuous	Testing Agent
3. Preparation of any required grout specimens, mortar specimens and/or prisms shall be observed.	Continuous	Testing Agent
4. Compliance with required inspection provisions of the construction documents and the approved submittals shall be verified.	Periodic	Testing Agent
F. Inspection of Soil Conditions per 1704.7 – 1704.7.3	----------	Testing Agent
G. Inspection of Pile Foundations per 1704.8	Continuous	Testing Agent
H. Inspection of Pier Foundations per 1704.9	Continuous	Testing Agent
I. Inspection for Special Cases per 1704.13	--------	Testing Agent
J. Seismic Resistance Inspections & Testing per 1707 – 1707.8 & 1708 – 1708.5	--------	Testing Agent
K. Structural Observations per 1709.1 (Seismic Design Categories D, E or F)	--------	Engineer

FINAL REPORT OF SPECIAL INSPECTIONS

Project:

Project Address:

Testing / Inspection Agent:

Testing / Inspection Agent Address:

Scope of Testing / Inspections:

To the best of my information, knowledge, and belief, the special inspections or testing required for this project, and designated for this Agent in the *Schedule of Special Inspections* submitted for permit, have been completed in accordance with the contract documents.

Interim reports submitted prior to this final report and numbered to - , form a basis for, and are to be considered an integral part of this final report.

Special Inspector's Seal

Prepared By:

Type or print name

Signature Date

(Licensed Professional Engineer)

SECTION 01500 - TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary (or Special) Conditions and other Part 1 Specification sections, apply to this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 SUMMARY

A. This Section specified requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.
   (1) Obtain and pay for all building permits, fees and licenses required by authorities having jurisdiction.

B. Temporary utilities required include, but are not limited to:
   (1) Temporary electric power and light.
   (2) Telephone service (Cellular Service is acceptable).
   (3) Water service and distribution.

C. Temporary construction and support facilities include, but are not limited to:
   (1) Temporary heat.
   (2) Field office and storage sheds.
   (3) Temporary roads and paving (Construction Entrances)
   (4) Sanitary facilities, including drinking water.
   (5) De-watering facilities and drains.
   (6) Temporary enclosures.
   (7) Hoists.
   (8) Temporary project identification signs and bulletin boards.
   (9) Waste disposal services.
   (10) Rodent and pest control.
   (11) Construction aids and miscellaneous services and facilities.
   (12) Project Identification Sign

D. Security and protection facilities include, but are not limited to:
   (1) Temporary fire protection.
   (2) Barricades, warning signs, and lights.
   (3) Environmental protection.

E. Related work specified elsewhere: Section 02301 “Erosion and Sedimentation Controls”.

1.03 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to:
   (1) Building Code requirements
   (2) Health and safety regulations
   (3) Utility company regulations
   (4) Police, Fire Department and Rescue Squad rules
   (5) Environmental protection regulations

B. Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-A10 Series Standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities".
   (1) Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services", prepared jointly by AGC and ASC, for industry recommendations.
   (2) Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with National Electric Code (NFPA 70).

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.04 PROJECT CONDITIONS

A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of the permanent service.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Provide new materials; if acceptable to the Architect, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.

B. Lumber and Plywood: Comply with requirements in Division-6 Section "Rough and Finish Carpentry".
   (1) For safety barriers, sidewalk bridges and similar uses, provide minimum 5/8" thick exterior plywood.

C. Tarpaulins: Provide waterproofing, fire-resistant, UL labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures provide translucent nylon reinforced laminated polyethylene or polyvinyl chloride fire retardant tarpaulins.

2.02 EQUIPMENT

A. General: Provide new equipment; if acceptable to the Architect undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.

B. Water Hoses: Provide 3/4" heavy-duty, abrasion-resistant flexible rubber hoses 100 ft. long, with pressure rating greater than the maximum pressure of the water distribution system; provide adjustable shut-off nozzles at hose discharge.

C. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.

D. Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.

E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.

F. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM or another recognized trade association related to the type of fuel being consumed.

G. Temporary Office: Provide prefabricated or mobile unit with lockable entrances, operable windows and serviceable finishes. Provide heated and air-conditioned units on foundations adequate for normal loading.

H. Temporary Toilet Units: Provide self-contained single-occupant toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material.

I. First Aid Supplies: Comply with governing regulations.

J. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers or a combination of extinguishers of NFPA recommended classes for the exposure.
   (1) Comply with NFPA 10 and 241 for classification, extinguishing, agent and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed, or are replaced by authorized use of completed permanent facilities.

3.02 TEMPORARY UTILITY INSTALLATION

A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment; comply with the company's recommendations.
   (1) Arrange with the company and existing users for a time when service can be interrupted, where necessary, to make connections for temporary services.
   (2) Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
   (3) Obtain easements to bring temporary utilities to the site, where the Owner's easements cannot be used for that purpose.

(4) Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Architect, and will not be accepted as a basis of claims for a Change Order.

B. Water Service: Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.
(1) Sterilize temporary water piping prior to use.

C. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload protected disconnects, automatic ground-fault interrupters and main distribution switch gear.
(1) Power Distribution System: Install wiring overhead, and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 volts, AC 20 ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.

D. Temporary Lighting: Whenever overhead floor or roof deck has been installed, provide temporary lighting with local switching.
(1) Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system, and will **provide adequate illumination for construction operations and traffic conditions**.

E. Temporary Telephones: Provide temporary telephone service for all personnel engaged in construction activities, throughout the construction period (cell phone service is acceptable).
(1) Post a list of important telephone numbers for persons having interest in this project, and for emergency services.

F. Sewer and Drainage: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off the site in a lawful manner.

3.03 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

A. Locate field offices, storage sheds, sanitary facilities and other temporary construction and support facilities for easy access.
(1) Maintain temporary construction and support facilities until near substantial completion. Remove prior to substantial completion. Personnel remaining after substantial completion will be permitted to use permanent facilities under conditions acceptable to the Owner.

B. Provide incombustible construction for offices, shops and sheds, located within the construction area, or within 30 feet of building lines. Comply with requirements of NFPA 241.

C. Temporary Heat: Provide temporary heat required by construction activities for curing or drying of complete installations or protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.

D. Heating Facilities: Except where use of the permanent system is authorized, provide vented self-contained LP gas or fueled oil heaters with individual space thermostatic control. (1) Use of gasoline-burning space heaters, open flame, or salamander type heating units is prohibited.

E. Field Office: Provide insulated, weathertight temporary office of sufficient size to accommodate required office personnel at the project site. Keep the offices clean and orderly for use for small progress meetings. Furnish and equip offices as appropriate to conduct business.

F. Sanitary facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with regulations and health codes for the type, number, location, operation and maintenance of fixtures and facilities. Install where facilities will best serve the project's needs.

(1) Provide toilet tissue, paper towels, paper cups and similar disposable materials for each facility. Provide covered waste containers for used material.

G. Temporary Enclosures: Provide temporary enclosure for protection of construction in progress and completed, from exposure, foul weather, other construction operations and similar activities.

(1) Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

(2) Install tarpaulins securely, with combustible wood framing and other materials. Close openings of 25 square feet or less with plywood or similar materials.

(3) Close openings through floor or roof decks and horizontal surfaces with load-bearing wood-framed construction.

H. Collection and disposal of waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 degrees F (28 degrees C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.

I. Dewatering Facilities and Drains: For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with dewatering requirements of applicable Division -2 Sections. Where feasible, utilize the same facilities. Maintain the site, excavations and construction free of water.

J. Project Identification and Temporary Signs: Prepare project identification and other signs. Install signs as directed to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative treated wood or steel. Do not permit installation of unauthorized signs.

(1) Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors.

(2) Project Sign: Provide Project Identification Sign. Project sign to be painted on 4' x 8' x ¾" th. Plywood and mounted on 4"x4" posts. **Project sign text and layout will be provided following award of Contract.**

3.04 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer as required by the Architect.

B. Temporary Fire Protection: Comply with NFPA 10 "Standard for Portable Fire Extinguishers", and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations".
   (1) Locate fire extinguishers where convenient and effective for their intended purpose.
   (2) Store combustible materials in containers in fire-safe locations.
   (3) Maintain unobstructed access to fire extinguishers, and access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.
   (4) Provide supervision of welding operations, combustion type temporary heating units and similar sources of fire ignition.

C. Barricades, Warning Signs and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed provide lighting, including flashing red or amber lights.

D. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.05 OPERATION, TERMINATION AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
   (1) Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on a 24 hour day basis where required to achieve indicated results and to avoid possibility of damage.
   (2) Protection: Prevent water filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or not later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.
   (1) Materials and facilities that constitute temporary facilities are property of the Contractor.

END OF SECTION 01500

SECTION 01700 - PROJECT CLOSEOUT

PART 1 - GENERAL

1.01 GENERAL

A. Upon completion of the project, the Contractor shall be required to furnish the following items to the Architect before approval of final payment will be made:

(1) **All other special warranties required by the various specification sections**.

(2) Roofing Contractor's Five (5) Year Roofing Guarantee.

(3) One (1) Year Warranties on all materials, equipment and workmanship provided by subcontractors who may be employed under this Contract.

(4) As Built Record Drawings (2 Sets). Electronic "As-built" drawings will be acceptable.

(5) Complete maintenance instructions for all items requiring maintenance at the building.

(6) Evidence that all indebtedness has been paid to subcontractors and material suppliers.

(7) Affidavit of Advertisement of Completion.

(8) **THESE ITEMS SHALL BE FURNISHED (THREE (3) SETS) ALL AT ONE TIME AND IN A NEATLY BOUND FORM.**

PART 2 - PRODUCTS (not applicable)

PART 3 - EXECUTION (not applicable)

END OF SECTION 01700

SECTION 02100 – TERMITE CONTROL

PART 1 – GENERAL

1.01 GENERAL CONDITIONS

A. The accompanying General Conditions, Part I, of these specifications shall apply to and form a part of this section.

1.02 SUMMARY

A. Provide soil treatment for termite control, as herein specified.

1.03 QUALITY ASSURANCE

A. Applicator: Company specializing in soil treatment for termite control, with five (5) years documented experience.

B. Materials: Provide certification that toxicants conform to specified requirements.

C. Material Packaging: Manufacturer's labels and seals identifying contents.

1.04 REGULATORY REQUIREMENTS

A. Comply with State of Alabama requirements for application, licensing and authority to use toxicant chemicals.

1.05 WARRANTY

A. Provide a Five (5) Year Warranty Bonded Guaranty for material and installation.

B. Warranty Bonded Guaranty shall cover against invasion or propagation of subterranean termites, damage to building or building contents caused by termites; repairs to building or building contents so caused.

C. Inspect work annually during warranty period and report findings in writing to Owner.

D. The Owner reserves the right to renew the warranty bonded guaranty for an additional five years.

PART 2 - PRODUCTS

2.01 CHEMICALS

A. The chemical used shall be one of the following, or approved equal, in the concentration designated on the labeled instructions:

Demon TC	Aggreszor
Termidor	Premise

PART 3 - EXECUTION

3.01 APPLICATION

A. Apply toxicant immediately 12 hours prior to installation of vapor barrier at slabs on grade, or finish grading outside foundation walls, porches and steps.

B. Apply toxicant in strict accordance with manufacturer's instructions, in rates of coverage as recommended by manufacturer.

C. Apply extra treatment to structural penetrations, including but not limited to piping, conduit and other soil penetrations.

D. Apply as a coarse spray to ensure uniform distribution.

E. Coordinate soil treatment at foundation perimeter with finish grading and landscaping work, to avoid disturbance of treated soil. Retreat disturbed treated soil as necessary.

3.01 RETREATMENT

A. If inspection identifies the presence of termites, retreat soil and retest.

B. Use same toxicant as used for original treatment.

END OF SECTION 02100

MBA ENGINEERS, INC.
STRUCTURAL CIVIL GEOTECHNICAL

Report of Subsurface Exploration and Geotechnical Engineering Evaluation

New City Hall & Municipal Office Facility
City of Centre
Centre, Alabama

MBA Project Number: G23-024.00
May 4, 2023

Prepared for:
Mayor Mark P. Mansfield
City of Centre
635 Armory Road
Centre, AL 35960

MBA Engineers Inc. – Geotechnical Department
2717 6th Avenue South, Birmingham, AL 35233

MBA ENGINEERS, INC.
STRUCTURAL CIVIL GEOTECHNICAL

MBA Engineers Inc – Geotechnical Department
2717 6th Avenue South, Birmingham, AL 35233

May 4, 2023

Mayor Mark P. Mansfield
City of Centre
635 Armory Road
Centre, AL 35960

Subject: Final Report of Subsurface Exploration and Geotechnical Engineering Evaluation
New City Hall & Municipal Office Facility
Centre, Alabama
MBA Reference Number: G23-024.00

Dear Mayor Mansfield:

MBA Engineers has completed the authorized subsurface exploration and geotechnical engineering evaluation of the proposed New City Hall & Municipal Office Facility project located at 350 E. Main Street in Centre, Alabama. Our services were performed in general accordance with the scope of services outlined in our Proposal Number G9373-23 dated March 21, 2023.

The purpose of our geotechnical study was to determine general subsurface conditions at widely spaced boring locations located around the perimeter of the proposed building footprint, and to gather information on which to base recommendations relative to site preparation, earthwork, and foundation design for the New City Hall & Municipal Office Facility. As design of the project progresses, we suggest our office be contacted regarding geotechnical-related design, earthwork specifications and contract documents so we may provide additional input related to development-specific subsurface conditions.

We appreciate the opportunity to work with you and we look forward to assisting you through the design and construction phase of this project. If you have any questions or need any additional information, please call us.

Respectfully submitted,
MBA ENGINEERS, INC

Drew Thornbury, P.E.
Geotechnical Principal Engineer

Tucker Thomas
Geotechnical Staff Professional

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APPENDIX

1.0 SCOPE OF SERVICES

The objective of the exploration is to provide preliminary site preparation and foundation recommendations for the proposed New City Hall & Municipal Office Facility. Based on the objectives, the following services were conducted:

1. Site reconnaissance, test boring layout, geologic map review and mobilization of a track-mounted drill rig. The existing Centre Middle School was still standing during the geotechnical study; therefore, our exploration was focused on the areas surrounding the existing main building.

2. Soil Test Borings: Five (5) soil test borings located near the proposed building pad were extended to boring termination depths on the order of 20.5 feet below the existing ground surface.

3. Laboratory Soil Classification Testing: Laboratory testing primarily focused on the general characteristics of the soils with an emphasis on the presence of highly plastic clays.

4. Report Preparation: Engineering evaluation and geotechnical report including site preparation and foundation recommendations for the proposed New City Hall & Municipal Office Facility.

2.0 SITE AND PROJECT DESCRIPTION

The New City Hall & Municipal Office Facility will be located at 350 E. Main Street in Centre, Alabama. Based on the Architectural Site Plan (dated 2-15-23) provided by Tom McElrath with Thomas M. McElrath, Architect, we understand the new facility will be located in the area where the existing Centre Middle School main building is currently located. We understand the Centre Middle School building has been abandoned since at least 2011. Additionally, Google Earth Satellite imagery indicates the Coosa River is less than a mile to the southwest from the subject site and Weiss Lake is less than a mile to the north from the subject site. Figure 1 shows the location of the proposed New City Hall & Municipal Office Facility.

Figure 1: Approximate Location of Proposed New City Hall & Municipal Office Facility Outlined in Red.

The existing Centre Middle School building is surrounded by maintained grassed areas to the north, east, and west, and parking areas to the south. Additionally, the existing school wings are located to the east and west of the main building. Existing topographic contours (from the Architectural Site Plan) indicate the site is relatively flat with minimal grade change (ranging from 660' to 661' at the proposed building pad). The main floor elevation of the existing building appears to be at 661'. Based on conversations with Tom McElrath, we understand the existing Centre Middle School building has a basement component; however, we are unaware of the basement location.

Proposed Construction: Construction will consist of a one-story New City Hall & Municipal Office Facility building consisting of office space, conference rooms, and a meeting hall. The proposed finish floor elevation for the building had not been determined at the time of this report; however, we assume the finish floor elevation will be near the elevation of the existing main floor elevation floor at 661'. Therefore, maximum cuts and fills will likely be on the order of 1' or less. Based on conversations with Keith Owens with MBA Engineers, maximum column and wall loads are expected to be less than 75 kips and 2.0 k/ft, respectively.

3.0 SITE GEOLOGY

Published geologic maps (*Geologic Map of* Alabama, 1988) indicate that High Terrace Deposits are present at the subject site underlain by the Conasauga Formation. High Terrace Deposits are described as unconsolidated silt and sand containing clasts of local bedrock and appear to be from the Coosa River watershed. Our borings were extended to 20' below the existing elevations and did not penetrate the upper High Terrace Deposits.

The Conasauga Formation typically consists of thin-to-medium-bedded limestone with thin partings of shale. The beds are usually folded and fractured. Weathering of the Conasauga formation typically results in a clayey or silty-clay soil with a highly irregular bedrock surface. Pinnacles may project to the surface, with limestone boulders and fragments occurring throughout the soil zone. The Conasauga Formation is also susceptible to vertical clay filled slots and seams in addition to the development of sinkholes. Figure 2 is an excerpt from the referenced map and the approximate subject site limits are outlined in red.

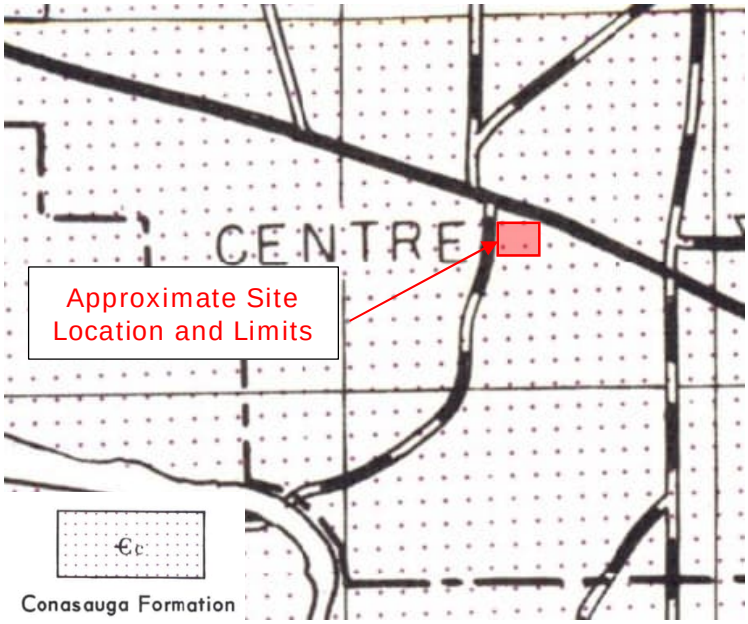


Figure 2: Excerpt from Geology Map of Cherokee County, Alabama, dated 1965

Residual soils derived from the weathering of the limestone strata vary in thickness from a few feet to 50+ feet, resulting from the irregular configuration of the underlying limestone. Typically, residual soils derived from this formation are moderately to highly plastic. The water level follows the erratic rock profile and can vary over small distances. A zone of soft soil is generally present several feet above the rock surface which is described as "karst disturbed soils".

3.1 SINKHOLE POTENTIAL

Because the Conasauga Formation is a carbonate rock formation, it is subject to dissolution; particularly along fractures, joints, and bedding planes. The rock dissolution is a very slow process and occurs over tens of thousands of years. The dissolution process tends to initially form vertical or steeply dipping slots in the carbonate rock. As water enters the slots and continues to dissolve the rock, the slots widen and can form sizeable cavities in the rock. Sinkholes may result when the overburden collapses or erodes into such voids.

Sinkholes are common in the Conasauga Formation due to the occurrence of solution cavities and zones of fracturing associated with the bedrock. Even an exploration consisting of many exploratory borings cannot determine with certainty whether a sinkhole will or will not occur during the service life of a project. Whether any future ground loss would occur at a given site is a function of existing voids in the carbonate rock beneath that site, fluctuation in the water table, and loss of soils into underground voids. The owner should understand that there is always some risk associated with building over geologic formations that are prone to the formation of sinkholes. As a minimum, we recommend those entities associated with development of, or operations on the property pursue sinkhole coverage on their insurance policy.

Karst disturbed soils were not observed during our exploration. Our scope of services did not include specific exploration to determine the presence of subsurface cavities or to determine sinkhole risk beneath the overall study area. Should the client so desire, a more comprehensive evaluation could be conducted in a separate exploratory program. However, even after an extensive exploration, the risk of a sinkhole developing during the service life of the development cannot be eliminated.

4.0 FIELD EXPLORATION

On April 18, 2023, a field exploration was conducted at the site consisting of five (5) soil test borings (designated B-1 to B-5) drilled near the proposed building pad and were extended to boring termination depths on the order of 20.5' below the existing ground surface. The boring locations were determined by measuring and angling from existing site features, and the boring locations should be considered approximate. Not all areas of the proposed building pad could be explored due to the presence of the existing Centre Middle School structure. The preliminary exploration generally focused on areas surrounding the existing main building.

The approximate boring locations are shown on the boring location plan in the Appendix. Conditions encountered at the boring locations represent conditions at the specific test locations at the time of exploration. It should be expected that conditions at other locations or at other times could differ from those observed and reported herein.

4.1 SOIL TEST BORINGS

Within each soil test boring, split-tube sampling, and Standard Penetration tests (SPT) were performed in accordance with ASTM D1586. The soil test borings were advanced by mechanically twisting continuous, hollow-stem auger flights into the ground. In the soil test borings, soil samples were obtained with a standard 2-inch O.D., 1.4-inch I.D., split-tube sampler. The sampler was first seated six inches to penetrate any loose cuttings and then driven one additional foot with blows of a mechanical hammer. The number of blows (N) required to drive the sampler the final foot of penetration is the standard penetration resistance. The penetration resistance, when properly evaluated, is an index to the soil's strength, density, and ability to support foundations.

Representative portions of the samples obtained from the split-tube sampler were sealed in relatively airtight containers and transported to our laboratory. In the laboratory, the geotechnical engineer classified the samples. The Logs of Boring in the Appendix indicate the soil descriptions and penetration resistances.

Groundwater levels were measured during and immediately after the borings were drilled and are indicated on the attached Logs of Boring. The completed boreholes were backfilled promptly for safety reasons. Consequently, groundwater levels were evaluated for only a very short time.

4.2 LABORATORY TESTING

In addition to the field exploration, a laboratory-testing program was conducted to obtain data regarding the engineering characteristics of subsurface materials. Results of laboratory testing may be found on the attached boring logs. The following laboratory procedures were conducted:

- Atterberg Limits (ASTM D4318) were determined on select samples to evaluate how the soil characteristics change upon variations in moisture content. The soil Plasticity Index (PI) is representative of these characteristics and is the difference between the Liquid Limit (LL) and the Plastic Limit (PL).

- Materials in Soil Finer than the No. 200 Sieve (ASTM D1140) was determined on select samples to determine the percentage of fine-grained soils. The No. 200 sieve represents the break point between a material classified as coarse grained versus fine grained.

- Natural Soil Moisture Contents (ASTM D2216) were conducted on selected samples to determine the natural moisture content, which is the ratio, expressed as a percentage, of the weight of water in each amount of soil to the weight of solid particles.

5.0 GEOTECHNICAL SITE CHARACTERIZATION

The general subsurface conditions encountered, and their pertinent characteristics are described in the following subsections. The described conditions are based on the assumption that significant changes in subsurface conditions do not occur between boreholes. Conditions represented by the logs should be considered applicable only at the boring locations on the dates shown, and it should be assumed that the conditions may be different at other locations or at other times.

Details of the subsurface conditions encountered by the borings are shown on the Logs of Boring in the Appendix. The boring logs represent our interpretation of the subsurface conditions based upon examination of the exploration samples. Stratification lines on the logs represent approximate boundaries between soil types; however, the actual transition between soil types may be gradual.

5.1 SURFACE CONDITIONS

The proposed New City Hall & Municipal Office Facility will be located in the area where the existing Centre Middle School is currently located. The existing building is surrounded by maintained grassed areas to the north, east, and west, and parking areas to the south. All five (5) of the borings were drilled within the grassed areas, and the topsoil observed within the borings was on the order of approximately 2" thick.

5.2 UNDOCUMENTED FILL

Soil described as undocumented fill was encountered directly beneath topsoil at each boring location and extended to depths ranging from approximately 3' to 5.5' below the existing ground surface. It is unknown whether the borings were in the general area of the basement; and we anticipate deeper fill depths in areas at or near the existing basement.

The observed undocumented fill samples generally consisted of medium to soft, light brown or gray-brown, silty clay or sandy clay. Traces of organics were observed in B-2. Standard penetration test (SPT) N-values within the undocumented fill ranged from two (2) to twenty-two (22) bpf; however, typical values ranged from 2 to 5 bpf, indicating a low consistency soil.

Results of laboratory test performed on selected fill samples showed moisture contents ranged from approximately 11.0 to 25.0 percent; however, typical values were between 13.0 and 23.0 percent. Additionally, classification testing was performed on selected fill samples at boring location B-3 and B-5 (at approximately 2'). Atterberg limits test results showed a liquid limit ranging from 25 to 28 and a plasticity index ranging from 10 to 14. The percent passing the No. 200 sieve ranged from 55.4 to 70.2 percent. Results from classification of both selected fill samples indicate a moderate to low plastic material and a predominantly fine-grained soil.

5.3 HIGH TERRACE DEPOSITS

Soils described as high terrace deposits from the Coosa River were encountered at each boring location directly beneath the undocumented fill and extended to boring termination depths of 20.5' below the existing ground surface. The high terrace deposits were not penetrated at any of the boring locations.

The terrace deposits encountered were generally described as high consistency, tan or red-brown, sandy clay underlain by dense, tan or red-brown, clayey coarse sand with varying amounts of rounded river rock.

Standard penetration test (SPT) N-values within the terrace deposited strata ranged from 13 to over 50 bpf; however, typical values ranged from 21 to 35, indicating a high consistency soil. The terrace deposits encountered are likely from the Coosa River watershed.

Results of laboratory test performed on selected terrace deposit samples at boring location B-2 within the upper 10' and 20' showed a percent passing the No. 200 sieve of 82.1% at 10' and 19.0% at 20', by weight, indicating a sandy clay at 10' and a clayey sand at 20'.

5.4 GROUNDWATER

During our exploration, groundwater was encountered at boring locations B-1 at 7'and B-2 at 18'. The observed water appears to be trapped water located within the various sand-clay strata within the high terrace deposits. The presence or absence of water in the borings during our exploration does not necessarily mean that groundwater would or would not be present at other times.

Due to the relatively short time frame of the field exploration, the groundwater may not have had sufficient time to stabilize. We note that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors not evident at the time the measurement was made and reported herein. Water is often trapped slightly above subsurface interfaces such as fill/ terrace deposits and should be expected during mass grading.

6.0 SITE PREPARATION AND GRADING CONSIDERATIONS

The evaluation of the site and the following considerations and recommendations are based on the subsurface conditions encountered at the exploration locations, results of geotechnical laboratory testing, provided grading plans, and structural loading conditions. As discussed previously, our recommendations are based on the assumption that significant changes in subsurface conditions do not occur between boreholes. However, anomalous conditions can occur between borings, across the site, or due to the modifying effects of construction or weather. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided. This is particularly important because our preliminary exploration was conducted around the existing Centre Middle School and large portions of the new building pad could not be explored due to presence of the existing structure.

6.1 GENERAL SITE PREPARATION

The finish floor elevation for the building was not determined at the time of this report; however, we anticipate maximum cuts and fills will be on the order of 1' or less. Therefore, we anticipate that the following will have to be considered when developing the subject site:

- Demolition of the Existing Centre Middle School: Construction will require demolition of the existing Centre Middle School including excavation of the existing basement areas. All previous structural components including foundations, slabs, and utilities, should be removed. Demolition and removal of buried utilities and slabs commonly results in disturbance of the upper soils, necessitating restoration of the disturbed soil conditions. Based on the presence of undocumented fill and terrace deposited soils we anticipate significant disturbance to the subgrade during the demolition. The contractor should be prepared to restore disturbed subgrade to a stable condition prior to fill placement or construction of surface improvements.

- Initial Site Clearing: Site preparation should include removal of all asphalt, debris, concrete, topsoil, vegetation, and soil containing organic matter to a depth where uniform, stable subgrade conditions are encountered. Topsoil in the grassy areas should be expected to be on the order of 2" in thickness. As stated previously, all previous construction and structures including sidewalks and utilities should be removed during general site preparation.

- Undocumented Fill: Low consistency undocumented fill was observed at all boring locations near the proposed building pad ranging from approximately 3' to 5.5' below the exiting ground surface. We anticipate fill depths at or near the basement area to be deeper. Within the building pad, the low consistency undocumented fill will require stabilization by undercutting to stable subgrade and replacing with properly compacted structural fill (from offsite). We recommend the following regarding stabilizing the undocumented fill:

    - Building Pad Stabilization: All undocumented fill will need to be undercut until high consistency subgrade is observed. Undercutting should extend to at least 10' outside the building pad. Prior to placing offsite structural fill, the existing subgrade should be moisture conditioned and recompacted to create a stabilized working grade. All structural fill placed should be compacted in a systematic manner in accordance with project specifications.

    - Unit Rates for Stabilization: We recommend that both unit rate and quantity allowance provisions be included in the earthwork budget for excavation and replacement of unsuitable soils. Methods of measurement and payment should be described in the specifications.

    - Additional Exploration within the Building Pad: Because of the anticipated undocumented fill within the proposed building pad and the limited subsurface information in the area of the existing Centre Middle School, the owner and contractor may want to consider a supplementary soil test boring or test pit exploration after (or during) demolition to verify fill and potential undercut depths. This is particularly important due to the initial borings not penetrating the upper high terrace deposit soils.

- Subgrade Observation: Following preparation of the subgrade, areas that are to receive engineered fill or construction of surface improvements, including pavements, should be evaluated by the geotechnical engineer. Such an evaluation will include proofrolling with a loaded dump truck or other heavy pneumatic tire-mounted construction equipment to reveal areas containing soft or loose soil. The geotechnical engineer can then determine the proper stabilization procedure to prepare a suitable subgrade. As a minimum, unit rates for undercut and replacing and moisture conditioning and recompacting should be included in the contract documents.

6.2 FILL PLACEMENT RECOMMENDATIONS

We understand fill placement will be required at the site (especially after undercut); and the following is recommended for placement of structural fill:

- Proofrolling: Prior to placement of fill, we recommend any areas to receive fill should be proofrolled thoroughly by a loaded dump truck in the presence of the geotechnical engineer.

- Engineered Fill Requirements: Engineered fill placed at the site should be virtually free of organic matter and other deleterious materials and should be low plasticity (LL less than 50, PI less than 25 and a maximum dry density greater than 105 pcf). Rock fragments in the fill mass should be no greater than four (4) inches in greatest dimension following compaction.

- Reuse of Onsite Fills: Because of the presence of undocumented fill, we recommend planning on using offsite borrow as structural fill (if needed).

- Field Density Testing: A sufficient number of field density tests should be performed during fill placement to indicate whether the fill is in general compliance with the project specifications. A commonly used testing frequency is one test per lift of compacted fill per 2,500 square feet of fill area.

- Compaction Requirements: Structural fill should be compacted to a minimum 98 percent of the maximum dry density obtained by a Standard Proctor compaction test. Fill moisture content should typically be in the range of ±2 percent of optimum as determined by ASTM D698. Mass fills should be placed in maximum 8-inch loose lifts.

- Structural Fill Testing: We recommend the grading contractor provide (well in advance of the start of site grading) us with representative samples of proposed off site borrow soil (if required) so tests can be performed to confirm compliance with the above structural fill recommendations. In general, soils with higher maximum dry densities and lower liquid limits and plasticity indices have better structural characteristics, are easier to moisture condition and compact, and will perform better than soils with lower maximum dry densities or higher liquid limits and plasticity indices.

- Confined Space Backfilling: Backfilling around storm drains and within utility trenches must be performed in a controlled manner to prevent settlement of the fill and cracking of floor slabs and pavements supported by the backfill. The same level of care must be exercised when backfilling around below-grade structures such as manholes, junction boxes, etc. Backfilling around such structures typically involves placing and compacting fill in relatively confined spaces where manually operated equipment must be utilized for effective compaction of fill. *We recommend limited spaces be backfilled with acceptable fill in four-inch lifts and densified by mechanical compactors to the project requirements.*

- Backfill with Open Graded Stone*: Should seepage occur in excavation trenches, it may be necessary to "floor" the trench with open-graded crushed stone (compacted in lifts) to provide a dry working surface.* Systematic compaction of limited space backfill will be required even if stone backfill is used.

6.3 SITE DRAINAGE DURING AND POST CONSTRUCTION

Site grading plans should include positive drainage away from the structures, and the contractor should provide drainage during the construction period. Surface water should be diverted away permanently from the surface improvements. It may be necessary to install temporary interceptor ditches to collect and divert surface water away from the construction area.

Excessive twisting and turning of construction equipment have the potential to disturb the subgrade soils and may cause the need for near-surface soil remediation. Consequently, preparing/protecting the exposed subgrade prior to rain events will be particularly important if backfilling cannot be completed promptly and the upper soil would be vulnerable to strength loss from water ponding. We recommend the project specification address the contractor's responsibility to maintain controlled site drainage during construction.

7.0 FOUNDATION RECOMMENDATIONS

Based on conversations with Keith Owens with MBA Engineers maximum column loads are expected to be on the order of 75 kips. Considering the structural loads and the soils that our exploratory borings encountered under the proposed building footprint, it is our opinion that spread and strip footings would be an appropriate foundation system for support of the New City Hall. *The use of spread footings assumes that all recommendations in the site preparation section are followed including mass undercut of all undocumented fill and replacement of properly compacted structural fill.*

Foundation Construction Consideration: Foundations bearing on properly compacted structural fill can be designed for a maximum allowable bearing capacity of 2,500 psf. Additionally, we recommend that the following items be incorporated into the building foundation design:

- Minimum footing dimensions of 18 inches are recommended for continuous strip footings. Column footings should have a minimum dimension of 24 inches.

- The geotechnical engineer of record should observe the exposed foundation bearing surfaces prior to concrete placement to verify that the conditions anticipated during the subsurface exploration are encountered.

- Pockets of organic or low consistency soils encountered during footing excavation should be fully penetrated to reach the high consistency soils for proper bearing. As discussed previously, all undocumented fill observed during footing construction that will require over excavation. Footing over excavation can be backfilled with lean concrete to the original bottom of footing elevation.

- *It is recommended that all footing bearing surfaces be compacted by a manually operated piston type tamper or vibratory plate compactor prior to placement of the reinforcing steel and observation by the geotechnical engineer*. We suggest that bearing surface compaction be addressed in the foundation notes.

- Soil exposed in the base of all satisfactory foundation trenches should be protected against any detrimental change in conditions such as disturbance from rain, frost, or flooding. Surface runoff water should be drained away from the excavations and not be allowed to pond during construction.

- All footing concrete should be placed during the same day the excavation is made. If this is not possible, then the footing excavation and bearing surface should be adequately protected using a 'mud mat' or other suitable means.

- Roof drainage should be routed away from the structure by positive drainage. Roof runoff should be directed away from the foundation areas and discharged a minimum of 5' away from the foundations with a positive slope away from the building.

- Limiting water intrusion around the building perimeter will be important. Applying "hardscape" such as sidewalks adjacent to the building's exterior walls is preferred to landscaped areas that require regular irrigation. Moisture penetration under slabs and foundation areas will be detrimental to the bearing capacity of the onsite soils.

8.0 FLOOR SLAB SUPPORT CONSIDERATIONS

Capillary Break*: Care should be taken so that fines are not allowed to contaminate the capillary break. If fines contaminate the stone, capillary rise and subsequent damage to moisture sensitive floor covering could occur. Moisture penetration through the slab and subsequent wetting of walls, carpets etc. can also result in other problems such as mold contamination.*

Building Pad Grading: On most project sites, the site grading is generally accomplished early in the construction phase. However as construction proceeds, the subgrade may be disturbed due to utility excavations, construction traffic, desiccation, rainfall, etc. As a result, the floor slab subgrade may not be suitable for placement of sub-base material and concrete and corrective action will be required. We suggest that provisions be included in the project specifications for the contractor to restore the floor slab subgrade soils to an acceptable condition prior to the construction of floor slabs. Subgrade restoration can be challenging (and a source of controversy) if the gravel sub-slab layer is placed early in the construction process, rainwater becomes trapped in the under slab gravel, and construction traffic contributes to rutting of the nearly completed pad.

Final Grading: We recommend the area underlying the floor slabs be rough graded and then thoroughly proofrolled with a loaded dump truck prior to final grading and placement of the sub-base. Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the affected material with properly compacted fill. All floor slab subgrade areas should be moisture conditioned and properly compacted to the recommendations in this report immediately prior to placement of the sub-base and concrete.

Vapor Retarder: The use of a vapor retarder should be considered beneath concrete slabs on grade that will be covered with wood, tile, carpet or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder. Our geotechnical evaluation did not include any detailed evaluation for determining the potential for mold growth inside the building due to the observed subsurface conditions and the site development plan.

Joint Spacing and Slab Design: Based on our experience, wide joint spacing is a common reason for floor slab cracking. Where appropriate, saw-cut control joints should be placed in the slab to help control the

location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or any cracks that develop should be sealed with a water-proof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments. Slab thickness design recommendations and establishing a slab joint pattern were not within our scope of services.

Construction of Slab: Special precautions must be taken during the placement and curing of all concrete slabs. Excessive slump (high water-cement ratio) of the concrete and/or improper curing procedures used during either hot or cold weather conditions could lead to excessive shrinkage cracking or curling of the slabs. Any crack control steel (including wire mesh) included in the slab should be supported permanently in its proper position in the slab during concrete placement to gain maximum benefit.

9.0 GENERAL PAVEMENT RECOMMENDATIONS

A plan showing planned pavements was not provided at the time of the report; however, we anticipate the development will require some like duty parking for the proposed structure. The following should be considered general pavement recommendations.

9.1 PAVEMENT SUBGRADE CONSIDERATIONS

Because the performance and durability of the pavement primarily depends on the support provided by the underlying subgrade material, use of proper soils, compaction and subgrade preparation are the most important element in pavement design and construction. For flexible (asphaltic concrete) pavements, bases and sub-bases provide uniformity of support and strength to distribute the load to the underlying soil over an area greater than the contact area of the tire. The weaker the underlying soil, the greater is the required area of load distribution and greater the required pavement thickness.

Fine grained, plastic soils have detrimental volume change characteristics due to changes in soil moisture content. Silts are susceptible to rutting and pumping upon saturation and may remain susceptible to pumping due to capillary action after paving. Any moisture sensitive soils encountered should be modified by stabilizing agents or undercutting and replacement with better materials. Problems often occur when such soils are present in pockets and also when transitioning from cuts to fills.

9.2 SUBGRADE DRAINAGE

Pavements fail for many reasons, including improper construction, design, or materials. However, one very important cause of failure is poor drainage of the subgrade. Poor drainage, according to AASHTO accounts for 60 percent of all pavement failures. The material under the structural element (asphaltic concrete or PCC) is usually a dense-graded granular base. Such bases are not usually free draining and can become saturated. Saturation of the subgrade and granular base leads to a reduction in load bearing strength and the potential for deformation. Water penetration under the pavement can occur from various sources and we recommend the pavement be designed to prevent the following:

- Ingress via cracks and joints or from unpaved permeable adjoining areas.
- Water pooling at the edges of the pavement and curbs and entering the granular base.
- Excessive runoff from landscape planters or lawn areas.
- Utility lines under the paving.
- Lack of slope on pavement causing pooling on the surface.

Poor draining subgrades such as silts and clays can cause a layer of water to form at the base course/subgrade interface, forming mud slurry. The sensitivity of the subgrade to changes in moisture content depends on the soil composition. Sandy soils are affected least because they have good drainage properties. Silty soils commonly exhibit significant reduction in strength when wetted. When dealing with clay subgrades, both the soil volume and strength can be impacted by an increase in soil water content. Installation of edge drains, interceptor drains and longitudinal drains are measures often considered in pavement design when enhanced drainage is warranted.

9.3 SUBGRADE PROTECTION AND NEWLY CONSTRUCTED PAVEMENTS

Often after the pavement subgrade has been moisture conditioned and prepared, construction traffic and inclement weather cause disturbance of the upper soil. It is essential that the subgrade be restored to a non-yielding condition slightly prior to placement of the pavement base course. Further, the aggregate base course should not be exposed to multiple rain events or freezing temperatures because the strength of the base course can be reduced.

It is a common practice to place pavement binder courses prior to building construction being complete. As a result, heavy traffic associated with construction often crosses incomplete or light-duty parking areas, or the pavements are used as material storage or staging areas, causing rutting and cracking of the partially-completed paving section. The need to treat premature pavement failures associated who was responsible to repair the failed pavement. It is recommended that construction traffic be prohibited from crossing any light-duty or partially-completed pavements, and that designated construction traffic lanes are identified, thereby reducing the amount of binder course that will have to be patched prior to application of the pavement wearing course

10.0 CONSTRUCTION OBSERVATION AND TESTING

Geotechnical engineering is an inexact science due to the potential manmade or natural changes that may have occurred between borings, across the site, or due to the modifying effects of construction or weather. The analysis and recommendations presented in this report are based upon the data obtained from a limited amount of borings performed at the indicated locations and from other information discussed in this report, and because we sample only a limited portion of the soils affecting the performance of the proposed site improvements, variations may occur at other locations throughout the site that will require the geotechnical engineer of record to provide supplementary recommendations. We recommend the owner retain MBA Engineers to provide a construction observation and testing program to assist in determining that certain aspects of construction are being carried out in general conformance with the project plans and specifications, including recommendations from the geotechnical report.

Construction testing commonly includes testing of construction materials such as compacted fill and concrete, inspection of structural steel and wood framing, and engineering observations and testing during the earthwork and foundation construction portions of the project. In addition, Special Inspections, in accordance with the International Building Code (IBC) are usually required during the construction of most structures other than single-family homes. According to current industry practice, if MBA is not retained to provide construction phase observation and testing services, we will cease to be the engineer of record for the project and will assume no responsibility for any potential claim during or

after construction of the project.

Engineering observation and materials testing during the earthwork and foundation construction phases is particularly important because assumptions (and recommendations) have been made based on the soil test borings. Comprehensive geotechnical observation and testing during construction are essential to allow the design engineer the opportunity to confirm that actual subsurface conditions are comparable to the assumed conditions. In actuality, observation during the site preparation, earthwork, and foundation installation phases is an essential part of the subsurface exploration process. Failure to engage the design geotechnical engineer to provide field observation during earthwork and foundation construction would result in an incomplete subsurface exploration and could increase the owner's risk of delays, change orders, and disputes.

The recommended *quality assurance* program would be for the owner's benefit and would not be intended to serve the quality control function for which the general contractor would be responsible. Inspection and testing would be done solely for the owner's benefit and would not relieve the contractor of his contractual obligation to meet the project specification requirements. The contractor would be responsible for his own quality control function, regardless of whether independent testing is conducted by the owner's representative.

11.0 GENERAL REMARKS AND LIMITATIONS

This report has been prepared for the exclusive use of Mayor Mark Mansfield with The City of Centre for specific application to the subject project and is non-transferable to any third party without prior consent from MBA Engineers. All recommendations contained in this report have been made in accordance with generally accepted soil and foundation engineering practices in the area where the services were performed. No other warranties are implied or expressed.

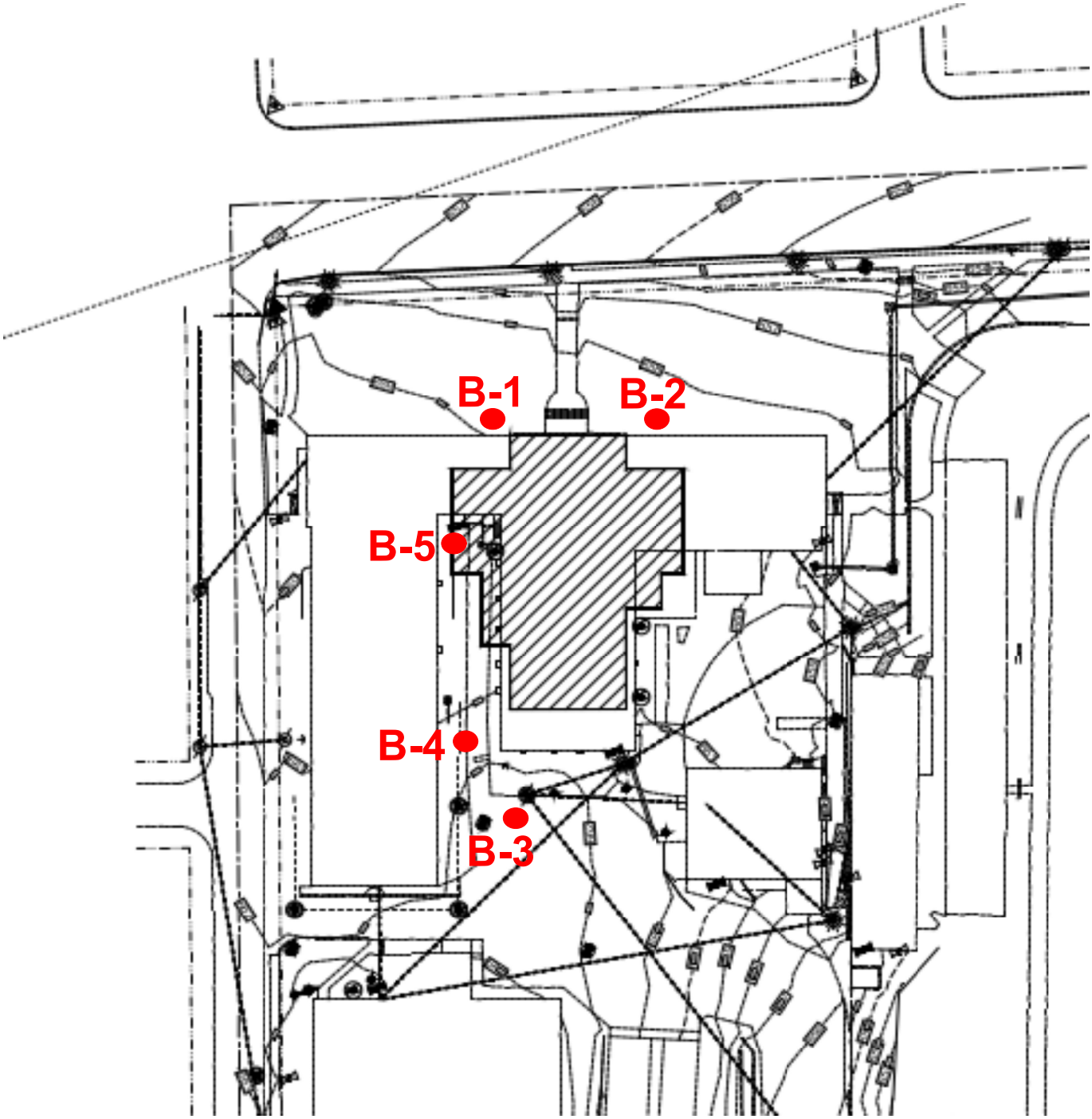
At the time this report was prepared, the site grading plan had not been finalized, and consequently the report may not address all geotechnical-related design issues. In addition, the analysis and recommendations submitted in this report are based, in part, upon the data obtained from a limited number of borings. The nature and extent of variations in soil conditions between the borings may not become evident until construction. If variations then appear evident, it may be necessary to re-evaluate the recommendations of this report

The information contained in this report is not intended, nor is sufficient, for the design of segmental retaining walls. Segmental wall designers/builders should perform independent analysis to determine all necessary soil characteristics (including soil shear strength and bearing capacity) used in wall design. Also, the geotechnical engineer in charge of this project is not a mold prevention consultant; none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention.

It is important that the geotechnical engineer be provided the opportunity to review the final geotechnical related plans and specifications to provide a level of confidence that the recommendations in this report were properly interpreted and incorporated in the design. It will be the client's responsibility to furnish the final grading and foundation plans to MBA Engineers for the necessary review. *If the geotechnical engineer is not accorded the privilege of making this recommended review, he can assume no responsibility for misinterpretation of the recommendations in this report.*

The information contained in this report is for the benefit of the client and to aid the other project professionals in planning and design of the subject project. The report is not intended to serve as a contract document and should not be used as a substitute for a project-specific earthwork or foundation specification. Instead, the input herein should be interpreted and applied to the appropriate specification sections.

An article published by the Geoprofessional Business Association (GBA), titled Important Information About Your Geotechnical Report, has been included in the Appendix. We encourage all individuals to become familiar with the article to help manage risk.



LEGEND

● INDICATES APPROXIMATE LOCATION OF SOIL TEST BORINGS

NOTES

1. THIS DRAWING HAS BEEN ADAPTED FROM THE ARCHITECTURAL SITE PLAN PROVIDED BY TOM MCELRATH WITH THOMAS M. MCELRATH, ARCHITECT AND THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY.

PROJECT NAME:	New City Hall & Municipal Office Facility
PROJECT NO:	G23-024
LOCATION:	Centre, AL
SCALE:	N/A
DATE:	28-Apr-2023
DRAWN BY:	RTT

BORING LOCATION PLAN

MBA ENGINEERS, INC.
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LOG OF BORING

BORING LOCATION: B-1

Project Name: New City Hall & Municipal Office Facility
Project Number: G23-024
Drilling Method: HSA
Equipment Used: Track-Mount
Hammer Type: Automatic

Project Location: Centre, AL
Drilling Date: Apr-18-2023
Weather: Sunny
Logged By: F. Habtemariam
Drill Crew: South Brothers

APPROX. SURFACE ELEV: -ft

DEPTH (feet)	MATERIAL DESCRIPTION	SAMPLE NO.	TYPE	BLOWS/ FOOT	N-VALUE	MOISTURE (%)	LL (%)	PL (%)	PI (%)	PPqu (tsf)	WATER LEVEL	NOTES:
0	Topsoil = 2"											
	Medium-stiff, tan, sandy clay	1	SS	2 - 2 - 3	5	18.0						
5	Soft, wet, tan, silty clay, little rock fragments (Fill)	2	SS	woh - 3 - 8	11*	25.0						* = Exaggerated due to rock fragments
	Very stiff, tan, sandy clay	3	SS	14 - 24 - 32	56	25.0				2.25	▽	
10	Very stiff, red-brown, sandy clay	4	SS	9 - 11 - 21	32					2.00		
15	Dense, red-brown, clayey coarse sand, little river rock fragments	5	SS	15 - 21 - 28	49*							* = Exaggerated due to rock fragments
20	...same... (High Terrace Deposits)	6	SS	16 - 15 - 24	39*							
	Boring Terminated at 20.5'											
25												
30												

Split Spoon Sample
Grab Sample
No Recovery
Rock Coring
Water Table Encountered @ Time of Drilling
Delayed Water Table Level

GNE = Groundwater Not Encountered
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index

MBA ENGINEERS, INC.
STRUCTURAL CIVIL GEOTECHNICAL

LOG OF BORING

BORING LOCATION: B-2

Project Name: New City Hall & Municipal Office Facility
Project Number: G23-024
Drilling Method: HSA
Equipment Used: Track-Mount
Hammer Type: Automatic

Project Location: Centre, AL
Drilling Date: Apr-18-2023
Weather: Sunny
Logged By: F. Habtemariam
Drill Crew: South Brothers

APPROX. SURFACE ELEV: -ft

DEPTH (feet)	MATERIAL DESCRIPTION	SAMPLE NO.	TYPE	BLOWS/ FOOT	N-VALUE	MOISTURE (%)	LL (%)	PL (%)	PI (%)	PPqu (tsf)	WATER LEVEL	NOTES:
0	Topsoil = 2"											
	Soft, wet, light brown, silty clay, trace organics (Fill)	1	SS	1 - 1 - 1	2	14.0						
5	Very stiff, tan, sandy clay	2	SS	5 - 8 - 13	21	20.0				2.50		
	...red-brown...	3	SS	20 - 21 - 39	60	23.0				3.00		
10	...same...	4	SS	14 - 17 - 18	35	19.0						Percent Passing #200 Sieve = 82.1%
15	Dense, red-brown, clayey coarse sand, little river rock fragments	5	SS	17 - 15 - 19	34*							* = Exaggerated due to rock fragments
20	...same... (High Terrace Deposits)	6	SS	19 - 25 - 22	47*							Percent Passing #200 Sieve = 19.0%
	Boring Terminated at 20.5'											
25												
30												

Split Spoon Sample
Grab Sample
No Recovery
Rock Coring
Water Table Encountered @ Time of Drilling
Delayed Water Table Level

GNE = Groundwater Not Encountered
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index

MBA ENGINEERS, INC.
STRUCTURAL CIVIL GEOTECHNICAL

LOG OF BORING

BORING LOCATION: B-3

Project Name: New City Hall & Municipal Office Facility
Project Number: G23-024
Drilling Method: HSA
Equipment Used: Track-Mount
Hammer Type: Automatic

Project Location: Centre, AL
Drilling Date: Apr-18-2023
Weather: Sunny
Logged By: F. Habtemariam
Drill Crew: South Brothers

APPROX. SURFACE ELEV: -ft

DEPTH (feet)	MATERIAL DESCRIPTION	SAMPLE NO.	TYPE	BLOWS/ FOOT	N-VALUE	MOISTURE (%)	LL (%)	PL (%)	PI (%)	PPqu (tsf)	WATER LEVEL	NOTES:
0	Topsoil = 2"											
	Soft, wet, tan, sandy clay (Fill)	1	☒	woh - woh - 2	2	13.0	28	13	14			Percent Passing #200 Sieve = 55.4%
5	Very stiff, tan, sandy clay	2	☒	4 - 9 - 17	26	20.0				2.50		
	...red-brown...	3	☒	16 - 21 - 24	45	23.0				3.00		
10	...same...	4	☒	6 - 11 - 16	27	21.0				2.50		
15	...same...	5	☒	6 - 10 - 9	19					2.00		
20	Stiff, tan, silty clay, trace river rock fragments (High Terrace Deposits)	6	☒	12 - 6 - 7	13					1.50		
	Boring Terminated at 20.5'											GNE
25												
30												

☒ Split Spoon Sample
Grab Sample
No Recovery
Rock Coring
Water Table Encountered @ Time of Drilling
Delayed Water Table Level

GNE = Groundwater Not Encountered
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index

MBA ENGINEERS, INC.
STRUCTURAL CIVIL GEOTECHNICAL

LOG OF BORING

BORING LOCATION: B-4

Project Name: New City Hall & Municipal Office Facility
Project Number: G23-024
Drilling Method: HSA
Equipment Used: Track-Mount
Hammer Type: Automatic

Project Location: Centre, AL
Drilling Date: Apr-18-2023
Weather: Sunny
Logged By: F. Habtemariam
Drill Crew: South Brothers

APPROX. SURFACE ELEV: -ft

DEPTH (feet)	MATERIAL DESCRIPTION	SAMPLE NO.	TYPE	BLOWS/ FOOT	N-VALUE	MOISTURE (%)	LL (%)	PL (%)	PI (%)	PPqu (tsf)	WATER LEVEL	NOTES:
0	Topsoil = 2"											
	Medium-dense, light brown, clayey sand, trace rock fragments (Fill)	1	☒	5 - 12 - 10	22	11.0						
5	Very stiff, red-brown, sandy clay	2	☒	4 - 7 - 14	21	19.0				2.50		
	...same...	3	☒	12 - 18 - 24	42	23.0				3.00		
10	...same...	4	☒	7 - 14 - 21	35	22.0				3.00		
15	...same...	5	☒	6 - 10 - 11	21					2.25		
20	Very dense, tan, clayey coarse sand (High Terrace Deposits)	6	☒	30 - 50/5 - x	50/5*							* = Exaggerated due to rock fragments
	Boring Terminated at 20.5'											GNE
25												
30												

☒ Split Spoon Sample
Grab Sample
No Recovery
Rock Coring
Water Table Encountered @ Time of Drilling
Delayed Water Table Level

GNE = Groundwater Not Encountered
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index

MBA ENGINEERS, INC.
STRUCTURAL CIVIL GEOTECHNICAL

LOG OF BORING

BORING LOCATION: B-5

Project Name: New City Hall & Municipal Office Facility
Project Number: G23-024
Drilling Method: HSA
Equipment Used: Track-Mount
Hammer Type: Automatic

Project Location: Centre, AL
Drilling Date: Apr-18-2023
Weather: Sunny
Logged By: F. Habtemariam
Drill Crew: South Brothers

APPROX. SURFACE ELEV: -ft

DEPTH (feet)	MATERIAL DESCRIPTION	SAMPLE NO.	TYPE	BLOWS/ FOOT	N-VALUE	MOISTURE (%)	LL (%)	PL (%)	PI (%)	PPqu (tsf)	WATER LEVEL	NOTES:
0	Topsoil = 2"											
	Soft, brown-gray, sandy clay, little rock fragments (Fill)	1	☒	3 - 5 - 4	9*	23.0	25	15	10			Percent Passing #200 Sieve = 70.2%
5	Stiff, red-brown, sandy clay	2	☒	4 - 5 - 8	13	20.0				1.50		
	Very stiff, red-brown, sandy clay	3	☒	11 - 17 - 20	37	22.0				3.00		
10	...same...	4	☒	8 - 13 - 16	29	23.0				2.75		
15	Very dense, tan, clayey coarse sand	5	☒	10 - 13 - 13	26							
20	...same... (High Terrace Deposits)	6	☒	9 - 13 - 18	31							
	Boring Terminated at 20.5'											GNE
25												
30												

☒ Split Spoon Sample
Grab Sample
No Recovery
Rock Coring
Water Table Encountered @ Time of Drilling
Delayed Water Table Level

GNE = Groundwater Not Encountered
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org

TABLE OF CONTENTS

TECHNICAL SPECIFICATIONS

A NEW CITY HALL AND MUNICIPAL OFFICE FACILITY

FOR

THE CITY OF CENTRE

Prepared by:

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James Payton, P.E.

LADD ENVIRONMENTAL

Providing Engineering Solutions

FEBRUARY 2024

SECTION 02060

STRUCTURE DEMOLITION

PART 1 GENERAL

1.01 Section Includes

A. Demolition of designated structures and removal of materials from site.

B. Demolition and removal of foundations and slabs-on-grade.

C. Disconnecting and capping of identified utilities.

1.02 Related Sections

A. Applicable to Work of this Section are the Drawings and General Provisions of the Contract.

1.03 Project Record Documents

A. Accurately record actual locations of capped utilities and subsurface obstructions.

1.04 Regulatory Requirements

A. Conform to applicable code for demolition of structures, safety of adjacent structures, dust control, runoff control and disposal.

B. Obtain required permits from authorities.

C. Notify affected utility companies before starting Work and comply with their requirements.

D. Do not close or obstruct roadways without permits.

E. Conform to applicable regulatory procedures when discovering hazardous or contaminated materials.

1.05 Scheduling

A. Schedule Work as appropriate to coincide with site excavation work and new construction.

B. Schedule Work to allow existing facilities to remain in operation as necessary and required by the Owner.

PART 2 PRODUCTS - NOT USED.

PART 3 EXECUTION

3.01 Preparation

A. Provide, erect, and maintain temporary barriers and security devices as required.

B. Protect existing structures which are not to be demolished.

C. Prevent movement or settlement of adjacent structures. Provide bracing and shoring.

D. Mark location of utilities.

E. Evaluate contents of all wetwells, piping, structures and other elements to be demolished and take appropriate actions to protect health and safety of the Contractor's, Owner's, Engineer's personnel and any other on-site personnel, as well as the general public. The Contractor is advised that the contents of certain elements may be hazardous, toxic, explosive, flammable or harmful to plants, humans, animals or aquatic life.

F. Determine all equipment and materials which the Owner wishes to retain.

3.02 Demolition Requirements

A. Conduct demolition to minimize interference with adjacent structures.

B. Cease operations immediately if adjacent structures appear to be in danger. Notify Engineer. Do not resume operations until safe.

C. Conduct operations with minimum interference to public or private accesses.

3.03 Demolition

A. The General Contractor and any demolition subcontractor shall comply with all licensing requirements of the Alabama General Contractor's Board, including the proper license category.

B. Contractor is responsible for demolition of all buildings on the site as shown on the plans. Contractor is fully responsible for demolition and disposal of all removed materials including asbestos containing materials, lead paint and other materials of concern noted in the Pre-Demolition Asbestos Survey.

C. An available report on the site is a Pre-Demolition Asbestos Survey prepared in 2020 and is included herein.

D. Contractor is completely responsible for submission of ADEM Form 496 included herein and all requirements of ADEM. The required 10-day notification shall be timed to coincide with the start date of the Contract.

E. Contractor is completely responsible for all asbestos removal and disposal to meet all applicable regulations. The available Pre-Demolition Asbestos Survey is provided for the Contractor's information, but there is no certification that all asbestos containing materials on the site are included. Contractor is advised to visit the site prior to bid to familiarize with the site conditions and the existing materials on-site. No additional payment will be approved based on materials found during demolition varying from any available reports or from what is found during pre-bid inspections. The bid is lump sum for all demolition and debris disposal.

F. Contractor shall completely remove all structures on the site as detailed herein including all concrete floors and footers for the Buildings and basement.

G. All debris including vegetation within the site shall be removed and disposed of as detailed on the Plans.

H. Any buried utilities discovered during demolition shall be flagged or marked in a semi-permanent manner with paint and/or flagging. Refer to the Plans for required demolition or abandonment of utilities.

I. All debris removed from the site including building materials, contents of the buildings, brick

and vegetation shall be disposed of off-site in an approved landfill. Receipts of dumping for all debris shall be provided to the Owner prior to approval of payment. Contractor is responsible for all required disposal fees. Burning on-site is prohibited.

J. Contractor may salvage materials from the building provided they are non-hazardous and are properly removed and stored off-site. Contractor shall detail any materials proposed to be salvaged prior to commencement of demolition work including the proposed location where the material will be hauled.

K. Contractor is responsible for safety on the site from the beginning of demolition procedures until all work is complete including control of access to the site during demolition and removal of materials. All access to the site shall be blocked with temporary chain link fencing (minimum 6 ft. high) including lockable gates to discourage access by the public. Contractor is not required to provide 24-hour security. The Contractor shall coordinate the demolition schedule with the City and its police department so that officers may be aware of the activities.

L. All bidders are advised to make a site visit prior to bid to become familiar with the site.

M. Site Address: The project site is located on 350 East Main Street, Centre, Alabama.

N. Bidders are advised to read in detail the available report on asbestos containing materials (ACM). Contractor is responsible for following the recommended and standard practices for safely removing and disposing of both ACM and non-ACM material including mercury thermostats, fluorescent and HID lights and ballasts. Some of these items may have been removed since the report was prepared.

O. Excavated areas including for footers and the basement shall be backfilled as detailed elsewhere in the Contract Documents.

3.04 Existing Equipment and Materials to be Retained by Owner **– NOT APPLICABLE.**

[5200]
[REV12/00]

END OF SECTION

SECTION 02110

SITE CLEARING

PART 1 GENERAL

1.01 Section Includes

A. Removal of surface debris.

B. Removal of paving, curbs, gutters, sidewalks and similar concrete or masonry structures.

C. Site clearing of plant life and grass.

D. Removal of trees and shrubs.

E. Removal of root system of trees and shrubs.

1.02 Related Sections

A. Applicable to Work of this Section are the Drawings and General Provisions of the Contract.

1.03 Regulatory Requirements

A. Conform to applicable code for disposal of debris, burning debris on site and related items.

PART 2 PRODUCTS - NOT USED.

PART 3 EXECUTION

3.01 Preparation

A. Verify that existing plant life designated to remain is tagged or identified.

3.02 Protection

A. Locate, identify, and protect utilities that remain from damage.

B. Protect trees, plant growth, and features designated to remain as final landscaping.

C. Protect bench marks and existing structures from damage or displacement.

3.03 Clearing

A. Clear areas required for access to site and execution of Work.

B. Remove paving, curbs, sidewalks and concrete structures.

C. Remove trees and shrubs. Remove stumps.

D. Clear undergrowth and deadwood without disturbing subsoil.

3.04 Removal

A. Remove debris, rock and extracted plant life from site.

3.05 Topsoil Excavation

A. See Section 02205.

[5200]
[Rev. 01/2021]

END OF SECTION

SECTION 02205

TOPSOIL

PART 1 GENERAL

1.01 Section Includes

A. Preparing for topsoil application.

B. Stripping topsoil from site and storing in designated areas.

C. Spreading of topsoil prior to seeding.

1.02 Related Sections

A. Applicable to Work of this Section are the Drawings and General Provisions of the Contracts.

1.03 References

A. Alabama Department of Transportation Standard Specifications for Highway Construction (ALDOT Standard Specifications).

PART 2 PRODUCTS

2.01 Materials

A. Topsoil: The natural, workable, friable, loamy surface layer of soil without admixture of subsoil, refuse, or foreign materials. The topsoil shall be free from hard lumps, stiff clay, hardpan, gravel, noxious weeds, brush or other undesirable materials. The topsoil shall be suitable for growing grasses and other ground covers.

B. On-site Topsoil: The existing on-site topsoil material; meeting the requirements as noted above for topsoil.

C. Off-site Topsoil: Topsoil furnished by the Contractor from an off-site location or stockpile which meets the requirements as noted above for topsoil.

PART 3 EXECUTION

3.01 Examination

A. Areas to be stripped shall be all disturbed areas and any other areas as designated on the Drawings.

3.02 Topsoil Excavation and Stockpiling

A. As specified under Section 02211 - Rough Grading.

B. Prior to stripping of topsoil from designated areas, all vegetation, briars, stumps, large roots, rubbish, stones and similar materials shall be removed.

3.03 Topsoil Placement

A. Spread evenly on prepared area to uniform depth of 2 inches after compaction.

B. No spreading where gravel or topsoil is frozen, excessively wet or in any condition detrimental to its placement.

C. All large stiff clods and hard lumps shall be broken and pulverized.

D. Manually spread topsoil close to trees, plants and buildings to prevent damage.

E. After placement the entire topsoiled area shall be harrowed. Any remaining clods, hard lumps, rocks, roots and other objectionable matter shall be removed.

F. Final compaction (using on-site construction equipment approved by Engineer) of the topsoil application, after removal of all objectionable material will be required unless the seeding operation immediately follows.

G. Topsoil will be graded to eliminate rough, low or soft areas and to ensure positive drainage.

H. On-site topsoil will be used for topsoil placement to the maximum extent possible. Use of off-site topsoil will require approval of the Engineer of the topsoil source prior to hauling and placement.

I. Remove surplus topsoil and subsoil from site. Leave stockpile area and site clean and raked ready to receive landscaping or seeding.

[5200]
[9/93]

END OF SECTION

SECTION 02211

ROUGH GRADING, COMPACTED FILL
AND COMPACTION TESTING

PART 1 GENERAL

1.01 Section Includes

A. Removal of topsoil and subsoil.

B. Cutting, grading, filling, and rough contouring the site.

C. Compacted fill.

D. Frequency of testing.

1.02 Related Sections

A. Applicable to Work of this Section are the Drawings and General Provisions of the Contract.

1.03 References

A. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 Pound Rammer and 12 Inch Drop (Standard Proctor).

B. ANSI/ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method (Compaction).

C. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 Pound Rammer and 18 Inch Drop (Modified Proctor).

D. ANSI/ASTM D2922 - Test Method for Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth).

1.04 Submittals

A. Samples: Submit 10 lb sample of each type of fill to testing laboratory, in air-tight containers.

B. Notify Engineer prior to taking sample so that Engineer may observe procedure as deemed necessary.

1.05 Project Record Documents

A. Accurately record actual locations of utilities remaining, by horizontal dimensions, elevations or inverts, and slope gradients.

PART 2 PRODUCTS

2.01 Materials

A. Topsoil: Excavated material, graded, free of roots, rocks larger than 1 inch, subsoil, debris, rubble and large weeds, as specified in detail in Section 02205.

B. Subsoil: Excavated material, graded, free of lumps larger than 6 inches, rocks larger than 2 inches, debris, rubble and similar extraneous materials. See Section 02223.

C. Granular Fill: Type A crushed aggregate or Type B coarse aggregate or Type D sand as specified in Section 02223 (See Drawings).

PART 3 EXECUTION

3.01 Examination

A. Verify that survey benchmark and intended elevations for the Work are as shown on Drawings.

3.02 Preparation

A. Identify required lines, levels, contours, and datum.

B. Identify known underground, above ground, and aerial utilities. Stake and flag locations.

C. Notify utility company to remove or relocate utilities.

D. Protect above and below grade utilities which are to remain.

E. Protect plant life, lawns, and other features remaining as a portion of final landscaping.

F. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.

3.03 Topsoil Excavation

A. Excavate topsoil from areas to be further excavated, re-landscaped or re-graded.

B. Stockpile in area designated on site. Remove excess topsoil not being reused from site.

C. Do not excavate wet topsoil.

D. Stockpile topsoil to depth not exceeding 8 feet.

3.04 Subsoil Excavation

A. Excavate subsoil from areas to be further excavated, re-landscaped or re-graded.

B. Stockpile in area designated on site. Remove excess subsoil not being reused from site.

C. Do not excavate wet subsoil.

D. Stockpile subsoil to depth not exceeding 8 feet.

3.05 Filling

A. Fill areas to contours and elevations with unfrozen materials.

B. Compacted Granular Fill: Place and compact materials in continuous loose lift layers not exceeding 6 inches, compacted to 95 percent of the Standard Proctor maximum dry density, unless otherwise indicated.

C. Compacted Subsoil and Topsoil Fill: Place and compact material in continuous loose lift layers not exceeding 8 inches compacted depth, compacted to 95 percent of the Standard Proctor maximum dry density, unless otherwise indicated.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. See Report of Subsurface Exploration and Geotechnical Environmental Evaluation.

F. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise.

G. Make grade changes gradual. Blend slope into level areas.

H. Remove surplus fill materials from site.

I. See Section 02222 and Section 02223.

3.06 Tolerances

A. Top Surface of Subgrade: Plus or minus 0.1 foot.

3.07 Field Quality Control

A. Tests and analysis of fill material will be performed in accordance with ANSI/ASTM D698 (Standard Proctor) and with Division No. 1.

B. Compaction testing will be performed in accordance with ANSI/ASTM D1556, ANSI/ASTM D698 and shall be in accordance with Division No. 1.

C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

E. Frequency of Compaction Tests

1. Mass Earthwork: One test per each 2500 square feet placed per each eight inch lift.

2. Footing and Foundation: Minimum one test per each 8 inch lift for each 50 linear feet. Where backfill not required, minimum one test per each 50 linear feet. Minimum one test per structure. Engineer may, at Contractors expense, request additional compaction tests at any time if integrity of base/subbase is suspect.

3. Slab-On-Grade: Minimum one test per each 8 inch lift for each 500 square feet. Where backfill not required, minimum one test per each 500 square feet. Minimum one test per structure. Engineer may, at Contractors expense, request additional compaction tests at any time if integrity of base/subbase is suspect.

4. Yard Piping Bedding and Backfill: Minimum one test each for bedding, haunching, initial backfill and final backfill for each 500 linear feet of pipe installed. Engineer may, at Contractor's expense, require additional compaction tests at any time if integrity of compacted bedding or backfill is suspect (see Section 02225).

E. Location of Tests

1. Engineer, in conjunction with test lab technician, will determine location of compaction tests.

[5200]
[9/97]

END OF SECTION

SECTION 02222

EXCAVATION

PART 1 GENERAL

1.01 Section Includes

A. Excavation for building foundations.

B. Excavation for slabs-on-grade, paving and landscaping.

C. Excavation for site structures.

1.02 Related Sections

A. Applicable to Work of this Section are the Drawings and General Provisions of the Contract.

1.03 Field Measurements

A. Verify that survey benchmark and intended elevations for the Work are as shown on Drawings.

PART 2 PRODUCTS - NOT USED.

PART 3 EXECUTION

3.01 Preparation

A. Identify required lines, levels, contours, and datum.

3.02 Excavation

A. Underpin adjacent structures which may be damaged by excavation work, including utilities and pipe chases.

B. Excavate subsoil required to accommodate building foundations, slabs-on-grade, paving, site structures and construction operations.

C. Excavate to working elevations for piling work. Coordinate special requirements for piling.

D. Machine slope banks to angle of repose or less, until shored. Contractor shall determine and provide the minimum slope required for safety.

E. Excavation cut not to interfere with normal 45 degree bearing splay of foundation.

F. Grade top perimeter of excavation to prevent surface water from draining into excavation.

G. Hand trim excavation. Remove loose matter.

H. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume. See Section 02229 for definition of site rock and its removal.

I. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume Work.

J. Correct unauthorized excavation at no extra cost to Owner.

K. Correct Areas Over-Excavated by Error

1. In area where structures are to bear on bed rock, over-excavation shall be corrected by installing Lean Concrete (see Section 02223).

2. In areas where structures are to bear on residual soil, Type A crushed aggregate (see Section 02223) shall be installed in minimum 6 inch loose fill layers and compacted to a minimum of 95 percent of the Standard Proctor maximum dry density and the same bearing capacity of the residual soil shall be obtained.

L. Stockpile excavated material in area designated on site and remove excess material not being reused from site.

3.03 Field Quality Control

A. An Independent Testing shall be utilized to monitor the excavation for each structure and to assure by test and reports that the bearing capacity indicated on the Drawings, the Report of Geotechnical Exploration or elsewhere within the Contract Documents, has been obtained.

B. Provide for visual inspection of bearing surfaces.

C. Required bearing capacities for the Project shall be as indicated on the Drawings.

D. Frequency of Bearing Capacity Test: Same as for Compaction Testing (See Section 02211).

3.04 Protection

A. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

C. OSHA Construction Standards for Excavations (29CFR Part 1926.650.652 Subpart P) and all other OSHA Regulations shall be adhered to by the Contractor.

D. Contractor shall take all necessary and appropriate measures to continuously protect all personnel at or near site at all times including Contractor's, Owner's and Engineer's personnel, other on-site personnel, visitors and the general public, both during active and inactive construction periods.

[5200]
[9/93]

END OF SECTION

SECTION 02223

BACKFILLING

PART 1 GENERAL

1.01 Section Includes

A. Building perimeter and site structure backfilling to subgrade elevations.

B. Site filling and backfilling.

C. Fill under slabs-on-grade and paving.

D. Consolidation and compaction.

E. Fill for over-excavation.

1.02 Related Sections

A. Applicable to Work of this Section are the Drawings and General Provisions of the Contract.

1.03 References

A. ANSI/ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.

B. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb Rammer and 12 inch Drop.

C. ANSI/ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

D. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18 inch Drop.

E. Alabama Department of Transportation Standard Specification of Highway Construction (ALDOT Standard Specifications).

F. ANSI/ASTM D2922 - Test Method for Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth).

1.04 Submittals

A. Samples: Where required by Engineer, submit 10 pound sample of each type of fill to testing laboratory in air-tight containers.

B. Notify Engineer prior to taking sample so that Engineer may observe procedure as deemed necessary.

PART 2 PRODUCTS

2.01 Fill Materials

A. Type A - Crushed Aggregate: Pit run, natural stone (crusher run); free of shale, clay, friable material, sand, debris; graded in accordance with ANSI/ASTM C136 within the following limits and meeting the requirements of ALDOT Standard Specifications, Section 801, Size No. 410:

SIEVE SIZE	PERCENT PASSING
2 Inches	100
1½ Inches	85 to 100
1 Inch	60 to 85
1/2 Inch	30 to 60
No. 4	18 to 30
No. 8	11 to 20
No. 16	8 to 15
No. 50	5 to 9
No. 200	2 to 6

B. Type B - Coarse Aggregate: Natural stone; washed, free of clay, shale, organic matter; graded in accordance with ANSI/ASTM C136, to the following limits and meeting the requirements of ALDOT Standard Specifications, Section 801, Size No. 6.

SIEVE SIZE	PERCENT PASSING
1 Inch	100
3/4 Inch	90 to 100
1/2 Inch	20 to 55
3/8 Inch	0 to 15
No. 4	0 to 5

C. Type C - Coarse Aggregate: Natural stone; washed, free of clay, shale, organic matter; graded in accordance with ANSI/ASTM C136, to the following limits and meeting the requirements of ALDOT Standard Specifications, Section 801, Size No. 5.

SIEVE SIZE	PERCENT PASSING
1-1/2 Inch	100
1 Inch	90 to 100
3/4 Inch	20 to 55
1/2 Inch	0 to 10
3/8 Inch	0 to 5

D. Type D - Sand: Natural river or bank sand; washed, free of silt, clay, loam, friable or soluble materials or organic matter; graded in accordance with ANSI/ASTM C136, within the following limits:

SIEVE SIZE	PERCENT PASSING
No. 4	100
No. 14	10 to 100
No. 50	5 to 90
No. 100	4 to 30
No. 200	0

E. Subsoil: Reused or imported, graded, free of lumps larger than 6 inches, free of rocks, boulders and gravel larger than 2 inch size, debris, rubble and similar extraneous materials determined by the Engineer to be detrimental to the facility installed.

F. Concrete: Lean concrete, structural concrete conforming to Division No. 3 with a minimum compressive strength of 2000 psi.

PART 3 EXECUTION

3.01 Examination

A. Verify fill materials to be reused are acceptable.

B. Verify that foundation perimeter drainage, storm drainage and utility piping installations have been inspected.

C. Verify underground tanks are anchored to their own foundation to avoid floatation after backfilling.

3.02 Preparation

A. Generally, compact subgrade to density requirements for subsequent backfill materials.

B. Cut out soft areas of subgrade not capable of in situ compaction. Backfill with Type A aggregate fill (6 inch minimum) and compact to density equal to or greater than requirements for subsequent backfill material.

C. Prior to placement of aggregate base course material at gravel paved areas, compact subsoil to 95 percent standard proctor maximum dry density in accordance with ANSI/ASTM D698.

D. Unless otherwise indicated or specified, in areas where a majority of the foundation is bearing in rock, a uniform foundation bearing capacity shall be obtained as specified on the Drawings by installing Lean Concrete down to rock elevation (see Drawings).

E. Unless otherwise indicated or specified, in areas where a majority of the foundation is on residual soil, a uniform foundation bearing capacity shall be obtained as specified or as indicated on the Drawings by undercutting the rock and installing layers of compacted Type A crushed aggregate (compacted to 95 percent Standard Proctor Maximum Dry Density) as directed by an independent testing firm to obtain the specified bearing capacity as shown on the Drawings.

3.03 Backfilling

A. Backfill areas to contours and elevations with unfrozen materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

C. Granular Fill (Type A, B and C Aggregate, and Type D Sand): Place and compact materials in continuous layers not exceeding 6 inches compacted depth.

D. Soil Fill: Place and compact material in continuous layers not exceeding 6 inches compacted depth.

E. Employ a placement method that does not disturb or damage foundation perimeter drainage, foundation dampproofing, foundation waterproofing and utilities in trenches.

F. Maintain optimum moisture content of backfill materials to attain required compaction density (see Section 02211).

G. Backfill against supported foundation walls. Do not backfill against unsupported foundation walls.

H. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

I. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise.

J. Make grade changes gradual. Blend slope into level areas.

K. Remove surplus backfill materials from site.

L. Leave fill material stockpile areas completely free of excess fill materials.

3.04 Tolerances

A. Top Surface of Backfilling Under Paved Areas: Plus or minus one inch from required elevations.

3.05 Field Quality Control

A. Field inspection and testing will be performed under provisions of Section 01400.

B. Tests and analysis of fill material will be performed in accordance with ANSI/ASTM D698.

C. Compaction testing will be performed in accordance with ANSI/ASTM D1556.

D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

E. Frequency of Tests: See Section 02211.

F. Proof roll compacted fill surfaces under slabs-on-grade and paving.

3.06 Protection of Finished Work

A. Recompact fills subjected to vehicular traffic.

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[Rev. 07/2022]

END OF SECTION

SECTION 02226

UTILITY TRENCHING, BEDDING AND BACKFILLING

PART 1 GENERAL

1.01 Section Includes

A. Excavate trenches for utilities.

B. Compacted bedding under fill over utilities.

C. Backfilling and compaction.

1.02 Related Sections

A. Applicable to Work of this Section are the Drawings and General Provisions of the Contract.

1.03 References

A. ANSI/ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.

B. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb Rammer and 12 inch Drop.

C. ANSI/ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

D. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18 inch Drop.

E. ANSI/AWWA C600 - Installation of Ductile Iron Water Mains and Their Appurtenances.

F. AWWA Manual No. M23 - PVC Pipe Design and Installation.

G. Handbook of PVC Pipe Design and Construction by Uni-Bell Plastic Pipe Association.

H. OSHA Construction Standard for Excavations - 29CFR Part 1926.650.652 Subpart P.

1.04 Field Measurements

A. Verify that survey benchmark and intended elevations for the Work are as shown on Drawings.

PART 2 PRODUCTS

2.01 Fill Materials

A. Type A - Crushed Aggregate: Pit run, natural stone (crusher run); free of shale, clay, friable material, sand, debris; graded in accordance with ANSI/ASTM C136 within the following limits and meeting the requirements of ALDOT Standard Specifications, Section 801, Size No. 410:

SIEVE SIZE	PERCENT PASSING
2 Inches	100
1-1/2 Inches	85 to 100
1 Inch	60 to 85
1/2 Inch	30 to 60
No. 4	18 to 30
No. 8	11 to 20
No. 16	8 to 15
No. 50	5 to 9
No. 200	2 to 6

B. Type B - Coarse Aggregate: Natural stone; washed, free of clay, shale, organic matter; graded in accordance with ANSI/ASTM C136, to the following limits and meeting the requirements of ALDOT Standard Specifications, Section 801, Size No. 6.

SIEVE SIZE	PERCENT PASSING
1 Inch	100
3/4 Inch	90 to 100
1/2 Inch	20 to 55
3/8 Inch	0 to 15
No. 4	0 to 5

C. Type C - Coarse Aggregate: Natural stone; washed, free of clay, shale, organic matter; graded in accordance with ANSI/ASTM C136, to the following limits and meeting the requirements of ALDOT Standard Specifications, Section 801, Size No. 5.

SIEVE SIZE	PERCENT PASSING
1-1/2 Inch	100
1 Inch	90 to 100
3/4 Inch	20 to 55
1/2 Inch	0 to 10
3/8 Inch	0 to 5

D. Type D - Sand: Natural river or bank sand; washed: free of silt, clay, loam, friable or soluble materials or organic matter; graded in accordance with ANSI/ASTM C136, within the following limits:

SIEVE SIZE	PERCENT PASSING
No. 4	100
No. 14	10 to 100
No. 50	5 to 90
No. 100	4 to 30
No. 200	0

E. Subsoil: Reused or imported, graded, free of lumps larger than 6 inches, free of rocks, boulders and gravel larger than 3 inch size, debris, rubble and similar extraneous materials determined by the Engineer to be detrimental to the facility installed.

F. Concrete: Lean concrete or structural concrete, minimum, compressive strength of 2000 psi.

PART 3 EXECUTION

3.01 Examination

A. Verify that fill materials to be used or reused are acceptable by Engineer.

3.02 Preparation

A. Identify required lines, levels, contours and datum.

B. Maintain and protect existing utilities remaining, which pass through work area.

C. Protect plant life, lawns and other features remaining as a portion of final landscaping.

D. Protect bench marks, existing structures, fences, sidewalks, paving and curbs from excavation equipment and vehicular traffic.

E. Protect above and below grade utilities which are to remain.

3.03 Excavation

A. Excavate subsoil required for utility piping or conduits.

B. Earth Excavation: Width of trench below top of pipe or conduit shall not be any greater than that necessary to provide room for pipelaying, jointing, bedding, haunching and compacting. Cut trenches only sufficiently wide to enable installation of utilities and allow inspection; maintain as narrow as practical (See 3.03J).

C. Rock Excavation: Width of trench below top of pipe or conduit must be at least 12 inches wider than the pipe diameter regardless of the method used for rock excavation.

D. Excavation shall not interfere with normal 45 degree bearing splay of foundations.

E. Hand trim excavation as necessary. Hand trim for bell and spigot pipe joints. Remove loose matter.

F. Remove lumped subsoil, boulders and rock up to 1/3 cubic yard, measured by volume. See Section 02229 for definition of size rock and its removal.

G. Correct unauthorized excavation at no cost to Owner.

H. Correct areas over-excavated by error with Type A crushed aggregate or Type B coarse aggregate as instructed by the Engineer.

I. Where unstable or flowing soil condition is encountered in the trench wall, stabilization will be required before laying pipe.

J. All trenches and particularly deep trenches (4 feet or more in depth) will be constructed with the safety of the construction workmen uppermost in mind. Trench walls shall be sloped or sheeted, shored, braced or similarly protected against unstable or flowing soil conditions as required by OSHA Construction Standard for Excavations.

K. Construction trenching shall be in accordance with AWWA Manual No. M23, ANSI/AWWA C600 or Handbook of PVC Pipe Design and Construction, except as modified in the Specifications.

L. When an unstable trench subgrade condition is encountered, which in the opinion of the Engineer will provide inadequate pipe support, the unsuitable material shall be removed and replaced with suitable

foundation material (Type A or B aggregate, Section 02226, as approved by the Engineer) prior to placing any bedding material.

M. Trenches shall be dewatered by pumping or other suitable means prior to any bedding or pipelaying.

3.04 Bury

A. The critical controls for bury on a pipeline crossing are the low points in the highway cross-section. Usually, these are the bottoms of the longitudinal ditches.

B. In establishing the depth of bury below an unpaved ditch, consideration should be given to potential increases in ditch depth, resulting from scour, ditch measurement operations or the need to increase the capacity of the ditch.

C. On longitudinal installation, the critical controls for bury are the depths of lateral drainage facilities, landscaping, buried utility lines, bridge structures and likely highway maintenance operation.

D. See highway permits for each specific installation.

E. Unless indicated otherwise, the normal controls for the bury of the pipeline within the highway right-of-way are as follows:

1. The minimum bury under ditches shall be 36 inches on freeways and high-grade highways and 30 inches on all other highways, unless otherwise indicated.

2. Where ditches are not involved, such as curb and gutter sections, the minimum bury under pavement for new or relocated installations shall be 4 feet, unless otherwise indicated.

3. The minimum bury for utility installation within the highway rights-of-way shall be 36 inches on freeway rights-of-way and other high-grade highways and 30 inches within the rights-of-way limits on all other types of highways, unless otherwise indicated.

4. Where less than minimum bury is necessary because of other utilities, water tables, ordinances or similar reason, the pipe shall be re-routed or else protected with a casing or concrete slab not in contact with the pipeline or use shall be made of other suitable measures acceptable to the Alabama Department of Transportation (ALDOT). Where less than minimum bury is necessary, the utility or Contractor shall supply ALDOT the necessary documentation to show that minimum bury cannot be attained.

5. Cover for pipelines carrying transmittances which are flammable, corrosive, expansive, energized or unstable, particularly if carried at high pressure or potential, should not be reduced below the minimum bury outlined in these standards.

3.05 Bedding

A. Bedding shall be placed as required for the type of pipe (pressure or gravity, plastic or ductile iron) and excavation (earth or rock) as specified herein. Bedding as specified for fill materials in this Section. Piping to be supported during placement and compaction of bedding fill. All bedding to be firm, stable and level.

B. Compaction: Bedding to be compacted to minimum 90 percent Standard Proctor Maximum Dry Density; minimum 95 percent Standard Proctor Maximum Dry Density under structures, concrete, pavement and streets (traffic area). Testing frequency see Field Quality Control.

C. Plastic Piping

1. Pressure Piping - Earth Excavation: Stable, firm, level, trench bottom providing uniform support for full length of pipe. Trench subsoil (free of rocks, boulders, rubble, cinders, ashes or debris which may be considered by the Engineer detrimental to the piping) may be used.

2. Pressure Piping - Rock Excavation: Minimum 6 inches compacted subsoil either excavated from trench or imported, meeting the approval of the Engineer, may be used. Contractor, at his option, may utilize Type A crushed aggregate (crusher run) or Type D sand.

3. Gravity (Non-Pressure) Piping - Earth or Rock Excavation: Minimum 6 inches compacted Type A crushed or Type B coarse aggregate used for cushioning and leveling purposes, as approved by the Engineer.

4. Pressure or Gravity Piping - Open Cut Under Concrete, Pavement or Streets (Traffic Area): Minimum 6 inches compacted Type A crushed aggregate (crusher run).

D. Ductile Iron or Steel Piping

1. Pressure Piping - Earth Excavation: Stable, firm, level trench bottom providing uniform support for full length of pipe. Trench subsoil (free of rocks, boulders, rubble, cinders, ashes and similar debris which may be considered by the Engineer to be detrimental to the piping) may be used unless otherwise indicated.

2. Pressure Piping - Rock Excavation: Minimum 6 inch Type D sand or Type A crushed aggregate (crusher run). Bedding shall be level and compacted.

3. Gravity Piping - Earth or Rock Excavation: Minimum 6 inches compacted Type A crushed or Type B coarse aggregate as approved by the Engineer used for cushioning and leveling.

4. Pressure or Gravity Piping - Open Cut Under Concrete, Pavement or Streets (Traffic Area): Minimum 6 inches compacted Type A crushed aggregate (crusher run).

3.06 Backfilling

A. Backfill Material: See Part 2 of this Section.

B. Backfill only after locations of pipe, valves and appurtenances have been recorded and the pipelaying, jointing and bedding have been approved by the Engineer.

C. Frozen backfill materials will not be used.

D. Backfill trenches to contours and elevations as shown, or to top of initial existing grade if no elevation is shown on Drawings. Windrow fill over trench to be provided to allow for natural settlement of the compacted fill unless otherwise indicated.

E. Compaction of Backfill (Haunching, Initial and Final): Same as specified for Bedding.

F. Haunching Backfill

1. Pressure Piping: Same as bedding material (unless otherwise indicated in the specific piping section), compacted in maximum 6 inch layers to springline of pipe. Work in and around pipe to provide uniform support, fill all voids and prevent future movement or settling.

2. Small Diameter Pressure Piping: Compacted haunching backfill not required in shallow (less than 5 feet deep) narrow trenches for small diameter (6 inch and less) pressure plastic or ductile iron pipe installation unless directed otherwise by the Engineer.

3. Gravity Sewer Piping: See Section 02732.

4. Storm Water Piping: See Section 02722.

G. Initial Backfill

1. Pressure Piping

a. Subsoil excavated from trench, or imported meeting Specifications and approval of Engineer.

b. No rocks, boulders, rubble, cinders, ashes or any debris which in the opinion of the Engineer may be detrimental to the pipe, will be placed as initial backfill.

c. Initial backfill to be placed mechanically and compacted in maximum 6 inch layers around pipe and minimum 1 foot above top of pipe. Care shall be taken not to damage the pipe.

d. In rock excavation, imported topsoil or subsoil meeting the approval of the Engineer will be required. Excavated rock during trenching operations, whether demolition required or not, will not be utilized for initial backfill.

e. See 3.07 for road crossings.

2. Gravity Sewer Piping: See Section 02732.

3. Storm Water Piping: See Section 02722.

H. Final Backfill

1. The final backfill may be the on-site excavated topsoil and subsoil; however, this must be free of boulders, large rocks, frozen clumps of dirt and rubble, which in the opinion of the Engineer would be detrimental to the pipe.

2. If sufficient on-site excavated topsoil and subsoil meeting the approval of the Engineer is not available, then fill material meeting the approval of the Engineer must be imported by the Contractor and utilized as final backfill. The final backfill shall be mechanically compacted by vibrating compactors and/or the on-site construction equipment meeting the approval of the Engineer.

3. The final backfill over the trench shall be windrow fill minimum 8 inches above the adjacent existing grade to allow for settling due to natural compaction over time, unless otherwise indicated.

4. Excavated rocks, boulders, rubble and similar debris not acceptable as fill material shall be removed from the construction site and disposed as a part of the final clean-up operation as specified in Section 01700.

5. See 3.07 for road crossings.

I. General Backfill Requirements

1. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

2. Granular Fill: Place and compact material in continuous layers not exceeding 6 inches compacted depth.

3. Soil Fill: Place and compact material in continuous layers not exceeding 6 inches compacted depth.

4. Employ a placement method that does not disturb or damage adjacent structures or utilities.

5. Maintain optimum moisture content of backfill materials to attain required compaction density.

6. See each pipelaying Section for any special requirements relating to trenching, bedding or backfilling.

3.07 Road Crossings

A. Open cut road crossings shall be as shown on Drawings.

B. Haunching, initial and final backfill shall be Type A crushed aggregate (crusher run) compacted in maximum 6 inch layers. Compaction as specified for bedding.

C. Pavement replacement as shown on Drawings. Pavement replaced must be equal or better than existing as approved by Engineer.

3.08 Tolerances

A. Top Surface of Backfilling Under Paved Areas: Plus or minus one inch from required elevations.

3.09 Field Quality Control

A. Engineer shall determine acceptance of compaction for bedding and backfill. Contractor may, at his option and expense, provide an independent testing laboratory to confirm that the minimum specified compaction is achieved should he not accept the Engineer's determination.

3.10 Protection of Finished Work

A. Recompact fills subjected to vehicular traffic.

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[Rev. 03/2010]

END OF SECTION

SECTION 02229

ROCK REMOVAL

PART 1 GENERAL

1.01 Section Includes

A. Removal of rock during excavation.

B. Rock removal by mechanical or explosive means.

1.02 Related Sections

A. Applicable to Work of this Section are the Drawings and General Provisions of the Contract.

B. Information Available to Bidders

1. Report of Geotechnical Exploration; bore hole locations and findings of subsurface materials.

2. Included on the Drawings are the bore hole and bore pit locations with a log of the subsurface data at each location. This information as well as the data in the Report of Geotechnical Exploration is representative only at the specific location where the hole or pit was made. This information was developed for the Engineer's use in designing the Project and all elevations indicated are based on the surface elevations existing at the time of the geotechnical study.

3. The Report of Geotechnical Exploration is available to the Bidder upon written request to the Engineer.

4. The Bidder is advised to perform all necessary additional on-site testing, drilling and excavation to verify and obtain all information required to accurately prepare their Bid (see Special Conditions).

1.03 References

A. Alabama Department of Transportation Standard Specifications for Highway Construction.

1.04 Definitions

A. Site Rock: Solid mineral material with a volume in excess of 1/3 cubic yard or solid material that cannot be removed with a 3/4 cubic yard capacity power shovel without drilling or blasting.

B. Trench Rock: Solid mineral material with a volume in excess of 1/6 cubic yard or solid material that cannot be removed with a backhoe without drilling or blasting.

1.05 Qualifications

A. Contractor or Subcontractor Explosive Firm: Specializing in explosives for disintegration of rock with five years documented experience.

1.06 Regulatory Requirements

A. Conform to applicable code for explosive disintegration of rock and to Alabama Department of Transportation Specification for Highway Construction for use of explosive materials.

B. Obtain permits from authorities having jurisdiction before explosives are brought to site or drilling is started.

C. Comply with all OSHA Requirements and Guidelines.

PART 2 PRODUCTS

2.01 Materials

A. Explosive: Type recommended by explosive firm.

B. Delay Device: Type recommended by explosive firm.

C. Blast Mat Material: Type recommended by explosive firm.

PART 3 EXECUTION

3.01 Examination

A. The Bidder is advised to perform all necessary additional on-site testing, drilling and excavation to verify and obtain all information required to accurately prepare their Bid (see Special Conditions).

B. Verify site conditions and note subsurface irregularities affecting Work of this Section.

3.02 Preparation

A. Identify required lines, levels, contours and datum.

B. Conduct pre-blast survey and document conditions of buildings near locations of rock removal and prior to blasting, photograph existing conditions identifying existing irregularities.

C. See Paragraph 3.04.

3.03 Rock Removal

A. Rock removal may be performed by the Contractor utilizing any one or combination of the following procedures unless otherwise noted in the Drawings.

1. Mechanical rock removal of site rock or trench rock by drilling holes and utilizing explosive tools and wedges to fracture rock.

2. Mechanical rock removal of trench rock by track mounted hydrostatic chain saws or rock saws.

3. Rock removal of site rock or trench rock by explosive method (see Paragraph 3.04).

B. Remove rock at bottom of excavation to form level bearing. Remove all disturbed rock at bottom of excavation.

C. Remove shaled layers to provide sound and unshattered base for footings and foundations.

D. Width of trench below top of pipe or conduit must be at least 12 inches wider than the pipe diameter regardless of the method used for rock excavation. Where trench boxes are utilized there shall be a minimum of 18 inches clearance between the outside pipe barrel and the inside face of the trench box.

E. Remove excavated materials from site.

F. Correct unauthorized rock removal in accordance with backfilling and compaction requirements of Section 02223.

3.04 Use of Explosives

A. General: This Section provides general guidelines for the handling and use of explosives. The Contractor shall be expected to use all precaution, control and safety features outlined by this Section as well as any additional requirements deemed necessary to insure the safety of life or property in the area of operations. The Contractor is reminded that he solely and alone is responsible for all Project related safety.

B. Control

1. When the use of explosives is necessary for the prosecution of the Work, the Contractor shall use the utmost care not to endanger life or property. Blasting operations shall be performed under the most skilled supervision. Where necessary and at any point of special danger, the Contractor shall use suitable mats or other approved methods to smother his blast. Particular attention shall be given to adequately smother the blast in the vicinity of overhead utility lines, and in populated areas. No loaded holes shall be left unattended.

2. Where blasting is to be done in streams, the Contractor shall notify the State Conservation Department sufficiently in advance to permit on-the-site observation by Conservation Department personnel at the time of the blast.

3. Where blasting is performed near existing utilities, structures, or in urban areas, or areas that are heavily populated, extreme care shall be taken to minimize the amount and degree of ground vibration, noise, overpressure and flying debris.

C. Storage of Explosives: All explosives shall be stored in a safe manner, in compliance with local, State and Federal laws and ordinances.

D. Warning of Blasting

1. The Contractor shall warn each utility company having utilities or structures in proximity to the blasting area of his intentions to use explosives. Such warning, however, shall not relieve the Contractor of responsibility for any damage resulting from blasting.

2. The Contractor shall erect suitable signs on all roads in the immediate vicinity of blasting operations, warning of blasting activity. The signs shall also include warning that all portable radio transmitters should be turned off while in the vicinity. Where required for safety, the Contractor shall control traffic by use of flagmen and guards in the danger zone of blasting.

3. Provide loud audible warning alarm to alert nearby personnel, property owners and the general public prior to blasting.

E. Pre-Blast Survey and Report

1. In all urban areas, other heavily populated areas, areas including numerous structures, or any area with a structure close to the proposed blasting, the Contractor shall conduct a pre-blast survey of all structures to determine the existing or pre-blasting condition, such survey being a written description with special emphasis on defects and documented with appropriate photographs.

2. This survey is intended to serve as a basis of comparison for any post-blast claims that may arise.

3. The pre-blast survey report shall be provided to the Engineer (three copies) prior to any drilling and blasting. After review by the Engineer, any deficiencies or additional information as required by the Engineer shall be provided by the Contractor. No drilling and blasting shall be allowed until the additional information as required by the Engineer is provided.

4. See Paragraph 3.02.

3.05 Field Quality Control

A. Provide for visual inspection of foundation bearing surfaces and cavities formed by removed rock.

B. All blasting and associated activities shall be monitored for safety by the Contractor.

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[REV3/07]

END OF SECTION

SECTION 02231

AGGREGATE BASE COURSE

PART 1 GENERAL

1.01 Section Includes

A. Aggregate base course.

1.02 Related Sections

A. Applicable to Work of this Section are the Drawings and General Provisions of the Contracts.

1.03 References

A. Alabama Department of Transportation Standard Specifications for Highway Construction (ALDOT Standard Specifications).

B. Alabama Department of Transportation Manual on Uniform Traffic Control Devices (ALDOT Manual).

C. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18 inch Drop.

D. ASTM D4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

E. ASTM C29 - Unit Weight of Aggregate.

F. ASTM C88 - Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.

G. ASTM C117 - Materials Finer than 75mm (No. 200) Sieve in Mineral Aggregates by Washing.

H. ASTM C131 - Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine.

I. ASTM C136 - Sieve or Screen Analysis of Fine and Coarse Aggregate.

J. ASTM D75 - Sampling Aggregate.

K. ASTM D693 - Crushed Stone, Crushed Slag and Crushed Gravel for Dry or Water-Bound Macadam Base Courses and Bituminous Macadam Base and Surface Courses of Pavement.

L. ASTM D698 - Moisture-Density Relations of Soils and Soil - Aggregate Mixtures Using 5.5 lb Rammer and 12 inch Drop.

M. ASTM D1556 - Density of Soil in Place by the Sand-Cone Method.

N. ASTM D2167 - Density of Soil In-Place by the Rubber-Balloon Method.

O. ASTM D2419 - Sand Equivalent Value of Soils and Fine Aggregate.

P. ASTM D2922 - Density of Soil and Soil-Aggregate In-Place by Nuclear Methods.

Q. ASTM D3017 - Moisture Content of Soil and Soil-Aggregate In-Place by Nuclear Methods.

R. ASTM D3665 - Random Sampling of Paving Materials.

S. ASTM D4318 - Liquid Limit, Plastic Limit and Plasticity Index of Soils.

T. ASTM D2922 - Density of Soil and Soil - Aggregate In-Place by Nuclear Methods.

U. ASTM D3017 - Moisture Content of Soil and Soil-Aggregate In-Place by Nuclear Methods.

V. ASTM D3665 - Random Sampling of Paving Materials.

1.04 Submittals

A. Samples: Submit 10 lb. sample of each type of aggregate to testing laboratory.

PART 2 PRODUCTS

2.01 Materials

A. Crushed Aggregate: The crushed aggregate base shall consist of 100 percent crushed aggregates conforming to Section 801 of ALDOT Standard Specifications.

B. Gradation

1. The proper gradation may be obtained by the proper mixing of regular Reference A Standard size aggregates as noted below and covered in Section 825, Type B of ALDOT Standard Specifications.

Sieve	Percent Passing
2 Inches	100
1-1/2 Inch	90 to 100
1 Inch	75 to 98
1/2 Inch	55 to 80
No. 4	40 to 70
No. 8	28 to 54
No. 16	19 to 42
No. 50	9 to 32
No. 200	7 to 18

2. The fraction passing the No. 40 sieve shall not have a P.I. in excess of 6, nor an L.L. in excess of 25 and shall not contain more than two thirds by weight passing the No. 200 sieve.

C. Coarse Aggregate

1. Coarse aggregate shall consist of crushed or uncrushed gravel, crushed stone, or crushed slag, having hard, strong, durable pieces, free from adherent coatings.

2. The amount of deleterious substances in coarse aggregates shall not exceed the following limits.

a. Soft Particles by ASTM Designation C-235: 5.0 Percent.

b. Coal and Lignite: 0.25 percent.

c. Clay Lumps: 0.25 percent.

d. Material Passing the No. 200 Sieve: 1.0 percent.

e. Thin or Elongated Pieces (Length Greater Than Five Times Average Thickness): 10.0 percent.

f. Other Local Deleterious Substances (Shale, Mica, Highly Absorbent Particles of Marcasite and Related Items): 2.0 percent.

D. Crushed Stone

1. Crushed stone shall consist of clean, tough, durable fragments of rock reasonably free of shale, conforming with the class and gradation specified.

2. Physical Tests: Crushed stone shall meet the following requirements for the respective physical tests.

a. Percent Wear, Los Angeles Test (AASHTO T-96)

1. Base or Aggregate Surface: 60 maximum.

2. Bituminous Work: 48 maximum.

b. Percent Sound, Soundness Test (AASHTO T-104 Using Sodium Sulphate and Five Cycles)

1. Base or Aggregate Surface: 90 minimum.

2. Bituminous Work: 90 minimum.

E. Gravel and Crushed Gravel: Gravel shall consist of natural rounded or crushed fragments of clean, tough, durable stone free from coatings of any character and conforming to the gradation specified.

1. Physical Tests: Gravel shall meet the following physical test requirements.

a. Percent Wear, Deval Test (AASHTO T-4): 23 maximum.

b. Percent Sound, Soundness Test (AASHTO T-104 Using Sodium Sulphate and Five Cycles): 90 minimum.

2. Crushed Gravel

a. Crushed gravel shall consist of crushed fragments of gravel, conforming to the requirements as indicated above.

b. At least 80 percent by weight of the crushed particles retained on the No. 4 mesh screen shall have at least two fully fractured faces, one of which shall have a dimension as large as the diameter of the particle inspected.

c. A specified size of crushed gravel shall be produced from larger gravel of at least the size noted in the following schedule.

MINIMUM NONCRUSHED SIZE	PERCENT PASSING
2 Inches	1-1/2 Inches
1-1/2 Inches	1 Inch
1 Inch	3/4 Inch
3/4 Inch	1/2 Inch
5/8 Inch	3/8 Inch

F. Crushed Slag

1. Crushed slag shall consist of clean, tough, durable pieces reasonably uniform in density and quality, without thin or elongated pieces and free from deleterious substances produced from processing air-cooled blast furnace slag, electric furnace slag or reclaimed from open hearth slag from cold piles approved by the Materials and Test Engineer.

2. Reclaimed open hearth slag furnished for use in bituminous work shall be blended with blast furnace slag in such proportions that the final blend will have a bulk specific gravity of not greater than 2.85.

3. Physical Tests: Physical tests for crushed slag shall be the same as required for gravel and crushed gravel.

G. Crushed Fine Aggregate

1. Crushed fine aggregate shall be manufactured from crushed stone, crushed gravel or crushed slag meeting the requirements as stipulated within this Section and meeting the gradation requirements of ALDOT Standard Specifications Section 802.09, size 105.

2. Crushed limestone, meeting the approval of the Engineer, may be used as fine aggregate in bituminous surface layers.

PART 3 EXECUTION

3.01 Examination

A. Verify subbase has been inspected, gradients and elevations are correct, and are dry.

3.02 Aggregate Placement

A. A base of up to 6 inch compacted thickness may be constructed in approximately equal layers not greater than 6 inch compacted thickness.

B. Mixing, placing and compaction of base shall be in accordance with Section 301 of ALDOT Standard Specifications and as stipulated herein.

C. Aggregate Mixing: Mixing shall be in accordance with Section 301 of ALDOT Standard Specifications.

D. Placing of Base Materials

1. The operational procedure must be such that placement and processing of a layer will not damage the underlying layer or layers. Any material to be paid for by the cubic yard shall based on cubic yards measured in-place (see Special Conditions). Premixed base and subbase materials shall be placed and spread by spreading equipment that will produce uniform layers of the required cross-sections and thickness.

2. Selection of the equipment shall be left to the Contractor and it shall be his responsibility to provide equipment meeting the required results of the intent of the Drawings and Specifications herein and as approved by the Engineer.

E. Compaction

1. Each layer of base and subbase shall be compacted to not less than 95 percent standard proctor dry density as determined by ASTM D698.

2. Compaction tests will be performed on each base layer and each layer shall be brought to required density before the next layer is placed.

3. Additional water in connection with compaction will be required to obtain required density at a uniform moisture content within 2 percentage points of optimum as determined by laboratory testing.

4. Compaction shall be in accordance with Section 306 of ALDOT Standard Specifications.

3.03 Tolerances

A. Surface Requirements

1. The finished general surfaces of each base layer shall not vary more than 1/2 inch in any 25 foot section from a taut string applied parallel to the surface and the roadbed centerline 1 foot inside the edges of the base, at the centerline and at other points as designated, nor shall it vary more than 1/2 inch from a template placed at right angles to the roadbed centerline.

2. The template shall be of a rigid frame adjustable metal type, accurately set and at least as long as the width of base layer being checked up to 24 feet.

3. Additional widths may be checked by the use of a string and Engineer's level.

4. The Contractor shall furnish template, string, level and necessary personnel to verify tolerance.

B. Gradation and Density: Testing for compliance will be made after all progressing, shaping and compaction of the layer is complete, except that a layer with a cement additive will require the pretesting of the blended components prior to the addition of the cement additive on the primary belt at the mixing plant with all other testing made on the completed compacted layer.

C. Checking Thickness of Each Layer

1. For a layer placed under a "square yard in-place" item, the compacted thickness of the layer shall not be more than 1/2 inch less nor 1 inch more than the thickness shown on the Drawings. A thickness greater than the 1 inch tolerance may be accepted if uniform over a sufficient length to not materially affect the riding surface or reduce any required clearances.

2. For a layer placed under a "cubic yard in-place" item, the compacted thickness of the layer shall not exceed 8 percent of each layer, plus or minus, of the indicated thickness.

3. Excess thickness above the 8 percent noted above may be permitted to remain in place provided the riding surface is not affected and any required clearances are maintained. The excess material above the 8 percent tolerance allowed will be deducted from the pay quantities.

3.04 Field Quality Control

A. Sampling and Testing

1. All sampling and testing shall be performed per Division No. 1.

2. All sampling and testing will be performed on the complete in-place base layers after mixing, shaping and compacting is completed.

3. Any necessary sample holes, required to satisfactorily establish the acceptability of any base layer shall be repaired by the Contractor immediately with like material. The cost of such repairs is considered to be incidental to the Work and shall be performed without additional compensation.

B. Frequency of Tests: Minimum one per 100 linear feet or as directed by Engineer in areas that appear to be below limits.

C. Gradation Requirements

1. The gradation (job mix) of the final mixture shall fall within the design range indicated in Table 1, when tested in accordance with ASTM C117 and C136. The final gradation shall be continuously well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on an adjacent sieve or vice versa.

2. Samples of aggregates to check gradation shall be taken by the Contractor at least once daily. Sampling shall be in accordance with ASTM D75 and testing shall be in accordance with ASTM C136 and C117.

D. References for Testing: See Paragraph 1.03.

3.05 Approval

A. Any discrepancies or inadequacies determined by the sampling and testing shall be corrected by the Contractor and the corrected Work again verified prior to final approval of the Work.

3.06 Maintenance of the Work

A. Each base layer shall be maintained as provided herein without extra compensation until it is covered by a succeeding layer or acceptance of the Contract.

B. The surface shall be kept free of ruts, ridges, holes and substantially true to profile, grade and cross-section.

C. Required density and moisture shall be maintained and the base must have the required density and moisture at the time it is covered by another layer or it is primed.

D. No layer of base shall be covered by another layer or primed until it has been approved by the Engineer.

E. It shall be the Contractor's responsibility to protect the base from damage and to protect the prime from being picked up or damaged by traffic and to replace promptly any base or prime so damaged.

3.07 Traffic Control

A. As required by ALDOT Manual, as a minimum.

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END OF SECTION

SECTION 02512

PLANT MIX BITUMINOUS PAVEMENT

PART 1 GENERAL

1.01 Section Includes

A. Hot plant mix bituminous paving.

B. Tack coat, primer and seal coat.

1.02 Related Sections

A. Applicable to Work of this Section are the Drawings and General Provisions of the Contract.

1.03 References

A. Alabama Department of Transportation Standard Specifications for Highway Construction (ALDOT Standard Specifications).

B. Alabama Department of Transportation Manual on Uniform Traffic Control Devices (ALDOT Manual).

1.04 Performance Requirements

A. Paving: Designed for parking, light duty commercial vehicles and trucks up to 60,000 pounds.

1.05 Quality Assurance

A. Perform Work in accordance with ALDOT Standard Specifications

B. Mixing Plant: Conform to ALDOT Standard Specifications.

C. Obtain materials from same source throughout.

1.06 Regulatory Requirements

A. Conform to ALDOT Standard Specifications.

1.07 Environmental Requirements

A. Do not place asphalt when base surface temperature is less than 40 degrees F or surface is wet or frozen.

PART 2 PRODUCTS

2.01 Materials

A. Asphalt Cement: In accordance with Section 424 of ALDOT Standard Specifications.

B. Aggregate for Base Course Mix: In accordance with Section 424 of ALDOT Standard Specifications. The maximum aggregate size shall be 1-inch for base course mix and for patching.

C. Aggregate for Wearing Course Mix: In accordance with Section 424 of ALDOT Standard Specifications. The maximum aggregate size shall be 1/2-inch for wearing course mix and 3/4" for binder leveling mix.

D. Fine Aggregate: Crushed aggregate or sand in accordance with Section 424 of ALDOT Standard Specifications.

E. Mineral Filler: Finely ground particles of limestone, hydrated lime or other mineral dust, free of foreign matter.

2.02 Accessories

A. Primer: Homogeneous, medium curing, liquid asphalt, in accordance with ALDOT Standard Specifications. **NOT USED.**

B. Tack Coat: Homogeneous, medium curing, liquid asphalt, in accordance with ALDOT Standard Specifications.

C. Seal Coat: Slurry type, in accordance with ALDOT Standard Specifications. **NOT USED.**

2.03 Asphalt Paving Mix

A. Asphalt shall conform to all requirements of Section 424 and related Sections of the ALDOT Standard Specifications.

B. Use dry material to avoid foaming. Mix uniformly.

C. Base Course: Minimum 4.4 percent of asphalt cement by weight mixture.

D. Binder Course: Minimum 5.5 percent of asphalt cement by weight in mixture.

E. Wearing Course: 5.5 percent of asphalt cement by weight in mixture in accordance with ALDOT Standard Specifications.

2.04 Source Quality Control

A. Submit proposed mix design of each class of mix for review prior to commencement of work.

PART 3 EXECUTION

3.01 Examination

A. Verify that compacted granular base is dry and ready to support paving and imposed loads.

B. Verify that width, gradients and elevations of base are correct.

3.02 Base

A. Section 02231 - Aggregate Base Course.

3.03 Preparation – Primer **- NOT USED.**

3.04 Preparation - Tack Coat

A. Apply tack coat in accordance with manufacturer's instructions and in accordance with ALDOT Standard Specifications.

B. Apply tack coat to contact surfaces of curbs and gutters.

C. Coat surfaces of manhole and catch basin frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

3.05 Placing Asphalt Pavement - Single Course

A. Install Work in accordance with ALDOT Standard Specifications.

B. Place asphalt within 24 hours of applying primer or tack coat.

C. Place to compacted thickness as shown on Drawings.

D. Install gutter drainage grilles and frames and manhole frames in correct position and elevation.

E. Compact pavement in accordance with ALDOT Standard Specifications. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

F. Develop rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.06 Placing Asphalt Pavement - Double Course

A. Place asphalt binder course within 24 hours of applying primer or tack coat.

B. Place binder course to compacted thickness as shown on Drawings.

C. Place wearing course within two hours of placing and compacting binder course.

D. Place wearing course to compacted thickness as shown on Drawings.

E. Install any gutter drainage grilles and frames and manhole frames in correct position and elevation.

F. Compact pavement in accordance with ALDOT Standard Specifications. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

G. Develop rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.07 Tolerances

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Scheduled Compacted Thickness: Within 1/4 inch.

C. Variation from True Elevation: Within 1/2 inch.

3.08 Field Quality Control

A. Field observation and testing will be performed under provisions of Division No. 1.

B. Take samples and perform tests in accordance with State of ALDOT Standard Specifications.

3.09 Protection

A. Immediately after placement, protect pavement from mechanical injury for 2 days.

3.10 Traffic Control

A. As required by ALDOT Manual, as a minimum.

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[Rev. 08/2011]

END OF SECTION

SECTION 02660

WATER DISTRIBUTION PIPING, VALVES AND RELATED ITEMS

PART 1 GENERAL

1.01 Section Includes

A. Potable and non-potable plant water distribution piping, fittings, valves, accessories, installation and testing.

1.02 Related Sections

A. Applicable to Work of this Section are the Drawings and General Provisions of the Contract.

1.03 References

A. ASTM A377 - Ductile Iron Pressure Pipe.

B. ANSI/AWWA C151/A21.51 - Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids.

C. ANSI/AWWA C104/A21.4 - Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water.

D. ANSI/AWWA C111/A21.11 - Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.

E. ANSI/AWWA C110/A21.10 - Ductile Iron and Gray Iron Fittings, 3 Inch through 48 Inch for Water and Other Liquids.

F. ANSI/AWWA C600 - Installation of Ductile Iron Water Mains and Their Appurtenances.

G. ANSI/AWWA C153/A21.53 - Ductile Iron Compact Fittings, 3 Inch through 16 Inch for Water and Other Liquids.

H. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

I. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Elastomeric Seals.

J. ASTM D 3350 – Standard Specification for Polyethylene Plastics Pipe and Fittings Material.

K. Handbook of PVC Pipe Design and Construction - Uni-Bell Plastic Pipe Association (Uni-Bell Handbook).

L. Alabama Department of Transportation Standard Specifications for Highway Construction (ALDOT Standard Specifications).

M. ASTM D2774 - Standard Recommended Practice for Underground Installation of Thermo Plastic Pressure Piping.

N. ANSI/AWWA C800 - Underground Service Line Valves and Fittings.

O. ANSI/AWWA C506 - Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valve Types.

P. ANSI/AWWA C509 - Resilient Seated Gate Valves for Water and Sewerage Systems.

Q. ANSI/AWWA C651 - Standard for Disinfecting Water Mains.

R. Construction Standard for Excavations - OSHA (29CFR Part 1926.650.652, Subpart P).

S. OSHA Standards, Regulations and Guidelines.

T. AWWA Manual No. M23 - PVC Pipe Design and Installation.

1.04 Definitions

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.05 Submittals

A. Product Data: Provide data indicating pipe, pipe accessories and fittings.

B. Manufacturer's Installation Instructions: Indicate any special products and any special procedures required to install products specified.

1.06 Project Record Documents

A. Record location of pipe run, connections, valves, meters, services, fire hydrants and related items.

B. Identify and describe discovery of uncharted utilities.

1.07 Regulatory Requirements

A. Conform to applicable code for materials and installation of the Work of this Section.

B. All applicable regulations and requirements of Alabama Department of Environmental Management shall apply to this Section.

C. Construction Standard for Excavations - OSHA (29CFR Part 192.6650.652, Subpart P).

D. OSHA Regulations and Guidelines.

1.08 Field Measurements

A. Verify that field measurements and elevations are as indicated.

PART 2 PRODUCTS and MANUFACTURERS

2.01 Pipe Materials

A. Ductile Iron Pipe and Ductile Iron Fittings

1. ASTM A746, AWWA C150 and AWWA C151; Pressure Class 350 (minimum thickness 0.25 inch) for pipe diameters 12 inch and smaller, Pressure Class 250 for pipe diameters 14 inch through 20 inch, Pressure Class 200 for pipe diameter 24 inch, and Pressure Class 150 for pipe diameters 30 inch and larger, unless specifically indicated otherwise on the Drawings.

2. Slip Joint and Mechanical Joint Pipe and Fittings: ANSI/AWWA C111.

3. Compact Fittings: ANSI/AWWA C153.

4. Standard Fittings: ANSI/AWWA C110.

5. Interior of pipe and fittings shall be cement mortar lined as specified in ANSI/AWWA C104.

6. Exterior of all ductile iron piping and fittings, except where specifically indicated to be primed and painted, shall have a standard asphaltic coating as specified in ANSI/AWWA C151.

7. All exposed piping and fittings to be primed and painted.

8. Manufacturer: Ductile iron pipe and fittings shall be manufactured by U.S. Pipe & Foundry Company, American Cast Iron Pipe Company, McWane, Inc., Griffin Pipe Products Company, Downers, IL, or approved equal.

B. Plastic (PVC) Pipe and Fittings: ASTM D1784 and ASTM D 2241.

1. Slip Joint Pipe and Fittings: ASTM D2241 with standard dimension ratios summarized as follows:

PIPE CLASS (psi)	SDR
125	32.5
160	26
200	21
250	17

2. Joints for 3" or larger shall be watertight, slip type with elastomeric compression seal conforming to ASTM D3139. **Solvent weld joints will not be allowed.**

3. Ductile Iron Fittings: For all PVC pipe 3 inch and larger, fittings shall be ductile iron in lieu of PVC. See Paragraph 2.01A.

4. Joints for 2" and smaller may be solvent weld joints.

5. Joint Restraint: For PVC pipe shall be equal to "Mega-Lug" as manufactured by EBAA Iron, Inc.; Sigma Series SLC "One-Loc"; or approved equal.

2.02 Pressure Reducing Valve for 2 Inch Meter Installation

A. Bronze body. NPT female inlet and outlet. Suitable for pressures up to 400 psi. Adjustable reduced pressure range 25 to 75 psi.

B. Valve shall be approved for buried or pit installations.

C. Manufacturer: Watts Model No. LF25AUB-Z3 (2") as manufactured by Watts Industries, Inc., Andover, MA, or approved equal.

2.03 Valve Box

A. Cast iron, adjustable with minimum 5-1/4 inch diameter shaft, including base, cover, top and center sections and extensions as required. Castings shall be coated with minimum 2 coats coal-tar pitch varnish or equal as approved by Engineer.

B. The lids of all boxes shall be cast with the word "Water".

C. Two valve wrenches to be furnished to the Owner by the Contractor.

D. Manufacturer: Valve box shall be U.S. Foundry Model 7500 as manufactured by U.S. Foundry and Manufacturing Corp., Medley, FL, or approved equal.

2.04 Tapping Sleeve and Valve

A. All wet connections shall be made using AWWA approved tapping sleeve and valve.

B. Tapping Valve

1. Tapping valve shall be gate valve meeting requirements of ANSI/AWWA C509. The valve shall include resilient seats nonrising stem, mechanical joint type end connections adequate for and designed specifically for the type of connecting pipe. Minimum pressure rating shall be 250 pounds per square inch unless otherwise indicated.

2. Manufacturer: Tapping valve shall be M & H No. 4751-NRS as manufactured by M & H Valve Co., Anniston, AL, or approved equal.

C. Tapping Sleeve (Stainless Steel)

1. Tapping sleeve body shall be stainless steel (Type 304) with stainless steel bolts (Type 304), flanged, full circumferential sealing gasket and designed specifically for the type pipe being tapped. The sleeve shall be designed for a minimum pressure rating of 250 psi unless otherwise indicated.

2. Manufacturer: The stainless steel tapping sleeve shall be the JCM No. 432 as manufactured by JCM industries, Nash, TX, or approved equal.

2.05 Concrete Kickblocks

A. Concrete shall be mixture of Portland Cement, washed natural sand and washed graded gravel or crushed limestone with minimum compressive strength of 2000 pounds per square inch.

B. Size, type and location of kickblocks shall be as shown on the Drawings.

2.06 Bedding Materials

A. Bedding for Earth Excavation: See Section 02225 or 02226.

B. Bedding for Rock Excavation: See Section 02225 or 02226.

2.07 Underground Utility Marking Device

A. Detector Wire

1. Wire: Minimum 12-gauge solid, insulated copper wire.

2. Installation: The detector wire shall be installed with all non-metallic, buried water lines. See Plans for installation detail of wire at valves and fire hydrants.

3. Bury: The wire shall be buried in the trench below the pipe. The wire shall not touch or be in contact with the pipe at any point.

1. Marking Tape: For all installations of detector wire, non-detectable marking tape shall also be installed directly above pipe.

B. Non-Detectable Marking Tape

1. Tape: Plastic (Ultra-high Molecular Weight Polyethylene), minimum 4.0 mil (0.004 inch) overall thickness; minimum two inches in width; alkaline and corrosion resistant; minimum 10.64 pounds/inch tensile break strength.

2. Detectable Core: None.

3. Color: The tape shall be color bonded with the AWWA recommended color for potable water lines – BLUE.

4. Lettering: The tape shall be inscribed with permanent, corrosion resistant, 1-1/2 inch tall black letters, repeated every 20 to 36 inches as follows:

"CAUTION WATER LINE BELOW"

5. Manufacturer: The non-detectable marking tape shall be the "SHIELDTEC" as manufactured by Thor Enterprises, Inc., Sun Prairie, WI, or approved equal.

6. Installation: The non-detectable marking tape shall be installed with all metallic, buried water lines and with all non-metallic, buried water lines utilizing detector wire.

7. Bury: The burial depth shall not exceed 36 inches below the backfilled grade and shall be a minimum of 12 inches above the top of the pipe. The tape shall not touch or be in contact with the pipe at any point.

PART 3 EXECUTION

3.01 Trenching

A. Excavate pipe trench in accordance with Section 02226. Hand trim as required for placement of pipe.

B. Trenches shall be of sufficient width to ensure proper bedding, haunching, compaction and backfill under and around pipe in order to facilitate pipelaying, future maintenance and protect the installed pipe in both earth and rock excavation conditions. (See Section 02226) In all cases, at all times, trench width shall be adequate for safety of all personnel.

3.02 Examination

A. Verify that trench cut is ready to receive Work and excavations, dimensions and elevations are as shown on Drawings.

3.03 Preparation

A. Hand trim excavations to required elevations as required.

B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

C. In general, all lines should be run parallel or perpendicular to the center line of the adjacent roadway or building. Coordinate with Engineer.

3.04 Bedding

A. Place bedding material at trench bottom, level materials in continuous layer as specified in Section 02226.

B. Bedding material must be free from projecting rocks and with sufficient clearance at bell to ensure that dirt and small rocks are not caught when the jointing is made.

3.05 Installation - Pipe

A. Ductile Iron Pipe: Install ductile iron pipe in accordance with ANSI/AWWA C600.

B. PVC Pipe: Install PVC pipe in accordance with ASTM D2774, Handbook of PVC Pipe Design and Construction and PVC Pipe Design and Installation, AWWA Manual No. M23, except as modified herein.

C. PE Pipe: Install PE pipe by butt fusion in accordance with ASTM D2774 and manufacturer's instructions except as modified herein.

D. Interior of pipe and all joint surfaces shall be clean and wiped dry before pipe is lowered into trench.

E. Position pipe carefully to insure full bedding and a true straight line. Breaks in line or grade shall not exceed one half the maximum deflection recommended for the joint.

F. Construction, trenching, pipelaying, materials, depth of cover and related appurtenances in traffic areas and within Highway Department rights-of-way shall be as required by the ALDOT Std. Spec. and the applicable utility permits.

G. All piping, valves and fittings to be field inspected by the Engineer and approved for use prior to installation. Any defective pipe or fittings, in the opinion of the Engineer, will not be acceptable for installation. Defects shall include, but not be limited to, ripples, cracks, chips, improper beveling, improper compression ring, improper jointing and brittle material.

H. The Contractor shall allow no trench water or dirt to enter the pipe after laying. Watertight plug or cap shall be inserted into open end of pipe when pipelaying is not in progress.

I. The Contractor shall lay all pipe continuous without any skips unless specifically authorized by the Engineer. No payment will be made for pipe installed contrary to this until the skips have been removed.

J. Piping Installed Under Structures: All piping installed under concrete slabs, foundations, buildings, structures and similar facilities shall be totally and completely flushed, cleaned and tested prior to the construction of the structure or facility over the pipe.

K. Marking Tape or Detector Wire: Install with pipe as specified in Division No. 2.

3.06 Backfill

A. Backfill including haunching, initial backfill and final backfill as specified in Section 02225 or 02226.

B. Backfill Material: See Section 02226.

3.07 Valve Setting

A. Clean and test working of each valve before setting.

B. Set each valve with stem plumb and at location as shown on the Drawings unless otherwise directed by the Engineer. Set valve boxes plumb with tops at finished grade. Tamp backfill thoroughly. Record exact position.

3.08 Setting Fire Hydrants **– NOT USED.**

3.09 Field Quality Control

A. Request inspection prior to and immediately after placing bedding and prior to placing backfill.

3.10 Hydrostatic Testing

A. After installation of piping and all related appurtenances including service taps, fill piping with water, opening hydrants or other outlets as necessary to expel all entrapped air from the section of pipe to be tested. When necessary, temporary blind flanges, valves or whatever is required shall be installed at connections to existing piping in order to assure that the new piping passes all required testing.

B. Test the pipe section in presence of Engineer. Test shall be minimum 6 hour duration. The test pressure shall be equal to the pressure rating (class) of the pipe. The test should begin and end with the pressure at 0 psi on the chart.

C. A recording pressure gage, minimum 10 inch diameter circular chart recorder, 24-hour type, shall be used throughout the entire test period. The pressure range of the chart shall not exceed 250 psi. The recorded pressures shall be maintained as project records (see Section 01700), and shall be signed by the Engineer and the Contractor upon completion of the test.

D. The original chart of the test record shall be furnished to the Engineer immediately after completion of each test.

E. The Contractor shall furnish calibration information to the Engineer upon request demonstrating the gage accuracy to the satisfaction of the Engineer.

F. Hydrostatic testing procedures as required by ADEM Guidelines, AWWA C600 and AWWA C605 shall apply except as specifically modified herein.

G. The maximum pressure loss shall not exceed 5 pounds per square inch at the end of the test period for the section being tested.

H. Leakage is defined as the quantity of water that must be applied into a pipe to maintain pressure within 5 psi of the test pressure after the pipe has been filled and air has been expelled. The maximum allowable leakage during the 6 hour test shall be based on the following formula:

L = ((S)*(D)*(P^0.5))/133,200.

Where: L = Maximum allowable leakage, in gallons per hour t (GPH).

S = Length of pipeline (or section of pipeline) in feet.

D = Nominal diameter of pipe, in inches.

P = Average test pressure during the leakage test, in pounds per square inch (gage).

I. Enclosed as Table No. 02660-1 is a summary of the maximum allowable leakage (based on the above formula) for various pipe diameters for the three most common pipe classes per 1,000 feet of pipe. For any pipe class (test pressure) or pipe diameter not listed, the formula as noted above shall be used to calculate the maximum allowable leakage.

J. If the pipeline section under testing contains sections of pipe of various diameters, the maximum allowable leakage shall be the sum of the calculated allowable leakage for each section based on its length and diameter.

TABLE NO. 02660-1

ALLOWABLE LEAKAGE IN GALLONS PER HOUR PER 1000 FEET OF PIPELINE (GPH/1000 FEET)

NOMINAL PIPE DIAMETER (Inches)	AVERAGE TEST PRESSURE (POUNDS PER SQUARE INCH)		
	250	200	160
2	0.237	0.212	0.190
3	0.356	0.319	0.285
4	0.475	0.425	0.380
6	0.712	0.637	0.570
8	0.950	0.849	0.760

K. A section of pipe passes the hydrostatic test if the pressure drops is 5 psi or less at the end of the 6 hour test and leakage is less than the allowable stated herein.

3.11 Flushing Installed Piping

A. Immediately upon completion of each phase of the water distribution system, test all valves to insure they are full, open and flush out the system.

B. Open the fire hydrant nearest to the supply tank or source of supply and open the supply valve to permit flushing of the piping installed. Allow the flow to continue until the fire hydrant discharge runs clear and meets the approval of the Engineer.

C. Repeat the above operation at the next downstream fire hydrant and continue through the entire installed piping system until the entire system has been flushed.

D. Use cocks at meters to flush upper ends of supply mains and service lines.

E. Flow testing at fire hydrants may be required by the Engineer during flushing operations to ensure that all valves are fully open and that the lines are clear. Additional flow testing may be required by the Engineer prior to final acceptance.

3.12 Disinfection of Water Distribution System

A. See Section 02675.

3.13 Air Removal

A. Removal of all entrapped air from the piping system is required. Air release valves, services and fire hydrants may be used for venting air from the system at appropriate high points.

B. The Contractor shall provide any additional temporary air release valves as may be required to fully vent all entrapped air from the piping system. These temporary air release valves are not separate pay items and are included in the pipeline installation cost.

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END OF SECTION

SECTION 02675

DISINFECTION OF WATER DISTRIBUTION SYSTEMS

PART 1 GENERAL

1.01 Section Includes

A. Disinfection of potable water distribution and transmission system.

B. Testing and reporting results.

1.02 Related Sections

A. Applicable to Work of this Section are the Drawings and General Provisions of the Contract.

1.03 References

A. ANSI/AWWA B300 - Standard for Hypochlorites.

B. ANSI/AWWA B301 - Standard for Liquid Chlorine.

C. ANSI/AWWA C651 - Standards for Disinfecting Water Mains.

D. Alabama Department of Environmental Management (ADEM) Administrative Code, Division No. 7.

1.04 Submittals

A. Test Reports: Indicate results as required by ADEM Regulations.

B. Certificate: Certify that cleanliness of water distribution system meets or exceeds specified requirements.

1.05 Project Record Documents

A. Disinfection Report; Record

1. Type, amount and form of disinfectant used.

2. Date and time of disinfectant injection start and time of completion.

3. Identification of all locations where hydrants, valves, etc., were opened or closed to ensure high strength disinfection of all line segments.

4. Test locations.

5. Initial and 24 hour disinfectant residuals in milligrams per liter (mg/l) for each outlet tested.

6. Date and time of flushing start and completion.

7. Disinfectant residual after flushing in mg/l for each outlet tested.

B. Bacteriological Report; Record

1. Date issued, project name, testing laboratory name, address and telephone number.
2. Time and date of water sample collection.
3. Name of person collecting samples.
4. Test locations.
5. Initial and 24 hour disinfectant residuals in mg/l for each outlet tested.
6. Coliform bacteria test results for each outlet tested.
7. Certification that water conforms, or fails to conform, to bacterial standards of ADEM.
8. Bacteriologist's signature and authority.

1.06 Quality Assurance

A. Perform Work in accordance with ANSI/AWWA C651.

1.07 Qualifications

A. Testing Firm: Company specializing in testing potable water systems, certified and approved by ADEM.

1.08 Regulatory Requirements

A. Conform to applicable code or regulation for performing the Work of this Section.

B. Provide certificate of compliance from ADEM indicating approval of water system.

PART 2 PRODUCTS

2.01 Disinfection Chemicals

A. Hypochlorite: ANSI/AWWA B300, Hypochlorite.

B. Storage: Store and protect as recommended by manufacturer.

C. Percent Available Chlorine: Verify with manufacturer that the indicated percent available chlorine is as specified and that the chemical shelf life has not been exceeded.

PART 3 EXECUTION

3.01 Examination

A. Verify that piping system has been cleaned, inspected, flushed and pressure tested.

B. Perform scheduling and disinfection activity with start-up, testing, adjusting and balancing, demonstration procedures, including coordination with related systems.

3.02 Pipe Disinfection Procedure

A. Provide and attach required equipment to perform the Work of this Section.

B. The method of chlorination utilized shall be at the discretion of the Contractor in accordance with ANSI/AWWA C651, summarized as follows:

1. Tablet Method: 25 mg/l minimum dose of calcium hypochlorite granules or tablets placed in the pipe during construction, with a minimum contact period of 24 hours prior to flushing. At the end of the contact period, the minimum chlorine residual shall be 10 mg/l.

2. Continuous-Feed Method: Calcium hypochlorite granules placed in the pipeline during pipe installation plus an additional dose of calcium hypochlorite to produce a minimum chlorine dose of 25 mg/l throughout the system, with a minimum 24 hour contact period. At the end of the contact period, the chlorine residual shall be 10 mg/l minimum.

3. Slug Method: Calcium hypochlorite granules placed in the pipeline during pipe installation plus an additional chlorination slug dose of 100 mg/l with a minimum contact period of 3 hours. The chlorine slug shall not be allowed to drop at any time below 50 mg/l at any point within the system.

4. Hypochlorite Dosage (pounds/1,000 ft.): See Paragraph 3.05, Chlorine Dosage Table.

C. Preliminary Flushing: Preliminary flushing between the initial chlorination during pipe installation and the final chlorination shall be as required by ANSI/AWWA C651.

D. Final Flushing

1. After the minimum contact period, test the residual chlorine levels at the end of each line. If the chlorine residual is less than the amount required by the chlorination method, repeat the chlorination process.

2. If the chlorine residual is greater than the minimum required at the end of the contact period for the chlorination method, proceed with flushing of the entire pipeline until all traces of chlorine residual are eliminated.

3. The Contractor is advised that chlorinated water used for disinfecting piping and tanks may be toxic to fish and other aquatic animals. Dispose of flushed disinfecting water in accordance with ADEM Requirements.

E. Valves and Hydrants: Open and close all valves and hydrants during the chlorination process.

F. Bacteriological Testing

1. Upon completion of the chlorination process and after final flushing, with residual chlorine present in the system, the Contractor shall collect and submit samples for bacteriological testing as required by ANSI/AWWA C651 and the Alabama Department of Environmental Management (ADEM).

2. One bacteriological sample is required for every 7,000 linear feet of pipe installed and one at each dead end line or as otherwise required by ADEM.

3. Flushing, re-chlorination and re-sampling for bacteriological testing shall be provided by the Contractor as necessary to obtain approval for use by ADEM.

4. No water within the distribution system shall be used for potable purposes nor provided to any customer until the system has been approved for use by ADEM.

3.03 Quality Control

A. Provide all valves, taps and appurtenances as required for sampling, disinfecting, flushing and testing.

B. Test samples in accordance with ANSI/AWWA C651.

3.04 Cost of Additional Water Required for Repeat Chlorination Procedures Due to Bacteriological Test Failures

A. See Special Conditions for determination of the party (Owner or Contractor) responsible for cost of water required for the project construction.

B. In the event the Owner is indicated in the Special Conditions as supplying the water for the construction project, the Contractor is advised that the cost of all water required for any additional, repeat pipeline chlorination procedures due to the failure of the bacteriological testing will be solely the responsibility of the Contractor.

3.05 Chlorine Dosage Table

Pipe Size (in)	Volume of Water (Gallons.1000 ft.)	Pounds/1000 Ft. to Achieve Dosage	
		Calcium Hypochlorite (65% Available Chlorine) 25 mg/l dosage	Calcium Hypochlorite (65% Available Chlorine) 100 mg/l dosage
3	367	0.12	0.47
6	1,469	0.47	1.89
8	2,611	0.84	3.35

NOTES:

1. Table indicates the various pounds of calcium hypochlorite dosage per 1,000 feet of the indicated pipe sizes to achieve a 25 mg/l and a 100 mg/l dosage.

2. Percentage of available chlorine may be reduced by extended or improper storage of chemicals. Verify with manufacturer.

3. Additional dosage may be required to meet the minimum residual chlorine requirements. Coordinate with Engineer.

4. For pipe sections less than 1,000 feet in length the dosage will be reduced in the same proportion as the reduction in pipe length. Coordinate with Engineer.

5. See Paragraph 3.02, this Specification Section.

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[Rev.01/01]

END OF SECTION

SECTION 02722

SITE STORM SEWERAGE SYSTEMS

PART 1 GENERAL

1.01 Section Includes

A. Site storm sewerage drainage piping, fittings, accessories, bedding and backfill.

B. Catch basins.

1.02 Related Sections

A. Applicable to Work of this Section are the Drawings and General Provisions of the Contract.

1.03 References

A. Alabama Department of Transportation Standard Specifications for Highway Construction (ALDOT Standard Specifications).

B. ANSI/ASTM C76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

C. ANSI/ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

D. AASHTO M252 – Standard Specification for Corrugated Polyethylene Pipe, 3” to 10” Diameter.

E. AASHTO M294 – Standard Specification for Corrugated Polyethylene Pipe, 12” to 48” Diameter.

F. ASTM D2321 – Standard Practice for Underground Installation of Thermoplatic Pipe for Sewers and Other Gravity-Flow Applications.

G. ASTM F477 – Specification for Elastometric Seals (Gaskets) for Joining Plastic Pipe.

H. ASTM F2306 – 12 to 60 in Annular Corrugated Profile – Wall Polyethylene (PE) Pipe and Fittings for Gravity – Flow Storm Sewer and Subsurface Drainage Applications.

1.04 Definitions

A. Bedding: Fill placed under pipe prior to subsequent backfill operations.

1.05 Submittals

A. Product Data: Provide data indicating pipe, pipe accessories, catch basin and lid, frame and related items.

B. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

1.06 Project Record Documents

A. Accurately record actual locations of pipe runs, connections, catch basins, cleanouts, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.07 Regulatory Requirements

A. Conform to applicable code for materials and installation of the Work of this Section.

B. Conform to OSHA Safety Requirements.

1.08 Field Measurements

A. Verify that field measurements and elevations are as indicated.

1.09 Coordination

A. Coordinate the Work with termination of storm sewer connection outside building and trenching.

PART 2 PRODUCTS

2.01 Storm Sewer Pipe Materials

A. Reinforced Concrete Pipe: ANSI/ASTM C76, Class III with Wall Type B; mesh or bar reinforcement; inside nominal diameter as shown on Drawings with bell and spigot end joints.

2.02 Pipe Accessories

A. Fittings: Same material as pipe, formed to suit pipe size and end design, in required tees, bends, elbows, cleanouts, reducers, traps and other configurations required.

2.03 Yard Catch Basins and Grated Inlets and Catch Basins

A. Grated Inlet

1. Manufacturer: Square gutter inlet frame and grate, cast iron construction, square base, Model No. R 3402-E manufactured by Neenah Foundry Company or equal. Equal manufacturers include East Jordan Iron Works, McKinley Iron Works, Inc. and Campbell Foundry Company.

2. Nominal Opening: 24 inch square.

3. Free Open Area: 1.9 SF.

4. Approximate Weight: 293 pounds.

5. Class: Heavy duty.

2.04 Reinforced Concrete Headwalls

A. Reinforced Concrete Headwalls as shown on Drawings and as specified in Section 03300.

2.05 Bedding Materials

A. Bedding: Fill Type B coarse aggregate as specified in Section 02223.

PART 3 EXECUTION

3.01 Examination

A. Verify that trench cut is ready to receive Work and excavations, dimensions, and elevations are as shown on layout drawings.

3.02 Preparation

A. Hand trim excavations to required elevations. Correct over excavation with coarse aggregate (Section 02223).

B. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

3.03 Trenching and Bedding

A. Excavate pipe trench in accordance with Section 02222 for Work of this Section. Hand trim excavation for accurate placement of pipe to elevations shown.

B. Place Type "B" coarse aggregate bedding material as specified in Section 02223 at trench bottom; level materials in continuous layer not exceeding 6 inches compacted depth as specified in Section 02223.

3.04 Installation - Pipe

A. Install pipe, fittings, and accessories in accordance with ALDOT Standard Specifications and manufacturer's instructions. Seal joints watertight.

B. Place pipe on minimum 6 inch deep compacted bed of Type B coarse aggregate as specified in Section 02223. See Section 02223 for compaction requirements.

C. Lay pipe to slope gradients noted on drawings, with maximum variation from true slope of 0.01 feet in 10 feet (non-cumulative).

D. Initial haunching and backfill to 12 inches above top of pipe with compacted Type B aggregate as specified in Section 02223. Use hand tamping and mechanical vibrator.

E. Final backfill with compacted subsoil as specified in Section 02223 unless otherwise noted. Compact with mechanical vibrator and on-site construction equipment.

F. For storm sewers in open cut under pavement, concrete, parking or traffic areas, bedding, initial and final backfill shall be compacted Type A crushed aggregate as approved by the Engineer. Compaction with mechanical vibrator (see Section 02223).

G. See Section 02223 for trenching, bedding, backfilling and compaction requirements. Do not displace or damage pipe when compacting.

H. Large rocks, boulders, rubble, debris and similar extraneous materials which are determined by the Engineer to be detrimental to the installed piping or appurtenances will not be used as backfill and will be removed by the Contractor.

3.05 Installation - Catch Basins and Cleanouts

A. Form bottom of excavation clean and smooth to correct elevation (Section 02223).

B. Form and place cast-in-place concrete base pad, with provision for storm sewer pipe end sections.

C. Level top surface of base pad to receive concrete shaft sections, sleeved to receive storm sewer pipe sections.

D. Establish elevations and pipe inverts for inlets and outlets as shown.

E. Mount lid and frame level in grout, secured to top cone section to elevation shown.

3.06 Installation of Headwalls **– NOT USED.**

3.07 Field Quality Control

A. Request inspection immediately before and after placing bedding, immediately after pipelaying, immediately after placing haunching and immediately after initial backfill materials.

3.08 Protection

A. Protect pipe and limestone backfill from damage or displacement until final backfilling operation is in progress.

3.09 Schedule

A. See Drawings for type, size, and location of piping and related items.

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[REV 07/06]

END OF SECTION

SECTION 02732

GRAVITY SANITARY SEWERAGE SYSTEM

PART 1 GENERAL

1.01 Section Includes

A. Sanitary sewerage piping, fittings, accessories, bedding and testing.

B. Connection of building sanitary drainage system to municipal sewers.

1.02 Related Sections

A. Applicable to Work of this Section are the Drawings and General Provisions of the Contract

1.03 References

A. ANSI/ASTM D2321 - Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.

B. ANSI/ASTM D2729 – Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

C. ANSI/ASTM D3033 - Type PSP Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

D. ANSI/ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

E. ASTM D1784 - Rigid Poly (Vinyl Chlorine) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC).

F. ASTM D1785 – Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120.

G. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

H. Handbook of PVC Pipe Design and Construction by Uni-Bell Plastic Pipe Association.

I. Alabama Department of Transportation Standard Specifications for Highway Construction (ALDOT Standard Specifications) Latest Edition.

J. Construction Standard for Excavations - OSHA (29CFR Part 1926.650.652 Subpart P).

K. Ten States Standards – Recommended Standards for Wastewater Facilities, Great Lakes-Upper Mississippi River Board of Static Public Health and Environmental Managers.

M. ASTM F679 – Standard Specifications for Poly (Vinyl Chloride).

N. ASTM D2122 – Standard Test Method for Determining Dimensions of Thermoplastic Pipe.

O. ASTM C969 – Standard Practice for Infiltration and Exfiltration Acceptance Testing of Insulated Precast Concrete Pipe Sewer Lines.

P. ASTM F1417 – Standard Test Method for Acceptance of Plastic Gravity Sewer Lines Using low Pressure Air.

Q. UNIBELL UNI-B-6 – Recommended Standard for Installation of PVC Pressure Pipe – UNIBELL Plastic Pipe Association.

1.04 Definitions

A. Bedding: Fill placed under pipe prior to subsequent backfill operations.

1.05 Submittals

A. Product Data: Provide data indicating pipe, pipe accessories and fittings complete with Specifications.

B. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

1.06 Project Record Documents

A. Record location of pipe runs, connections, services, laterals, manholes, catch basins, cleanouts, top and invert elevations, grade, etc.

B. Identify and describe discovery of uncharted utilities.

1.07 Regulatory Requirements

A. Conform to applicable code for materials and installation of the Work of this section.

B. Construction Standard for Excavations - OSHA (29CFR Part 1926.650.652 Subpart P).

C. Comply with all OSHA Regulations and Guidelines.

1.08 Field Measurements

A. Verify that field measurements and elevations are as shown.

1.09 Coordination

A. Coordinate the sanitary sewer connection, to municipal sewer with the local utility service company.

PART 2 PRODUCTS

2.01 Sewer Pipe Materials

A. Plastic Service Pipe: ASTM D1785, Schedule 40, Poly (Vinyl Chloride) (PVC) material; bell and spigot style solvent sealed joint end.

2.02 Pipe Accessories

A. Fittings: Same material as pipe, molded, cast, or formed to suit pipe size and end design, including service wyes, tee, bends, elbows, cleanouts, plugs, reducers, traps and other configurations as required.

2.03 Sewer Service Saddles

A. Elastomeric PVC strap-on service saddle, tee or wye, capable of fitting any pipe size from 4" to 18" diameter, and any pipe material.

B. Saddle Sealer shall be cold applied mastic, designed to adhere to concrete, clay, and PVC pipe and rubber or Elastomeric PVC Saddle; FS SS-C-153C Type 1, ASTM D4586093.

C. Connection to service pipe shall be with saddle sealer, one stainless steel hose clamp and to the sewer pipe with minimum two stainless steel straps. Screw housing and clips shall be stainless steel.

D. Service saddle shall be either the "Tee" or "Wye" type. Coordinate with Engineering and Owner.

E. Saddle shall be constructed of Elastomeric PVC with molded-in inserts.

F. Manufacturer: Saddle shall be Model 4T/C or 4Y/C Flexible Saddle as manufactured by NDS, Inc., Lindsey, CA, or approved equal.

2.04 Sewer Service Lines and Fittings

A. ASTM D1785, Schedule 40 PVC (See 2.01 C, Plastic Service Pipe).

B. Service lines shall be compatible with sewer connection whether service wye, tee, or service saddle. Provide coupling or adapter as required and as approved by Engineer.

C. Cleanouts installed on service lines shall be schedule 40 PVC pipe and fittings. Base pad shall be cast-in-place concrete.

2.05 Pipe Adapters and Couplings

A. Couplings shall be provided for connection of dissimilar sewer pipes and for repairs as required, and as approved by Engineer.

B. Couplings shall include a stainless steel shear ring (min. 12 mil) with 316 stainless steel nut and bolt clamps. A rubber gasket or bushing resistant to sewer gas and common household chemicals shall provide a water tight seal against the pipe and to account for varying size of the two pipes being joined.

C. Manufacturers include Fernco, Inc. Mission, or equal.

D. Solid rubber couplings that lack a stainless steel shear ring are not allowed.

2.06 Service Line Cleanouts

A. Piping, Fittings, Plug: ASTM D1785, Schedule 40 PVC.

B. Base Pad: Cast-in-place concrete – minimum 3,000 PSI 28-day compressive strength.

C. Location: See Drawings.

2.07 Bedding Materials

A. Bedding: Type "A" crushed or Type "B" coarse aggregate as specified in Section 02226, and as approved for use by Engineer.

2.08 Underground Utility Marking Tape

A. Non-Detectable Marking Tape

1. Tape: Plastic (Ultra-high Molecular Weight Polyethylene); minimum 4.0 mil (0.004 inch) overall thickness; minimum two inches in width; alkaline and corrosion resistant; minimum 10.64 pounds/inch tensile break strength.

2. Detectable Core: None.

3. Color: Same as Detectable – **Green**.

4. Lettering: Same as Detectable – "**CAUTION GRAVITY SEWER LINE BELOW"**.

5. Manufacturer: The non-detectable marking tape shall be the "SHIELDTEC" as manufactured by Thor Enterprises, Inc., Sun Prairie, WI, or approved equal.

6. Installation: The non-detectable marking tape shall be buried with all metallic and non-metallic Standard Gravity Sewer Lines, Service Lines and with all Small Diameter Gravity Sewer Lines.

7. Bury: The burial depth shall not exceed 36-inches below the final backfilled grade and shall be 12-inches above the top of the pipe.

B. Contractor to coordinate all underground utility marking devices with Engineer prior to installation.

PART 3 EXECUTION

3.01 Examination

A. Verify that trench cut is ready to receive Work and excavations, dimensions and elevations are as shown on Drawings.

3.02 Preparation

A. Hand trim excavations to required elevations. Correct over excavation with Type "A" crushed or Type "B" coarse aggregate (Section 02226) as approved for use by Engineer.

B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

3.03 Trenching

A. See Section 02226.

B. Excavate pipe trench in accordance with Section 02226 for Work of this Section. Hand trim excavation for accurate placement of pipe to elevations noted.

3.04 Installation - Pipe

A. Install pipe, fittings and accessories in accordance with ALDOT Standard Specifications and Handbook of PVC Pipe Design and Construction. Seal joints watertight (see Section 02226).

B. Minimum Cover. Minimum cover over a gravity sewer service shall be 24-inches unless high strength pipes (i.e. ductile iron or steel casing) has been provided.

C. Bedding: Material free of rocks.

D. Pipelaying: Lay pipe to slope gradients noted on layout Drawings; with maximum variation from true slope of 0.01 feet in 10 feet (non-cumulative). Any pipe which has its alignment, grade, or joints disturbed after installation shall be taken up and relaid.

E. Underground Utility Marking Devices: Install underground utility marking devices as required by type of sewer line. See Paragraph 2.10.

F. Haunching and Backfill: Material free of rocks.

G. For sewers or service lines in open cut under pavement, concrete, driveways, parking or traffic areas, final backfill shall be compacted Type A aggregate as approved by the Engineer (see Section 02226). Compaction shall be by mechanical tamper.

H. See Section 02226 for trenching requirements. Do not displace or damage pipe when compacting.

I. Large rocks, boulders, rubble, debris and similar unsuitable excavated materials which are determined by the Engineer to be detrimental to the installed piping or appurtenances will not be used as backfill and will be removed by the Contractor and properly disposed of in a manner acceptable to the City/County Public Works Department in a manner which will not adversely affect the environment.

J. All pipelines shall be laid to line and grade as shown on the Drawings with the spigot end downstream. Bell holes shall be excavated and a firm and even bearing provided along the barrel of the pipe.

K. Dead ends of the pipe and unused branches of crosses, tees or wyes must be closed with plugs or blind flanges held in place with the regular joint for the type of pipe in use.

L. Pipes shall be thoroughly cleaned both inside and outside before they are laid and the inside of all pipes shall be kept clean until accepted in the completed Work.

M. Whenever pipelaying is stopped for the night, or for any other cause, the ends of all lines and fitting openings shall be securely closed to prevent entrance of water, mud, debris or any obstruction.

N. No pipe shall be covered over until it has been inspected and approved by the Engineer.

O. In general, pipelaying shall begin at the lowest point on the gravity system and proceed upstream in a continuous line, except as otherwise authorized by the Engineer.

P. Service Connections

1. Service Wyes. Wye fittings (same material as service pipe) shall be installed as shown on Drawings. Service lines shall be installed, including fittings as required to the edge of the street row (property line) and plugged unless otherwise indicated on Drawings.

2. Service Saddles. Service saddles may be installed in lieu of the service wyes if approved in advance by the Owner and Engineer. Service connections on existing sewer lines shall be by a service saddle, with circular cored service hole, minimum size same as service line.

3. No hammer taps allowed.

4. Cleanouts: Cleanouts shall be installed where indicated on the Drawings.

Q. Service Lines

1. Service lines may be bored or jacked (on grade) under existing pavement or concrete, or open cut at the option of the Contractor unless otherwise indicated. If open cut, existing paving and concrete must be replaced as indicated on Drawings and Specifications.

2. Minimum grade for service lines shall be 1.2 percent for 4-inch diameter, and 0.63 percent for 6-inch diameter unless otherwise indicated.

3. See Service Connections.

4. Coordinate with Engineer.

R. Lay pipe to slope gradients shown on Drawings; maximum variation from true slope to 0.01 feet in 10 feet (non-cumulative).

S. The Contractor is advised that construction trenching and pipelaying shall be in accordance with OSHA Construction Standards for Excavation. See also Section 02226.

T. The Contractor shall take whatever measures are desirable and necessary for the safety of the Contractor's personnel as well as others in the vicinity of the Work.

U. Piping Installed Under Structures: All piping installed under concrete slabs, foundations, buildings, structures and similar facilities shall be totally and completely flushed, cleaned, inspected and tested (all required testing) prior to the construction of the structure or facility over the pipe. See Drawings for any specific pipe installation requirements.

V. Connection of Dissimilar Pipe Materials

1. Coupling or adapter as recommended by pipe manufacturer shall be furnished and installed by the Contractor for connection of sewer pipes constructed of dissimilar material or different dimensions (i.e. 15-inch PVC and 16-inch ductile iron).

2. Coordinate with Engineer.

W. By-Passing of Raw Wastewater

1. By-passing of raw wastewater onto the ground or into a receiving stream is prohibited.

X. Separation of Water and Sewer Lines

1. Contractor to maintain a minimum 5 ft. horizontal separation and 18-inch vertical separation between all water and sewer lines.

2. When the above separation is not possible a welded steel casing shall be utilized.

3.05 Field Quality Control

A. Request inspection immediately prior to and after placing bedding, immediately after pipelaying, immediately after placing haunching and immediately after placing initial backfill materials.

3.06 Testing - Gravity Sewers

A. General: All sewer lines will be tested by the Contractor in the presence of the Engineer in accordance with the requirements of the Handbook of PVC Pipe Design and Construction. The Contractor shall be totally responsible for all safety aspects associated with testing.

B. Flushing: Prior to any testing, all sewer lines will be thoroughly cleaned by flushing with an appropriately sized sewer cleaning ball or squeegee. Additional cleaning and flushing by high velocity water jet may be required by the Engineer if deemed necessary for adequate cleaning, in the opinion of the Engineer.

C. Visual Test: All sewer lines shall be inspected visually to verify accuracy of alignment and freedom from debris and obstructions. The full diameter of the pipe should be visible when viewed between consecutive manholes. The method of test will be by flashlight, mirrors, and/or other methods deemed appropriate by the Engineer. All noted visual defects shall be corrected.

D. Test Failure

1. In the event the pipe installation fails any of the above tests required by the Engineer and conducted by the Contractor in the presence of the Engineer, the Contractor shall determine at his own expense the cause of the failure, source of leakage, poor alignment, rolled gaskets, excessive deflection, obstructions or any other cause of the test failure.

2. The Contractor shall remedy the cause of the failure and shall repair or replace all defective materials or workmanship to the satisfaction of the Engineer. The failed pipe section shall be totally retested by the Contractor in the presence of the Engineer including TV inspection.

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3. The completed pipe installation shall meet the test requirements as specified herein.

3.07 Protection

A. Protect finished Work under provisions of Section 01500.

B. Protect pipe and aggregate backfill from damage or displacement until final backfilling operation is in progress.

3.08 Schedule

A. See Drawings for piping, fittings, and related items required by project.

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[REV 10/15]

END OF SECTION

SECTION 02856

PARKING LOT AND DRIVEWAY MARKINGS

PART 1 GENERAL

1.01 Section Includes

A. Parking lot markings.

1.02 Related Sections

A. Applicable to Work of this Section are the Drawings and General Provisions of the Contract.

1.03 References

A. Alabama Department of Transportation Standard Specifications for Highway Construction.

B. Alabama Department of Transportation Manual on Uniform Traffic Control Devices.

1.04 Submittals

A. Submit for all required materials.

PART 2 PRODUCTS

2.01 Materials

A. Parking Spaces: Shall be "traffic white" or blue for accessible parking, Class I, Type A, reflectorized paint as specified in ALDOT Standard Specifications, Section 856.

B. Traffic Flow Arrows and Markings: Shall be “traffic yellow”, Class I, Type A, reflectorized paint as specified in ALDOT Standard Specifications, Section 856.

PART 3 EXECUTION

3.01 Examination

A. Verify location and placement of parking lot and driveway markings on Plans and coordinate with Engineer.

3.02 Preparation

A. Prepare surfaces to receive paint and thermoplastic materials in accordance with manufacturer's recommendations.

3.03 Installation and Application

A. Application of reflectorized paint and thermoplastic material shall be in accordance with ALDOT Standard Specifications, Section 856 and the manufacturer.

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[Rev. 5/19]

END OF SECTION

SECTION 02923

LANDSCAPE GRADING

PART 1 GENERAL

1.01 Section Includes

A. Final grade topsoil for finish landscaping.

1.02 Related Sections

A. Applicable to Work of this Section are the Drawings and General Provisions of the Contract.

PART 2 PRODUCTS - NOT USED.

PART 3 EXECUTION

3.01 Examination

A. Verify building and trench backfilling has been inspected.

B. Verify substrate base has been contoured and compacted.

3.02 Subsoil Preparation

A. Eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove subsoil contaminated with petroleum products or any other toxic substance.

C. Scarify subgrade to depth of 3 inches where topsoil is scheduled. Scarify in areas where equipment is used for hauling and spreading topsoil and has compacted subsoil.

3.03 Placing Topsoil

A. See Section 02205, Topsoil.

3.04 Tolerances

A. Top of Topsoil: Plus or minus 1/2 inch.

3.05 Protection

A. Protect landscaping and other features remaining as final Work.

B. Protect existing structures, fences, sidewalks, utilities, paving and curbs.

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[9/93]

END OF SECTION

SECTION 02936

SEEDING

PART 1 GENERAL

1.01 Section Includes

A. Preparation of subsoil.

B. Placing topsoil.

C. Seeding, mulching and fertilizer.

D. Maintenance.

1.02 Related Sections

A. Applicable to Work of this Section are the Drawings and General Provisions of the Contract.

1.03 References

A. Alabama Department of Transportation Standard Specifications for Highway Construction (ALDOT Standard Specifications)..

1.04 Definitions

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel and Brome Grass.

1.05 Quality Assurance

A. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging and location of packaging.

1.06 Regulatory Requirements

A. Comply with applicable regulatory agencies for fertilizer and herbicide composition.

1.07 Delivery, Storage and Handling

A. Deliver, store, protect and handle products to site under provisions of Section 01600.

B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

C. Deliver fertilizer in waterproof bags showing weight, chemical analysis and name of manufacturer.

1.08 Maintenance Service

A. Furnish maintenance of seeded areas for three months from Date of Substantial Completion as approved by the Engineer.

B. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition for two cuttings.

PART 2 PRODUCTS

2.01 Seed Mixture

A. Seeding mixture shall be as specified herein for the specific sowing season for the northern or southern areas within the State of Alabama.

B. Areas south of Latitude 33 degrees North are designated as South Alabama; areas North of Latitude 33 degrees North are designated as North Alabama. Latitude 33 degrees North runs generally from Dancy (Pickens County) through Eoune (Bidd County) to Penton (Chambers County).

C. South Alabama Seed Mix

SOWING SEASON	SEED	POUNDS/ACRE
March-June	Bermuda Grass (Hulled) Kobe Lespedeza	20 45
July-August	Bermuda Grass (Hulled) Reseeding Crimson Clover	20 60
Sept.-Dec.	Bermuda Grass (Unhulled) Reseeding Crimson Clover	30 60
Jan.-Feb.	Bermuda Grass (Hulled) Reseeding Crimson Clover Kobe Lespedeza	30 40 45

D. North Alabama Seed Mix

SOWING SEASON	SEED	POUNDS/ACRE
March-July	Bermuda Grass (Hulled) Kobe Lespedeza	20 45
Aug.- Feb.	Bermuda Grass (Unhulled) White Clover Kentucky Bluegrass	30 15 30

E. Seed shall be furnished separately or in mixtures in standard containers with the seed name, lot number, net weight, percentages of purity and of germination and hard seed and percentage of maximum weed seed content clearly marked for each kind of seed.

F. The Contractor shall furnish the Engineer duplicate signed copies of a statement by the vendor certifying that each lot of seed has been tested by a recognized laboratory for seed testing within six months of date of delivery. This statement shall include:

1. Name and address of laboratory.

2. Date of test.

3. Lot number for each kind of seed.

4. Test Results Including

a. Name of seed.

b. Percent purity.

c. Percent germination.

d. Percent weed content.

5. If a seed mixture, the results shall also include the proportions of each kind of seed.

2.02 Soil Materials

A. Topsoil: See Section 02205 - Topsoil.

2.03 Mulching Material

A. Oat or wheat straw, free from weeds and foreign matter detrimental to plant life.

B. Dry hay or chopped cornstalks are not acceptable.

2.04 Fertilizer

A. Manufacturer standard commercial fertilizer recommended for grass, of proportion necessary to eliminate any deficiencies of topsoil, as indicated in analysis to the following proportions: Nitrogen 13 percent, phosphoric acid 13 percent, soluble potash 13 percent.

2.05 Water

A. Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.

2.06 Agricultural Limestone

A. Crushed or ground and specifically prepared for agricultural liming. All such limestone shall have a neutralizing value of 90 percent calcium carbonate or better.

2.07 Erosion Fabric

A. Jute matting; open weave.

PART 3 EXECUTION

3.01 Examination

A. Verify that prepared soil base is ready to receive the Work of this Section.

3.02 Preparation of Subsoil

A. See Section 02923, Landscape Grading.

3.03 Placing Topsoil

A. Topsoil: As specified in Section 02205.

3.04 Lime Application

A. Lime (agricultural limestone) shall be applied at the rate of 1500 pounds per acre unless soil test results forwarded by the Contractor indicated that soil pH adjustment requires a lesser or greater amount.

B. The applied lime shall be mixed with the topsoil and scarified by disking or other appropriate means prior to applying fertilizer.

3.05 Fertilizing

A. Apply fertilizer in accordance with manufacturer's instructions at a rate to provide at least 120 pounds per acre of nitrogen, 120 pounds per acre of available phosphoric acid and 120 pounds per acres of total potash as computed from the nominal contents of the fertilizing ingredients unless soil test results forwarded by Contractor indicates an adjustment in the amounts.

B. Apply after smooth raking of topsoil and prior to roller compaction.

C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.

D. Mix thoroughly into upper 2 inches of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.06 Seeding

A. Apply seed at the rate indicated in Paragraph 2.01 above, evenly in two intersecting directions. Rake in lightly.

B. Do not seed areas in excess of that which can be mulched on same day.

C. Planting Season and Seed Mix: As indicated in Paragraph 2.01 above.

D. Do not sow immediately following rain, when ground is too dry, or during windy periods.

E. Roll seeded area with hand roller weighing 40 to 65 pounds per foot of width for clayey soils and weighing 150 to 200 pounds per foot of width for sandy soils.

F. Immediately following seeding and compacting, apply mulch to provide an adequate cover to prevent erosion and maintain moisture. Maintain clear of shrubs and trees.

G. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

3.07 Seed Protection

A. Identify seeded areas with stakes and string around area periphery. Set string height to 24 inches.

B. Cover seeded slopes where grade is 4 inches per foot or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

C. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Provide 12 inch overlap of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.

D. Secure outside edges and overlaps at 36 inch intervals with stakes.

E. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

F. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 12 inches.

3.08 Maintenance

A. Water to prevent grass and soil from drying out.

B. Immediately reseed areas which show bare spots.

C. Protect seeded areas with warning signs during maintenance period.

D. See Paragraph 1.09 above.

3.09 Grassing Schedule

A. All disturbed areas within construction site, except those indicated, to be sodded, paved or concreted.

B. See Drawings.

[5200]
[04/06]

END OF SECTION

SECTION 02937

GRASS SODDING

PART I GENERAL

1.01 Section Includes

A. Preparation of subsoil (where topsoil is to be added).

B. Specifications of Topsoil Material and Application.

C. Specifications for Fertilizer, Lime and Final Soil Preparation.

D. Specifications for Turfgrass Sod Materials and Installation.

E. Specifications of Maintenance of Grass Sod.

1.02 Related Sections

A. Applicable to Work of this Section are the Drawings and General Provisions of the Contract.

1.03 References

A. Alabama Department of Transportation Standard Specifications for Highway Construction (ALDOT Standard Specifications).

1.04 Definitions

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel and Brome Grass.

1.05 Quality Assurance

A. Provide transported soil materials that are free of rocks and debris that are 2” and larger.

1.06 Regulatory Requirements

A. Comply with applicable regulatory agencies for fertilizer and herbicide composition.

1.07 Delivery, Storage and Handling

A. Deliver, store, protect and handle products to site under provisions of Section 01600.

B. Deliver grass sod in sections on pallets. Damaged sections will not be accepted.

C. Deliver fertilizer in waterproof bags showing weight, chemical analysis and name of manufacturer.

1.08 Maintenance Service

A. Furnish maintenance of sodded areas for three months from Date of Substantial Completion as approved by the Engineer.

PART II SPECIFICATIONS FOR TOPSOIL MATERIAL AND APPLICATION

Note: Topsoil on the existing site may often be used, standards as set forth in these Specifications.

A. General: Unless otherwise specified by the Engineer, the landscape contractor shall furnish all topsoil, labor, material and equipment required to complete the work described herein in strict accordance with the drawings and/or terms of the contract.

B. Tilling: After the areas to be topsoiled have been brought to grade, and immediately prior to dumping and spreading the topsoil, the sub-grade shall be loosened by disking or rototilling to a depth of at least 3 to 4 inches to permit bonding of the topsoil to the subsoil.

C. Soil: Texture of the topsoil shall be specified and approved by the Engineer or his agent. Topsoil shall be free of tree roots, stumps, building material, and trash, and shall be free of stones larger than 1-1/2 inches in any dimension. Topsoil shall be free of quackgrass or nut grass.

All topsoil shall be tested as outlined in Section 1. No turfgrass sod shall be placed on soil which has been treated with soil sterilants or herbicide until sufficient time has elapsed to permit the dissipation of toxic materials. The landscape contractor shall assume full responsibility for any loss or damage to turfgrass sod arising from improper use of sterilants or due to his or her failure to allow sufficient time to permit dissipation of toxic materials, whether or not such sterilants are specified herein.

D. Grading: The topsoil shall be uniformly distributed on the designated areas. It shall be a minimum depth of 4 inches after firming. Spreading shall be performed in such a manner that turfgrass sod installation can proceed with a minimum of additional soil preparation and tillage. Any irregularities in the surface resulting from top soiling or other operations shall be corrected in order to prevent the formation of depressions or crowns. Topsoil shall not be placed while in a frozen or muddy condition or when the sub-grade is excessively wet, or in a condition that may otherwise be detrimental to proper grading or proposed turfgrass sod installation.

E. Clean-Up: After the topsoil has been spread and the final grades approved, the area shall be cleared of all grade stakes, surface trash and other objects that would hinder installation of turfgrass sod. Paved areas over which hauling operations are conducted shall be cleaned as soon as the job is completed.

F. Acceptance: Acceptance shall be given by the general contractor, Owner, Engineer or his or her agent upon satisfactory completion of each section or area indicated on the drawings or as otherwise specified. Acceptance shall be recorded and signed by the Owner or authorized agent.

PART III SPECIFICATIONS FOR FERTILIZER AND LIME MATERIALS AND FINAL SOIL PREPARATION

Note: Specifications given in this Section apply to both areas where topsoil has been added and to areas where soil from the existing site is used.

A. General: The landscape contractor shall furnish all labor, material and required equipment to complete the work described herein in strict accordance with the Drawings and/or terms of the Contract.

B. Materials: Soil tests shall be made to determine requirements for both lime and fertilizer. Soil tests shall be conducted by a reputable testing laboratory. Provide Engineer with copy of soil test.

1. Fertilizers: All fertilizers shall be uniform in composition and free-flowing. Fertilizer shall be delivered to the job site fully labeled according to applicable state fertilizer laws. Fertilizer application rates shall be determined by soil tests. Fertilizer shall be distributed uniformly over the area to be sodded with turfgrass.

2. Agricultural Limestone: Crushed or ground and specifically prepared for agricultural liming. All such limestone shall have a neutralizing value of 90 percent calcium carbonate or better.

C. Grading

1. Tillage: Lime and fertilizer shall be uniformly mixed into the top four inches of soil.

2. Final Grading: Any irregularities in the surface resulting from fertilizing, liming, or other causes shall be leveled prior to turfgrass sod installation. Areas damaged by flooding or erosion shall be reconstructed and all grades reestablished by the landscape contractor in accordance with the Drawings and/or other applicable Specifications.

   Except for turfgrass sod-installing equipment, care should be taken to keep equipment off prepared areas. Particular care should be taken to avoid “COMPACTION” during the grading process. The use of clay soils for grading material and the utilization of heavy equipment for surface preparation will contribute to soil compaction.

D. Clean-Up: Prior to turfgrass sod installation, the surface shall be free of stones, cleared of all trash, debris, roots, brush, wire, grade takes and other objects that would interfere with establishment or maintenance operations.

E. Acceptance: Acceptance shall be given to the general contractor, homeowner, Engineer or his or her agent upon satisfactory completion of each section or area as indicated on the Drawings or as otherwise specified.

F. General Contractor’s Responsibility: Unless otherwise specified by the Contract, the general contractor is responsible for maintaining the accepted area which are to be sodded with turfgrass. The effective turfgrass sod installation date shall be specified in a written notice from the general contractor.

PART IV SPECIFICATIONS FOR TURFGRASS SOD MATERIALS AND INSTALLATION

A. General: Unless otherwise stated, it is expected that the landscape contractor shall furnish all labor, material and equipment required to complete the work described herein in strict accordance with the Drawings and/or terms of the Contract. All previously established grades shall be maintained in conformance with the Drawings and/or other Specifications.

B. Materials

1. Sod Composition: Shall be equal to Turfgrass Sod or Zeon Type Zoia.

2. Thickness of Cut: Turf shall be machine-cut at a minimum uniform soil thickness necessary for plant viability during the Harvest-Transport-Installation cycle. Where "washed turfgrass sod" is specified, soil must be removed as completely as possible using soil-extraction systems currently available.

3. Pad Size: Individual pieces of turfgrass sod shall be cut to the supplier's standard width and length. Maximum allowable deviation from standard widths and lengths shall be 5 percent.

4. Strength of Turfgrass Sod Sections: Standard size sections of turfgrass sod shall be strong enough to support their own weight and retain their size and shape when suspended vertically from a firm grasp on the upper 10 percent of the section.

5. Replacement: The policy of replacement of turfgrass sod is dependent upon each individual farm. Most replacements extend only to the cost of the turfgrass sod involved, not labor or transportation expenses. Notification of defective turfgrass sod must be made within 24 hours of delivery. Failure to notify the turf farm within the specified time period can result in the farm's refusal to replace the turfgrass sod.

C. Installation

Note: To help insure proper turfgrass sod establishment, turfgrass sod should always be installed on areas that have been prepared in accordance with Part III of these Specifications (Specifications for Fertilizer and Lime Materials and Final Soil Preparations).

1. Moistening the Soil: After all grading has been completed, the soil shall be irrigated within 12 to 24 hours prior to laying the turfgrass sod. Turfgrass sod should not be laid on soil that is dry and powdery.

2. Starter Strip: The first row of turfgrass sod shall be laid in a straight line, with subsequent rows placed parallel to, and tightly against, each other. Lateral joints shall be staggered to promote more uniform growth and strength. Care shall be exercised to insure that the turf is not stretched or overlapped, and that all joints are butted tight in order to prevent voids, which would cause air-drying of the roots.

3. Sloping Surfaces: On sloping areas where erosion may be a problem, turfgrass sod shall be laid with staggered joints and secured by pegging.

4. Watering: The landscape contractor, or agreed-upon party, shall be responsible for watering turfgrass sod immediately during and after installation to prevent drying. It shall then be thoroughly irrigated to a depth sufficient that the underside of the new turfgrass sod pad and soil immediately below the turfgrass sod are thoroughly wet (usually 1 inch of water is needed). The general contractor shall be responsible for having adequate water available at the site prior to and during installation of the turfgrass sod.

D. Acceptance: Acceptance of the installed turfgrass sod shall be on a daily basis within 14 hours of completion of an area or selection, unless otherwise specified.

E. Disclaimer: The landscape contractor shall not be held liable for damages to turfgrass sod caused by de-icing compounds, fertilizers, pesticides, herbicides or other material not applied by him or her or under his or her supervision, nor for those caused by acts of God or vandalism.

F. Guarantee: The landscape contractor shall guarantee work covered by this specification.

G. General Contractor's Responsibility: Unless otherwise specified, the general contractor shall be responsible for maintenance of sodded areas until final written acceptance by the Owner.

PART V SPECIFICATIONS FOR MAINTENANCE OF INSTALLED TURFGRASS SOD

A. General: Unless stated otherwise, it is expected that the landscape contractor shall furnish all labor, material and equipment required to complete the work described herein in strict accordance with the Drawings and/or terms of the Contract. The general contractor shall supply adequate water to the site.

B. Time Limitation: Duration of maintenance responsibilities by landscape contractor shall be for 30 days or until otherwise specified in writing by the Owner, architect or general contractor.

C. Watering

1. First Week: The landscape contractor shall provide all labor and arrange for all watering necessary for establishment of the turfgrass sod. In the absence of adequate rainfall, watering shall be performed daily or as often as necessary during the first week in sufficient quantities to maintain moist soil to a depth of at least 4 inches. Watering should also be done during the heat of the day to help prevent wilting.

2. Second and Subsequent Weeks: The landscape contractor shall water the turfgrass sod as required to maintain adequate moisture in the upper 4 inches of soil. Avoid application of too much water. Turfgrass sod should not be continually saturated. Depending on the sprinkler, as little as 20 to 30 minutes of water application may be sufficient; other sprinklers may require long water application times.

D. Mowing: For bluegrass or bluegrass/fescue turfgrass sod, zeon zoia turfgrass height shall be maintained between 1-1/2 and 2-1/2 inches unless otherwise specified. Not more than 1/3 of the grass leaf shall be removed by the initial cutting or subsequent cuttings. For bentgrass sod, initial turfgrass height shall be maintained as specified by the grower or installer. Not more than 1/3 of the grass leaf shall be removed by the initial cutting or subsequent cuttings. Height of bentgrass turf may be gradually reduced to the desired cutting height by weekly or more frequent lowering of the mower setting as specified by the grower installer.

E. Disclaimer: The landscape contractor shall not be held liable for damages to turfgrass sod caused by de-icing compounds, fertilizers, pesticides, herbicides and other materials not applied by him or her or under his or her supervision nor those caused by act of God or vandalism.

F. Guarantee: The landscape contractor shall guarantee work covered by this Specification.

[5200]
[6/2012]

END OF SECTION

ADEM FORM 496

NOTICE OF ASBESTOS ABATEMENT

AND/OR DEMOLITION

Contractor shall submit to ADEM prior to Demolition

NESHAPS #

STATE OF ALABAMA

Department of Environmental Management

Notice of Asbestos Abatement and/or Demolition

Reason: ☐ **Original** ☐ **Cancelled** ☐ **Postponed** ☐ **Annual** ☐ **Revision #____**

1. Facility Name: _____
   Facility Physical Address: _____
   City: _____ State: AL Zip: _____ County: _____
   On Site Contact: _____ Title: _____ Phone: _____
   Building Description [size (sf), age, #floors, prior use]: _____
   _____
   Exact Removal Site (room, floor, building #, etc.): _____
   _____

2. Facility Owner: _____
   Owner Address: _____ City: _____ State: _____ Zip: _____
   Contact: _____ Title: _____ Phone: _____
   Owner email: _____

3. Asbestos Inspector Name: _____ Employer:_____
   Inspector Phone: _____ Inspector Email: _____
   Safe State Accreditation No.: AIN_____ Date of Inspection: _____

4. Abatement Contractor: _____ ADEM Certification No.: _____
   Address: _____ City: _____ State: ____ Zip: _____
   Contact Name: _____ Phone: _____ Email: _____

   Demolition Contractor: _____
   Address: _____ City: _____ State: ____ Zip: _____
   Contact Name: _____ Phone: _____ Email: _____

5. ☐ RENOVATION ☐ DEMOLITION ☐ HAS NO ASBESTOS ☐ ORDERED *(attach documentation)*

Abatement Dates	Demolition Dates
Start _____ Finish _____	Start _____ Finish _____
Start _____ Finish _____	Start _____ Finish _____
Start _____ Finish _____	Start _____ Finish _____

Work Days (Mon, Tue, etc.): _____ Work Hours:_____
Emergency reason(s) for not complying with 10-day notification requirement: _____
_____

6. **Attach a list that includes the following: Amount(s) and type(s) of ACM to be abated, whether the material is friable or non-friable, and removal methods.** ***Contact ADEM for requirements for demolition by burning.***

7. Waste Disposal Site: _____
   Address: _____ City: _____ State: ____ Zip: _____
   Contact: _____ Phone: _____ Permit No.: _____

8. Procedures for unexpected ACM: _____

I certify the above is correct.

Signature: _____ Date: _____
Print Name: _____ Phone: _____

WHO MUST SUBMIT A NOTIFICATION FORM?

Regulations require that someone (usually a contractor, property owner or consultant) submit a notification to the appropriate agency 10 weekdays prior to disturbing any regulated asbestos-containing material (RACM) or beginning demolition. Specifically, a notification must be submitted if one of the three following situations exists:

1. It is a renovation project and at least 260 linear feet or 160 square feet or 35 cubic feet of RACM is to be removed.
2. It is a demolition project with or without asbestos-containing material (ACM).
3. A structure is going to be burned for fire training (requires Departmental approval).

WHAT IS REGULATED ASBESTOS-CONTAINING MATERIAL?

RACM has greater than 1% asbestos by weight and includes friable and nonfriable forms. ("Friable" means that it can be crushed to powder by hand pressure.) RACM can include: (1) Friable ACM, such as pipe and elbow insulation, storage vessel insulation, and spray-applied applications such as fireproofing, soundproofing, or decoration. (2) Category I nonfriable ACM such as vinyl floor tile and mastic, asphalt roofing products, gaskets and packing which have become friable or will be subject to sanding, grinding, cutting or abrading. *Please be aware that some older sheet vinyl (linoleum) has an asbestos-containing felt backing which can turn to powder (become friable) under certain circumstances. You must be careful with it.* (3) Category II nonfriable ACM such as transite and cementitious siding or roofing which have a high probability of becoming crumbled, pulverized, or reduced to powder during renovation or demolition activities.

WHAT ARE SOME OTHER REGULATORY REQUIREMENTS?

A structure must be surveyed by an Alabama licensed inspector before renovation or demolition or burning for training. Friable and Category II nonfriable ACM must be removed from a structure before demolishing it. Category I nonfriable ACM can usually be left in the structure during demolition, if no materials are going to be recycled. Friable ACM must be wetted before, during and after removal until soaked through. It should be containerized while wet and properly labeled. Friable ACM must be disposed of as special waste, regardless of amount. Nonfriable ACM can usually be disposed of as general or construction waste. It is best to check with the landfill or waste hauler first. Removed Category II nonfriable ACM must be disposed of separately. RACM must be removed by an organization certified by the Alabama Department of Environmental Management (ADEM). *(NOTE: All ACM must be removed from a structure before burning for training.)*

ARE THERE ANY EXEMPTIONS?

Privately owned residential buildings of 4 or less units that remain residential property are exempt from asbestos regulations, but they must comply with disposal regulations. (This residential exemption puts homeowners at risk!)

HOW ARE NOTIFICATIONS SUBMITTED?

Original notifications may be sent by U.S. Mail, special delivery service, hand-delivered or by e-mail (most common method). Revisions to notifications and courtesy notifications may be sent by facsimile transmission, but usually by e-mail. They must be sent to one of the 3 individuals/organizations below, depending upon the location of the renovation/demolition.

City of Huntsville:
Mr. Scott Cardno
Department of Natural Resources and Environmental Management
City of Huntsville
P.O. Box 308
Huntsville, AL 35804-0308
PH: 256/427-5750
FAX: 427-5751
(Street Address:)
320 Fountain Circle
Huntsville, AL 35801-4240
E-mail: Scott.Cardno@huntsvilleal.gov

Jefferson County (collects job fees):
Mr. Craig Tucker
Air and Radiation Protection Division
Jefferson County Department of Health
P.O. Box 2648
Birmingham, AL 35202-2648
PH: 205/930-1204
FAX: 939-3019
(Street Address:)
400 6th Avenue South
Birmingham, AL 35233-1598
E-mail: craig.tucker@jcdh.org

All other areas:
Mr. Don Barron
ADEM—Air Division
P.O. Box 301463
Montgomery, AL 36130-1463
PH: 334/271-7879
FAX: 279-3044)
(Street Address:)
1400 Coliseum Boulevard
Montgomery, AL 36110-2059
E-mail:
asbestosmail@adem.alabama.gov

PRE-DEMOLITION ASBESTOS SURVEY

The attached Survey was prepared in 2020 on behalf of Cherokee County Schools. The Survey included the Centre Elementary School, which was at a different location and not part of the City Hall Project. Several attachments related only to the Elementary School have been removed. All references to the Centre Middle School Campus are applicable to the City Hall Project.

May 7, 2020

Cherokee County Schools
c/o Mr. Sloan Walker
RA-LIN & Associates
428 Main Street
Oxford, Alabama 36203

Subject: Pre-Demolition Asbestos Survey
Centre Elementary School & Former Centre Middle School
Centre, Alabama
EMC Project No. MA-3992

Dear Mr. Walker:

In accordance with EMC's proposal MA-20-113, we have completed a pre-demolition asbestos survey within two buildings located on the Centre Elementary School campus and four buildings located on the former Centre Middle School campus. This report presents the findings.

Background Information

It is EMC's understanding that Cherokee County Schools will be demolishing a portion of the elementary school campus in order to move school operations into the new school facility which is currently under construction. The former middle school campus is to be demolished completely. EPA's NESHAP regulations require than an asbestos survey be performed so that any asbestos-containing building materials within the buildings can be properly addressed prior to or during building demolition.

Asbestos Survey

On April 20, 2020, EMC personnel arrived at Centre Elementary School and met with Mr. Dale James with Cherokee County Schools. Mr. James provided access to the elementary school facilities that were part of the proposed demolition as well as coordinated our site visit to the former Centre Middle School campus. EMC then performed a tour of the elementary school project areas, noting materials that are considered suspect for asbestos. During the site visit EMC recorded the general locations of 31 building materials that are considered suspect to contain asbestos.

On April 21-22, 2020, EMC personnel met with Mr. James at the former Middle School campus and were provided a tour of the campus facilities. Mr. James indentified the areas within the main school building that had different construction or renovation dates. The primary school building was separated in five separate sampling areas due to various construction periods since the original construction. The various structures and/or separate sampling areas were given a unique identification number for sampling and reporting pursposes. During the site visit EMC recorded the general locations of 53 building materials that are considered suspect to contain asbestos.

Summary of Individual Building Sections and Homogenous Sampling Areas Identifed

School Campus Location	Building ID # or Section #	HSAs Identified
Elementary School	Building ID #01 – Main Building	19
Elementary School	Building ID #02 – 2nd Building	12
Former Middle School Campus	Main Facility - Section #01 - Original Building	11
Former Middle School Campus	Main Facility - Section #02 – Media Center	6
Former Middle School Campus	Main Facility - Section #03 – Science Center	3
Former Middle School Campus	Main Facility - Section #04 – West Wing Addition	3
Former Middle School Campus	Main Facility - Section #05 – West Wing Addition	4
Former Middle School Campus	Building ID #02 – STAR Program Building	8
Former Middle School Campus	Building ID #03 – Gymnasium	12
Former Middle School Campus	Building ID #04 – Cafeteria	6
	Total	**84**

**A homogeneous sampling area (HSA) is defined by being a material that is the same in type, color, texture and applied or installed during the same time of construction or renovation.*

Bulk samples for asbestos analysis were obtained in all listed school facilities in general accordance with EPA recommendations. The EPA's recommended procedures involve representative sample site selection within sampling areas. After sampling, the bulk samples were forwarded to EMSL Analytical in Smyrna, Georgia. The NVLAP lab code for EMSL's Smyrna lab is 101048-1. The asbestos survey and sampling work was performed by Mr. Trent Hill (Alabama Accreditation No. AIN0220708327) and Mr. Hadley Smith (Alabama Accreditation No. AIN0619539627). The bulk samples were analyzed by polarized light microscopy (PLM) coupled with dispersion staining. This technique is used to identify asbestos fibers by their shape and unique optical properties. The analysis identified twenty-three asbestos-containing materials (ACMs) based on the samples collected by EMC.

Summary of Asbestos-Containing Materials Identifed in each Unique Building # or Section #

School Campus Location	Building ID # or Section #	Total # of ACMs
Elementary School	Building ID #01 – Main Building	6
Elementary School	Building ID #02 – 2nd Building	5
Former Middle School Campus	Section #01 – Main Facility	1
Former Middle School Campus	Section #02 – Main Facility – Media Center	0
Former Middle School Campus	Section #03 – Main Facility – Science Center	2
Former Middle School Campus	Section #04 – Main Facility – west wing addition	1
Former Middle School Campus	Section #05 – Main Facility – west wing addition	2
Former Middle School Campus	Building ID #02 – STAR Program Building	1
Former Middle School Campus	Building ID #03 – Gymnasium	2
Former Middle School Campus	Building ID #04 – Cafeteria	3
	Total	**23**

**A site drawing and aerial photographs have been attached identifying each building and/or building section on the school campuses.*

A summarization of the analytical results are provided in the tables included with this report. Specific data for each sample analysis is shown on the enclosed analytical data sheets and chain-of-custody. Site reference maps are also included with this report.

Asbestos Comments

The EPA defines an asbestos-containing material as one containing greater than 1% asbestos. Regulated asbestos-containing materials (RACM) are those materials containing greater than 1% asbestos and can include both friable and non-friable forms. This survey identified only one ACM that is classified by the EPA as a RACM friable material and twenty-two materials classified as non-friable. Friability is defined as a material that can be crushed or reduced to a powder with hand pressure. The one material observed and sampled that is considered friable is a small amount of boiler mud located in the elementary school's mechanical room, along the sides of the boiler (see photo page 1 for reference). This material must be removed prior to any demolition activities planned for the boiler system.

OSHA considers removal of the friable asbestos-containing material to be Class I asbestos work, and requires establishment of regulated areas, supervision by a competent person, worker training, adherence to specified work practices, and respiratory protection.

The floor tiles and roofing materials are classified as Category I non-friable ACM. Materials such as vinyl floor coverings and asphalt roofing materials are regulated under NESHAP when they have become friable or will be subject to sanding, grinding, cutting or abrading. OSHA requires employers to protect their workers from airborne asbestos exposure when asbestos materials are disturbed. The materials identified as black mastics, and caulk, are classified by the EPA as Category II non-friable ACMs. Category II non-friable materials are only regulated under NESHAP if they become friable or have a high probability of becoming or have become crumbled, pulverized, or reduced to a powder by forces expected to act on them.

OSHA considers removal of the identified non-friable ACM to be Class II asbestos work, and requires establishment of regulated areas, supervision by a competent person, worker training, adherence to specified work practices, and respiratory protection (or documentation that it is not required).

The Alabama Department of Environmental Management (ADEM) requires that all asbestos wastes be disposed in a permitted landfill. Asbestos-containing materials cannot be recycled. However, ADEM allows Category I non-friable materials to remain in place during demolition activities and disposed in a C/D landfill with all other demolition debris. Category II non-friable materials can remain in place with all other demolition debris if they have not or will not become a RACM as defined in the above paragraphs. However, contractors must use best management practices while demolishing the structure. These practices include wet demolition methods to prevent airborne dust hazards.

Non-Scope Items - For General Reference Only:

Additional Pre-Demolition – Materials and Other Wastes of Concern

Mercury Thermostats – EMC did observe mercury-containing thermostats at the time of the site visit, primarily in the Middle School campus facilities. The mercury-containing thermostats can be recycled as mercury-containing equipment which is considered as Universal Waste. However, handling must be performed in a manner that does not create a spill or leak. Waste handling and disposal must follow EPA regulation 40 CFR 273.13 – Waste Management. All thermostats will need to be observed for the presence or absence of mercury and handled appropriately.

Fluorescent Lights – EMC observed fluorescent light fixtures and bulbs in all facilities surveyed. All flourscent lamps must be collected prior to demolition activities and disposed of properly. Lamps that are identified as "green tip" or "green labeled" lamps can be disposed as a solid waste or recycled as a universal waste. All lamps that cannot be properly identified as "green tip" or "green labeled" must be disposed as universal waste. We recommend that Safety Data Sheets (SDS) be reviewed for all lamp products. SDSs provide disposal instructions as well as the manufacturer's TCLP information. Green lamps or ECO lamps produced by Sylvania, Phillips, or General Electric

(GE) are typically non-regulated and pass TCLP regulations for mercury. Proper handling must be used in order to prevent breaking or pulverizing the lamps.

All boxes and containers used for recycling must be properly closed and labeled as "Universal Waste – Used Lamps" with the start date written when the first lamp is placed in the box or container. (Example Label: Universal Waste – Used Lamps, Start Date 5-30-2020). Lamps must be recycled within one year from the start date that was placed on the container.

High Intensity Lamps (High Intensity Discharge- HID) – EMC recorded thirty high intensity lamps located in the Middle School gymnasium. The lamps are attached to the ceiling system. HID lamps can contain mercury-vapor, metal-halide or high-pressure sodium-vapor and are classified as hazardous waste lamps. However, these lamps are covered by the EPA's Universal Waste standard as defined in the Code of Federal Regulations 40 CFR 273.9. All lamps require proper collection and disposal. We recommend that the demolition contractor contact their waste hauler and prepare containers along with the fluorescent lamps that will need to be disposed as Universal Waste. These lamps must be removed and containerized separately from the typical fluorescent light lamps. Waste handling and disposal must follow EPA regulation 40 CFR 273.13 – Waste Management. Proper handling must be used in order to prevent breaking or pulverizing the lamps.

Light Fixture Ballasts - All ballasts will need to be observed for the presence or absence of PCBs and handled appropriately. Ballasts on this project may or may not be labeled with the words "No PCBs". The light fixture ballasts containing proper labeling with the words "No PCBs" can be disposed as a solid waste. Ballasts that do not contain a label or any identifcation information stating the product contains "No PCBs" must be tested or assumed to contained PCBs and disposed of properly. All ballast labels should be verified.

Based on current EPA Polychlorinated Biphenyls (PCBs) regulations, materials containing PCBs at levels greater than 50 ppm are not authorized for use and must be removed. Waste materials from renovation and/or demolition projects must follow procedures outlined in EPA 40 CFR 761.62 – Disposal of PCB Bulk Product Waste.

It is EMC's understanding, after speaking with an ADEM representative in the Solid Waste, Land Division, that any materials greater than 50 ppm are considered a hazardous waste and must be disposed in a permitted hazardous waste landfill, such as Chemical Waste Management (CWM) Emelle located in Emelle, Alabama. Waste shall not be disposed in a municipal landfill or C&D landfill.

Miscellaneous Cleaning Products, Paints, or Chemicals – EMC did observe containers and left over chemicals within the middle school campus. Proper identification, handling and disposal must be performed with left over acids, cleaning products, etc. prior to disposal, if these materials cannot be recycled or re-used at other school facilities. Some waste materials may be classified as a hazardous waste and should be properly handled, labeled, contained, stored, and disposed in accordance with the EPA's Resource Conservation and Recovery Act (RCRA) and Department of Tranportation (DOT) guidelines and regulations (40 CFR 260-262, 40 CFR 105-110 and 171-180).

Lead-Based Paint - EMC did not perform any lead-based paint testing or surveying services as part of the scope of work for this project. Due to the overall age of the structures lead-based paint could be present.

Based on EPA Resource Conservation and Recovery Act (RCRA), the disposal of lead-contaminated waste, which includes demolition debris, can sometimes be considered a hazardous waste. In order to document whether a proposed demolition waste is classified as a hazardous waste or non-regulated waste, a Toxicity Characteristic Leaching Procedure (TCLP) sample(s) must be collected prior to demolition and/or prior to any waste being hauled off-site to a landfill. OSHA regulations

require contractors to protect their employees from exposure to elevated airborne lead levels. The demolition contractor should be advised of the potential for lead in some older painted surfaces and reminded of their responsibility to protect their workers.

Limitations

EMC's observations, sampling, and testing were limited to exposed materials on the exterior and within the building. EMC only performed small, minor demolition of the walls, flooring materials, ceilings, or insulations to observe and sample underlying materials. Determination of whether a suspect material contains asbestos was generally based on analyses of the minimum number of samples allowed by the EPA's AHERA regulations. Because of variations in the composition of some materials, and our inability to visually identify those variations, it is possible that not all asbestos-containing materials were identified. The non-scope items included in this report were provided for reference only and should not be relied upon as a complete survey of all regulated or hazardous materials/wastes. This report has been prepared for the use of Cherokee County Schools and/or its representatives. No other warranties are expressed or implied.

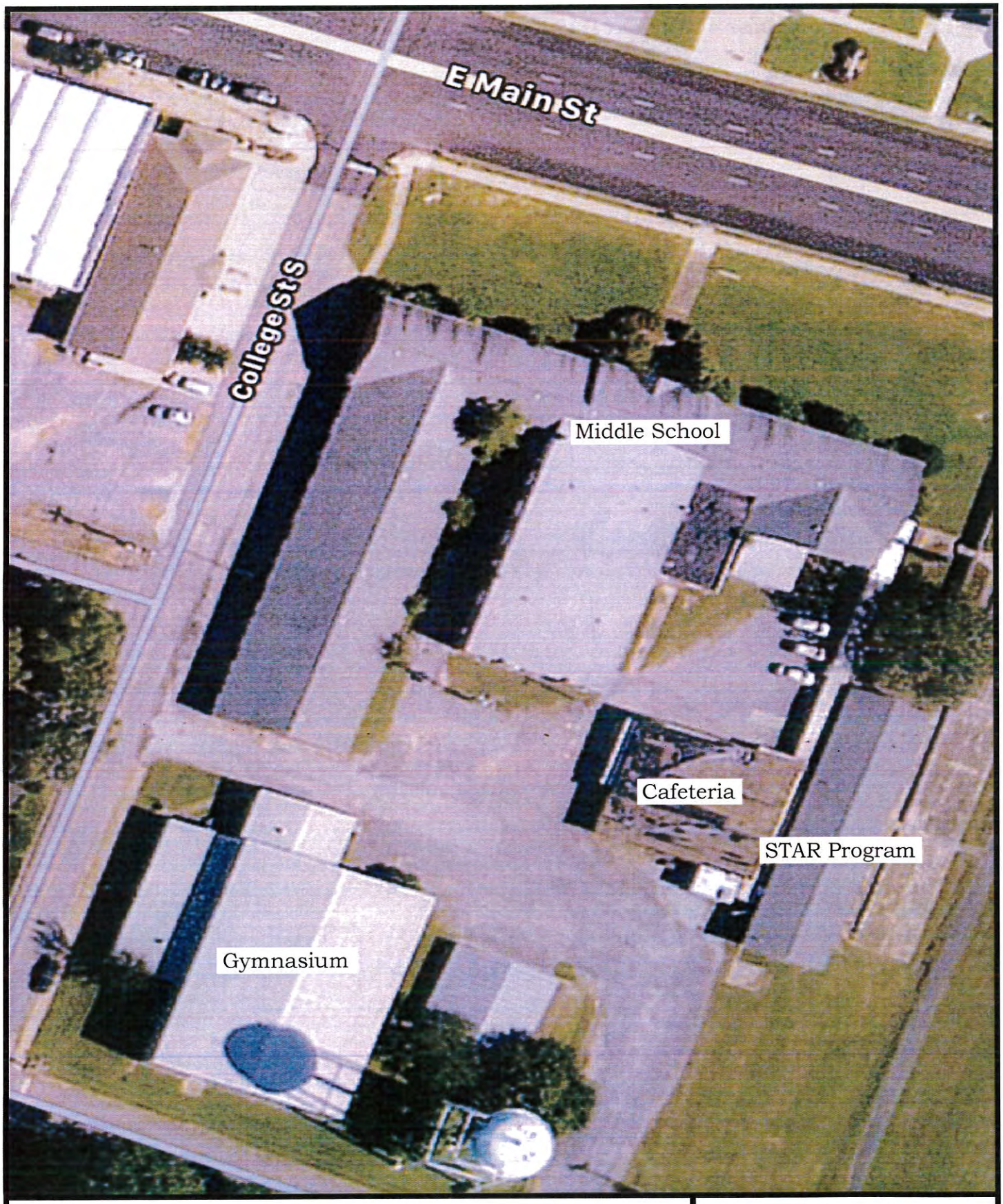
We appreciate the opportunity to provide this service. Please do not hesitate to contact us if you have questions about EMC's work.

Sincerely,
Environmental-Materials Consultants, Inc.

REGISTERED ENVIRONMENTAL MANAGER
TRENT S. HILL
REM
12432

Trent S. Hill, REM, CESCO
Owner/President

enclosures



Cherokee County Schools
EMC Project Number: MA-3992
Asbestos Survey Date: April 21-22, 2020

EMC
ENVIRONMENTAL-MATERIALS CONSULTANTS, INC.

Centre Middle School
Asbestos Survey Section 01

N
W E
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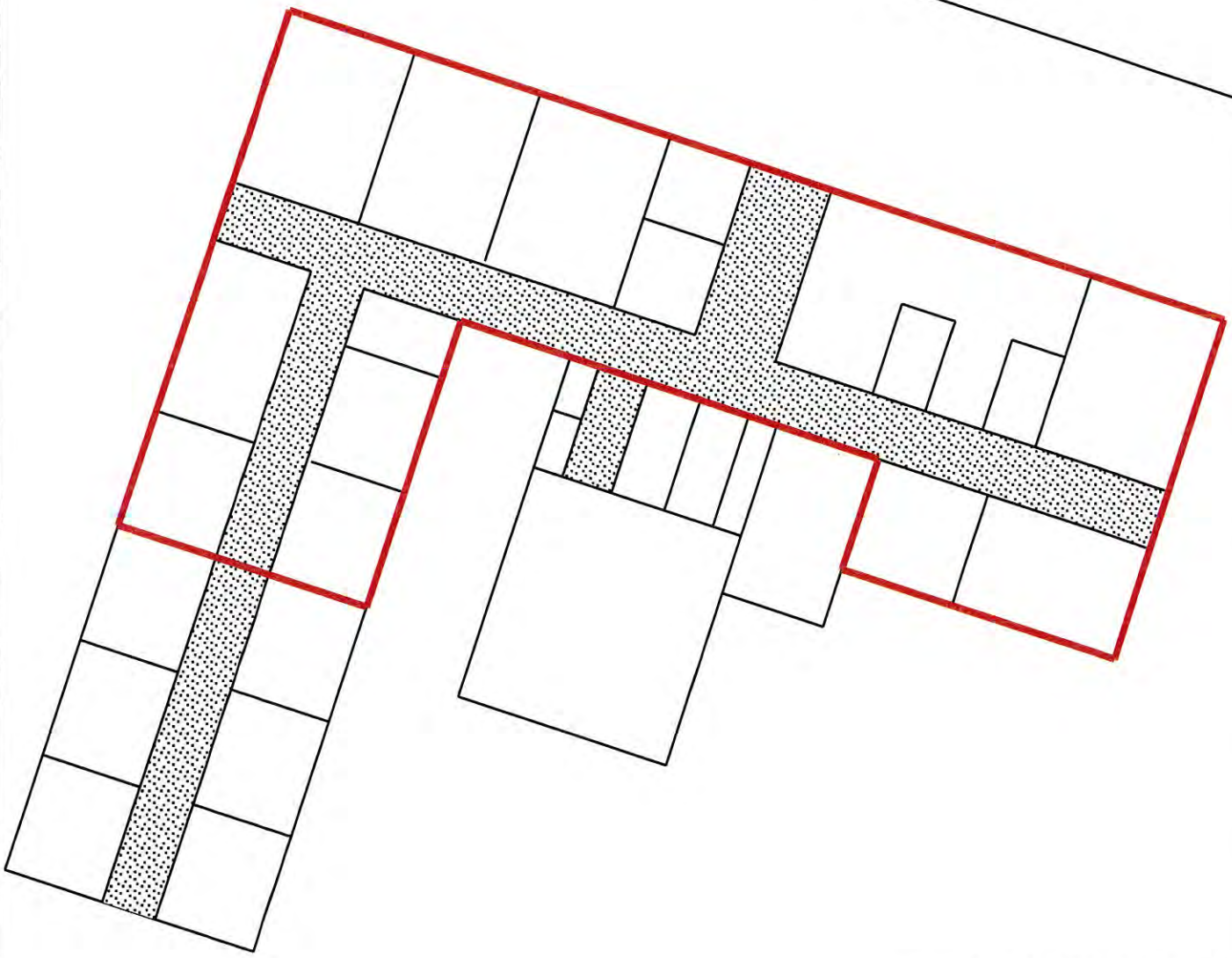
East Main Street

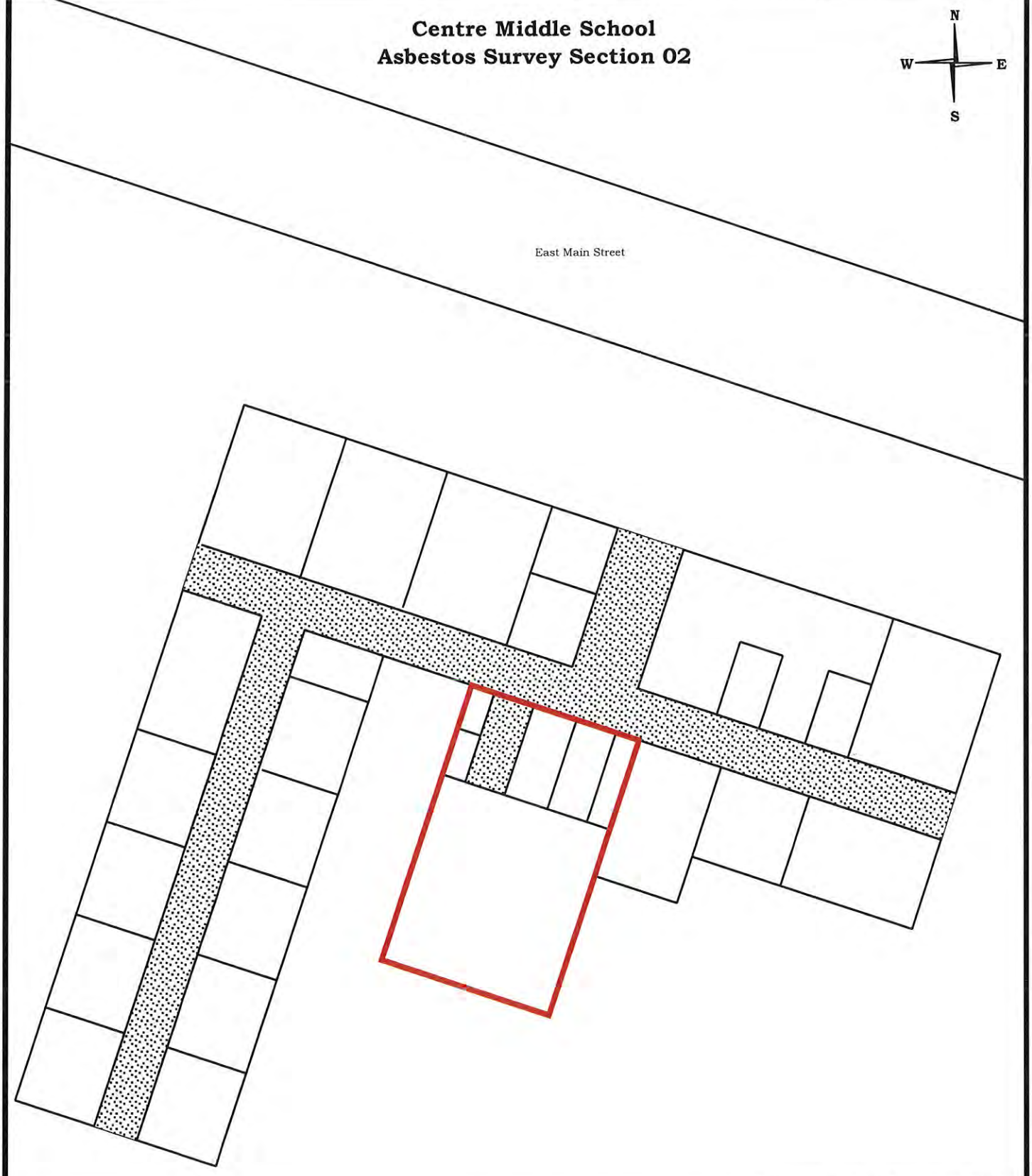


Drawing adapted from a Centre Middle School Fire Drill Map. Not to scale.

Cherokee County Schools
EMC Project Number: MA-3992
Asbestos Survey Date: April 21, 2020
Building Section 01

EMC
ENVIRONMENTAL-MATERIALS CONSULTANTS, INC.

Centre Middle School
Asbestos Survey Section 02

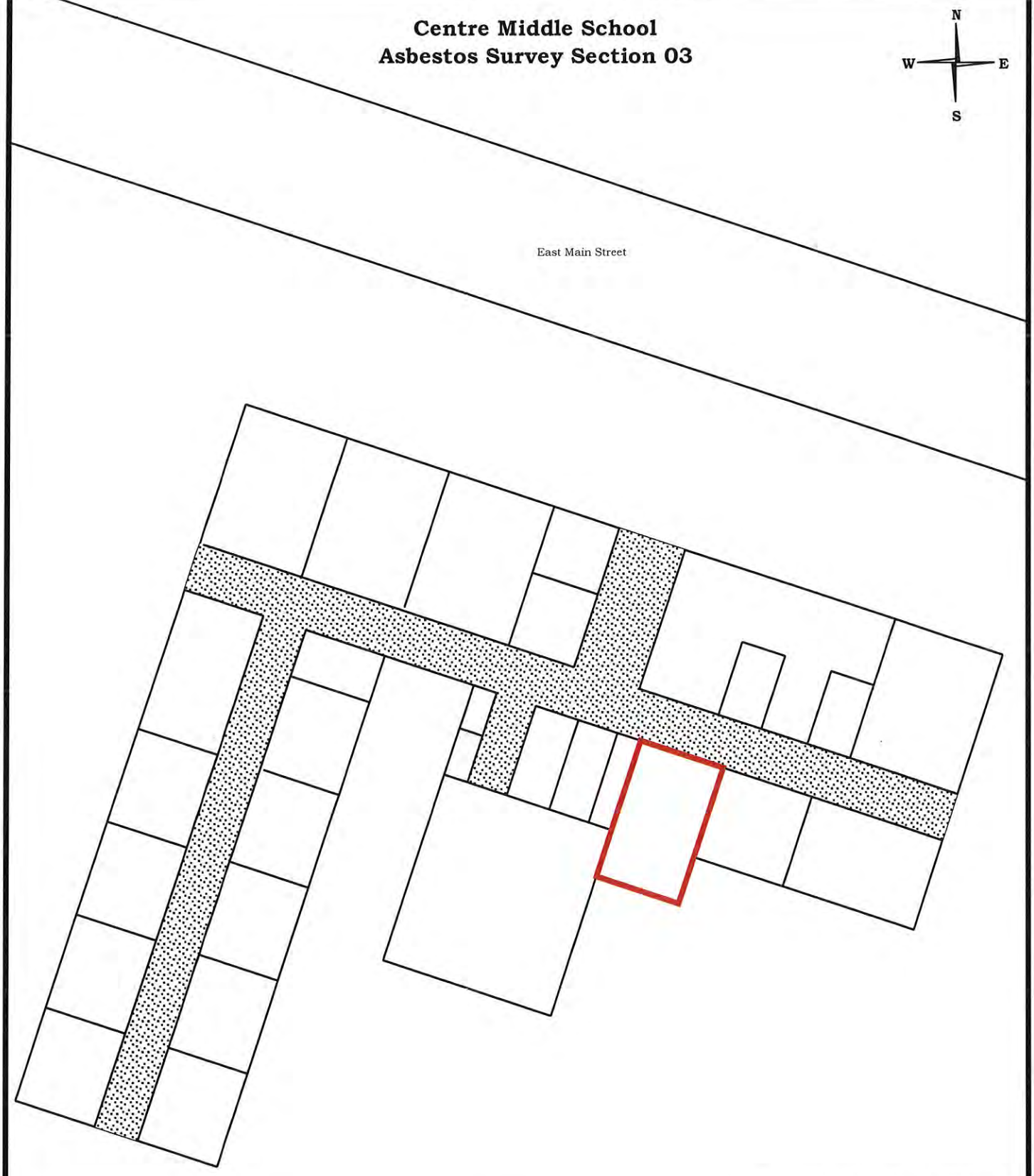


Drawing adapted from a Centre Middle School Fire Drill Map. Not to scale.

Cherokee County Schools
EMC Project Number: MA-3992
Asbestos Survey Date: April 21, 2020
Building Section 02

ENVIRONMENTAL-MATERIALS CONSULTANTS, INC.

Centre Middle School
Asbestos Survey Section 03

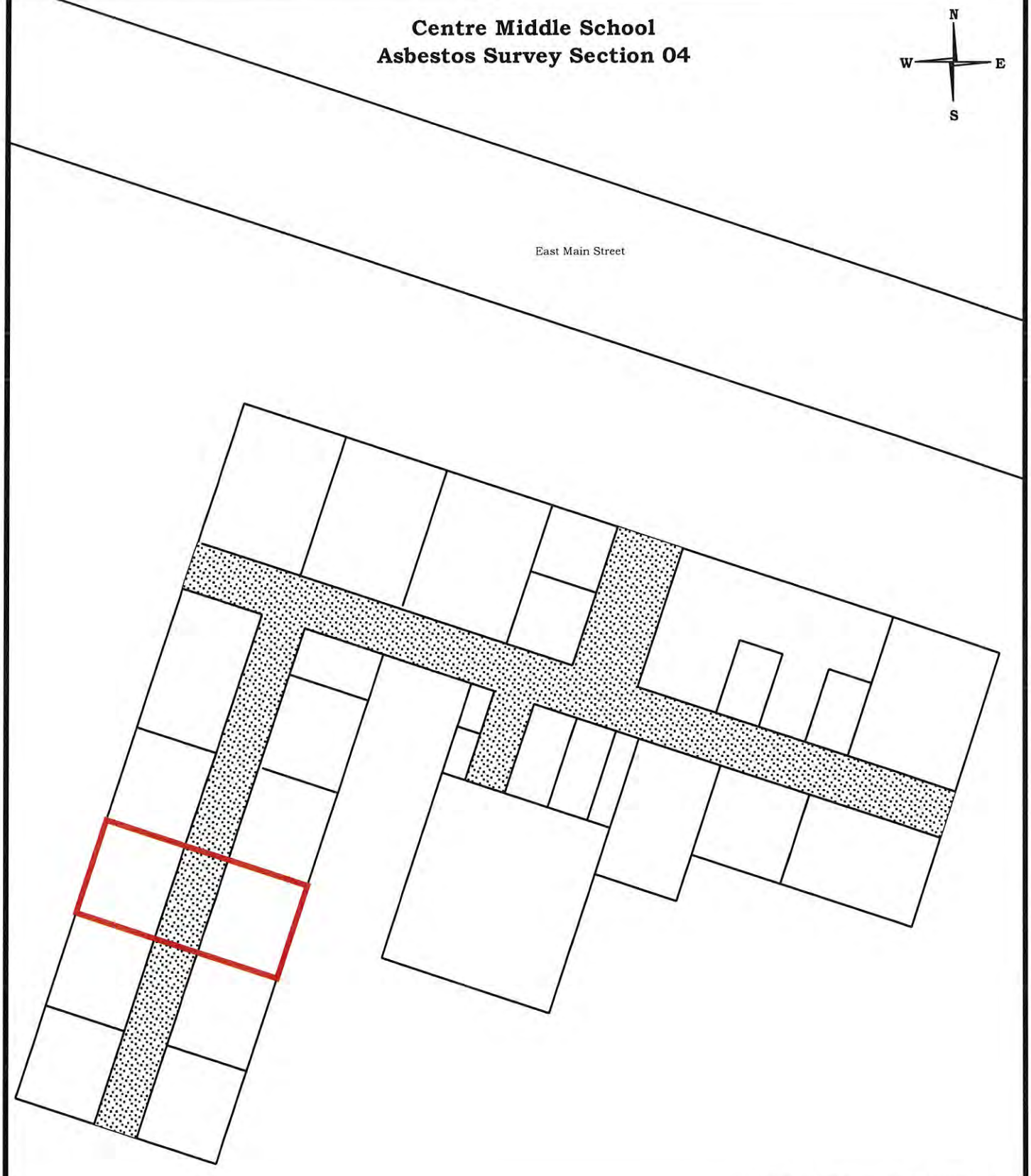


Drawing adapted from a Centre Middle School Fire Drill Map. Not to scale.

Cherokee County Schools
EMC Project Number: MA-3992
Asbestos Survey Date: April 21, 2020
Building Section 03

ENVIRONMENTAL-MATERIALS CONSULTANTS, INC.

Centre Middle School
Asbestos Survey Section 04

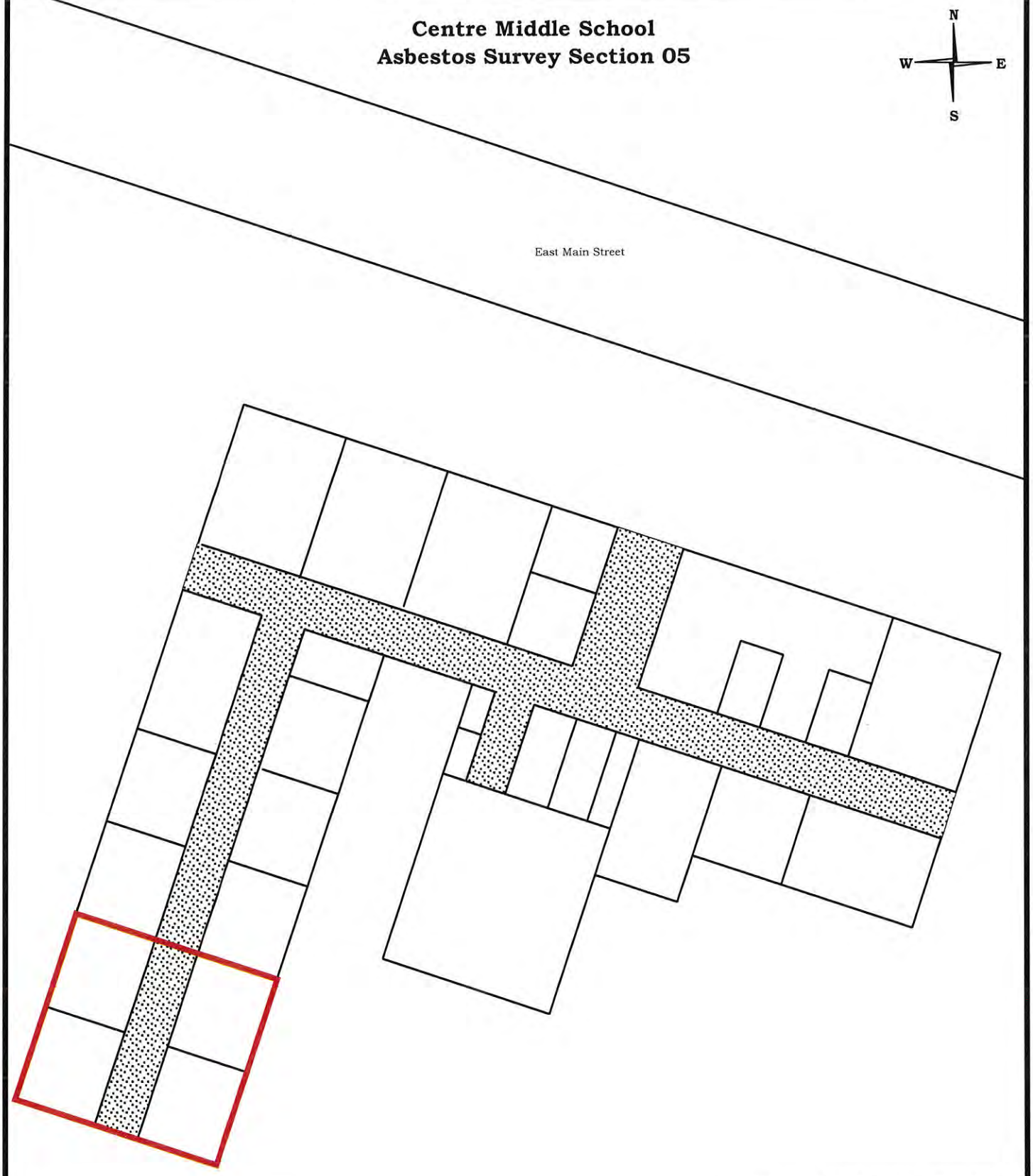


Drawing adapted from a Centre Middle School Fire Drill Map. Not to scale.

Cherokee County Schools
EMC Project Number: MA-3992
Asbestos Survey Date: April 21, 2020
Building Section 04

ENVIRONMENTAL-MATERIALS CONSULTANTS, INC.

Centre Middle School
Asbestos Survey Section 05



Drawing adapted from a Centre Middle School Fire Drill Map. Not to scale.

Cherokee County Schools
EMC Project Number: MA-3992
Asbestos Survey Date: April 21, 2020
Building Section 05

ENVIRONMENTAL-MATERIALS CONSULTANTS, INC.

ASBESTOS SURVEY SUMMARY
Cherokee County Schools
CENTRE, ALABAMA
EMC Project Number MA-3992
April 2020

Middle School Campus – Section 01 - Original Building (Main Facility)

EMC HSA#	Material Description	General Location	Asbestos
3992-01-01-01	plaster	throughout	none detected
3992-01-01-02 **3992-01-01-02a**	floor tile, 12"x12", light gray with brown specks **black mastic**	**throughout most classrooms and hallways**	none detected **5% Chrysotile**
3992-01-01-03	wallboard and joint compound (composite analysis)	ceilings throughout and one wall	none detected
3992-01-01-04 3992-01-01-04a	floor tile, 12"x12", white with brown and gray streaks yellow mastic	one classroom	none detected none detected
3992-01-01-05	elbow and joint mud, white	boiler room	none detected
3992-01-01-06	door caulk, brown	exterior side of doors	none detected
3992-01-01-07	window caulk, white	exterior side of windows	none detected
3992-01-01-08 3992-01-01-08a	asphalt roofing shingle asphalt roofing shingle	majority of roof (pitched roof system)	none detected none detected
3992-01-01-09	roofing felt paper	majority of roof (pitched roof system)	none detected
3992-01-01-10	exterior plaster, gray	exterior wall (south wall of Science Center)	none detected
3992-01-01-11 3992-01-01-11a 3992-01-01-11b 3992-01-01-11c	roof decking, layer 1 roof decking, layer 2 roof decking, layer 3 roof decking, layer 4	roof of media center	none detected none detected none detected none detected

ASBESTOS SURVEY SUMMARY
Cherokee County Schools
CENTRE, ALABAMA
EMC Project Number MA-3992
April 2020

Middle School Campus – Section 02 - Media Center (Main Facility)

3992-01-02-01 3992-01-02-01a	floor tile, 12"x12", light gray w/brown and white mottling yellow mastic	entrance and part of front rooms	none detected none detected
3992-01-02-02	ceiling tile, 2'x2', white, pin holes and small gouges	throughout, except entrance	none detected
3992-01-02-03	ceiling tile, 2'x4', white, pin holes and small gouges	entrance	none detected
3992-01-02-04	wallboard and joint compound (composite analysis)	throughout building addition	none detected
3992-01-02-05	cove base adhesive	throughout building addition	none detected
3992-01-02-06 3992-01-02-06a	floor tile, 12"x12", beige with brown streaks yellow mastic	office/workroom	none detected none detected

Middle School Campus – Section 03 - Science Center (Main Facility)

3992-01-03-01 3992-01-03-01a	floor tile, 12"x12", white w/peach and aqua mottling yellow mastic	throughout most of the room	none detected none detected
3992-01-03-02 3992-01-03-02a	**floor tile, 9"x9", light gray with black streaks black mastic**	**small areas of the room**	**6% Chrysotile 2% Chrysotile**
3992-01-03-03	cove base adhesive, tan	throughout room	none detected

Middle School Campus – Section 04 - West Wing Addition (Main Facility)

3992-01-04-01 3992-01-04-01a	**floor tile, 9"x9", tan** black mastic	**throughout small addition**	**7% Chrysotile** none detected
3992-01-04-02	wallboard and joint compound (composite analysis)	ceilings	<1% Chrysotile
3992-01-04-03	cove base adhesive	throughout small addition	none detected

ASBESTOS SURVEY SUMMARY
Cherokee County Schools
CENTRE, ALABAMA
EMC Project Number MA-3992
April 2020

Middle School Campus – Section 05 - West Wing Addition (Main Facility)

3992-01-05-01 **3992-01-05-01a**	**floor tile, 12"x12", light gray with gray specks** **black mastic**	**throughout addition**	**5% Chrysotile** **5% Chrysotile**
3992-01-05-02	wallboard and joint compound (composite analysis)	ceilings	<1% Chrysotile
3992-01-05-03	cove base adhesive, brown	throughout addition	none detected
3992-01-05-04	ceiling finish, white	throughout addition	none detected

Middle School Campus - Star Program - Building 02

EMC HSA#	Material Description	General Location	Asbestos
3992-02-01	ceiling tile, 2'x4', pin holes and gouges	kitchen, breakroom, bathrooms	none detected
3992-02-02 3992-02-02a	floor tile, 12"x12", beige with gray mottling yellow mastic	kitchen and breakroom	none detected none detected
3992-02-03	sink undercoating, black	kitchen	none detected
3992-02-04	cove base adhesive, tan	throughout the building	none detected
3992-02-05 3992-02-05a **3992-02-05b**	floor tile, beige/light gray yellow mastic **black mastic**	**underneath HSA 02**	none detected none detected **4% Chrysotile**
3992-02-06 3992-02-06a	asphalt roofing shingle asphalt roofing shingle	entire pitched roof	none detected none detected
3992-02-07	roofing felt paper	entire pitched roof	none detected
3992-02-08	window caulk, white	exterior side of windows	none detected

ASBESTOS SURVEY SUMMARY
Cherokee County Schools
CENTRE, ALABAMA
EMC Project Number MA-3992
April 2020

Middle School Campus - Gymnasium - Building 03

EMC HSA#	Material Description	General Location	Asbestos
3992-03-01 3992-03-01a	**floor tile, 12"x12", gray w/dark gray and white streaks** yellow mastic	**foyer/entrance**	**3% Chrysotile** none detected
3992-03-02	ceiling tile, 2'x2', pin holes and gouges	foyer/entrance	none detected
3992-03-03	wallboard and joint compound (composite analysis)	throughout the building	none detected
3992-03-04	gym floor adhesive, pink	underneath gym flooring materials	none detected
3992-03-05 3992-03-05a	sheet flooring, gray tile pattern yellow adhesive	official's room	none detected none detected
3992-03-06	pipe mud insulation	water heater	none detected
3992-03-07	cove base adhesive, yellow/tan	back hall to locker rooms	none detected
3992-03-08 3992-03-08a	floor tile, 12"x12", black yellow mastic	by double doors leading into gym	none detected none detected
3992-03-09	cove base adhesive, brown	room with the water heater	none detected
3992-03-10	cove base adhesive, white/gray	large multi-purpose room	none detected
3992-03-11	caulk, black	exterior, metal siding caulk against slab	none detected
3992-03-12	**window caulk, white**	**exterior side of windows**	**4% Chrysotile**

ASBESTOS SURVEY SUMMARY
Cherokee County Schools
CENTRE, ALABAMA
EMC Project Number MA-3992
April 2020

Middle School Campus - Cafeteria - Building 04

EMC HSA#	Material Description	General Location	Asbestos
3992-04-01 **3992-04-01a**	**floor tile, 12"x12", beige and brown mottled** **black mastic**	**throughout the building**	**4% Chrysotile** **4% Chrysotile**
3992-04-02	ceiling tile, 2'x4', gray board	throughout the building	none detected
3992-04-03	window glaze, white	exterior side of windows	none detected
3992-04-04	door caulk, brown	exterior side of doors	none detected
3992-04-05	ceiling tile, 2'x4', gypsum type	Southeast corner room	none detected
3992-04-06	**built-up roof decking**	**entire roof**	**15% Chrysotile**

Materials shown in bold contain asbestos.
General location information is provided to assist in identifying the material and may not list all locations where the material exists.
Reported asbestos percentages are visual estimations made by the microscopist.

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2205 Corporate Plaza Parkway SE, Suite 200 Smyrna, GA 30080
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http://www.EMSL.com / atlantalab@emsl.com

EMSL Order: 072002909
Customer ID: ENVI40
Customer PO:
Project ID:

Attention: Trent Hill
Environmental Materials Consultants
2027 Chestnut Street
Montgomery, AL 36106

Phone: (334) 322-1164
Fax: (334) 265-4043
Received Date: 04/23/2020 8:25 AM
Analysis Date: 04/23/2020 - 04/29/2020
Collected Date:

Project: CCS Middle School/MA-3992

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
3992-01-01-01-01 *072002909-0001*	Plaster	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-01-01-02 *072002909-0002*	Plaster	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-01-01-03 *072002909-0003*	Plaster	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-01-02-01-Floor Tile *072002909-0004*	Floor Tile, 12"x12", Light Gray with Brown Specks	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-01-02-01-Mastic *072002909-0004A*	Floor Tile, 12"x12", Light Gray with Brown Specks	Black Non-Fibrous Homogeneous		95% Non-fibrous (Other)	5% Chrysotile
3992-01-01-02-02-Floor Tile *072002909-0005*	Floor Tile, 12"x12", Light Gray with Brown Specks	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-01-02-02-Mastic *072002909-0005A*	Floor Tile, 12"x12", Light Gray with Brown Specks				Positive Stop (Not Analyzed)
3992-01-01-02-03-Floor Tile *072002909-0006*	Floor Tile, 12"x12", Light Gray with Brown Specks	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-01-02-03-Mastic *072002909-0006A*	Floor Tile, 12"x12", Light Gray with Brown Specks				Positive Stop (Not Analyzed)
3992-01-01-03-01 *072002909-0007* *This is a composite result of wallboard, jt. compound, and tape*	Wallboard and Joint Compound (Composite Analysis)	Various Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
3992-01-01-03-02 *072002909-0008* *This is a composite result of wallboard, jt. compound, and tape*	Wallboard and Joint Compound (Composite Analysis)	Various Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
3992-01-01-03-03 *072002909-0009* *This is a composite result of wallboard, jt. compound, and tape*	Wallboard and Joint Compound (Composite Analysis)	Various Non-Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
3992-01-01-04-01-Floor Tile *072002909-0010*	Floor Tile, 12"x12", White with Brown and Gray Streaks	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Initial report from: 04/29/2020 13:17:48

EMSL Analytical, Inc.
2205 Corporate Plaza Parkway SE, Suite 200 Smyrna, GA 30080
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http://www.EMSL.com / atlantalab@emsl.com

EMSL Order: 072002909
Customer ID: ENVI40
Customer PO:
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
3992-01-01-04-01-Mastic *072002909-0010A*	Floor Tile, 12"x12", White with Brown and Gray Streaks	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-01-04-02-Floor Tile *072002909-0011*	Floor Tile, 12"x12", White with Brown and Gray Streaks	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-01-04-02-Mastic *072002909-0011A*	Floor Tile, 12"x12", White with Brown and Gray Streaks	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-01-04-03-Floor Tile *072002909-0012*	Floor Tile, 12"x12", White with Brown and Gray Streaks	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-01-04-03-Mastic *072002909-0012A*	Floor Tile, 12"x12", White with Brown and Gray Streaks	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-01-05-01 *072002909-0013*	Elbow and Joint Mud	Gray Fibrous Homogeneous	10% Min. Wool	90% Non-fibrous (Other)	None Detected
3992-01-01-05-02 *072002909-0014*	Elbow and Joint Mud	Gray Non-Fibrous Homogeneous	10% Min. Wool	90% Non-fibrous (Other)	None Detected
3992-01-01-06-01 *072002909-0015*	Door Caulk, Brown	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-01-06-02 *072002909-0016*	Door Caulk, Brown	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-01-06-03 *072002909-0017*	Door Caulk, Brown	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-01-07-01 *072002909-0018*	Window Caulk, White	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-01-07-02 *072002909-0019*	Window Caulk, White	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-01-07-03 *072002909-0020*	Window Caulk, White	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-01-08-01-Shingle 1 *072002909-0021*	Roofing Shingles	Black Fibrous Homogeneous	10% Glass	90% Non-fibrous (Other)	None Detected
3992-01-01-08-01-Shingle 2 *072002909-0021A*	Roofing Shingles	Black Fibrous Homogeneous	10% Glass	90% Non-fibrous (Other)	None Detected
3992-01-01-08-02-Shingle 1 *072002909-0022*	Roofing Shingles	Black Fibrous Homogeneous	10% Glass	90% Non-fibrous (Other)	None Detected

Initial report from: 04/29/2020 13:17:48

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EMSL Order: 072002909
Customer ID: ENVI40
Customer PO:
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
3992-01-01-08-02-Shingle 2 *072002909-0022A*	Roofing Shingles	Black Fibrous Homogeneous	10% Glass	90% Non-fibrous (Other)	None Detected
3992-01-01-08-03-Shingle 1 *072002909-0023*	Roofing Shingles	Black Fibrous Homogeneous	10% Glass	90% Non-fibrous (Other)	None Detected
3992-01-01-08-03-Shingle 2 *072002909-0023A*	Roofing Shingles	Black Fibrous Homogeneous	10% Glass	90% Non-fibrous (Other)	None Detected
3992-01-01-09-01 *072002909-0024*	Roofing Felt	Black Fibrous Homogeneous	80% Cellulose	20% Non-fibrous (Other)	None Detected
3992-01-01-09-02 *072002909-0025*	Roofing Felt	Black Fibrous Homogeneous	80% Cellulose	20% Non-fibrous (Other)	None Detected
3992-01-01-09-03-~~Shingle~~ *072002909-0026*	Roofing Felt	Black Non-Fibrous Homogeneous	10% Glass	90% Non-fibrous (Other)	None Detected
3992-01-01-09-03-Felt *072002909-0026A*	Roofing Felt	Black Fibrous Homogeneous	80% Cellulose	20% Non-fibrous (Other)	None Detected
3992-01-01-10-01 *072002909-0027*	Exterior Plaster, Gray	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-01-10-02 *072002909-0028*	Exterior Plaster, Gray	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-01-10-03 *072002909-0029*	Exterior Plaster, Gray	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-01-11-01-Layer 1 *072002909-0030*	Roof Decking	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-01-11-01-Layer 2 *072002909-0030A*	Roof Decking	Black Non-Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
3992-01-01-11-01-Layer 3 *072002909-0030B*	Roof Decking	Black Fibrous Homogeneous	5% Glass	95% Non-fibrous (Other)	None Detected
3992-01-01-11-01-Layer 4 *072002909-0030C*	Roof Decking	Brown Fibrous Homogeneous	80% Cellulose	20% Non-fibrous (Other)	None Detected
3992-01-01-11-02-Layer 1 *072002909-0031*	Roof Decking	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-01-11-02-Layer 2 *072002909-0031A*	Roof Decking	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

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EMSL Order: 072002909
Customer ID: ENVI40
Customer PO:
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
3992-01-01-11-02-Layer 3 *072002909-0031B*	Roof Decking	Black Fibrous Homogeneous	5% Glass	95% Non-fibrous (Other)	None Detected
3992-01-01-11-02-Layer 4 *072002909-0031C*	Roof Decking	Black Fibrous Homogeneous	5% Synthetic	95% Non-fibrous (Other)	None Detected
3992-01-02-01-01-Floor Tile *072002909-0032*	Floor Tile, 12"x12", Light Gray with Brown and White Mottling	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-02-01-01-Mastic *072002909-0032A*	Floor Tile, 12"x12", Light Gray with Brown and White Mottling	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-02-01-02-Floor Tile *072002909-0033*	Floor Tile, 12"x12", Light Gray with Brown and White Mottling	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-02-01-02-Mastic *072002909-0033A*	Floor Tile, 12"x12", Light Gray with Brown and White Mottling	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-02-01-03-Floor Tile *072002909-0034*	Floor Tile, 12"x12", Light Gray with Brown and White Mottling	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-02-01-03-Mastic *072002909-0034A*	Floor Tile, 12"x12", Light Gray with Brown and White Mottling	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-02-02-01 *072002909-0035*	Ceiling Tile, 2'x2', White, Pin Holes and Small Gouges	Gray Fibrous Homogeneous	60% Cellulose 5% Min. Wool	35% Non-fibrous (Other)	None Detected
3992-01-02-02-02 *072002909-0036*	Ceiling Tile, 2'x2', White, Pin Holes and Small Gouges	Gray Fibrous Homogeneous	60% Cellulose 5% Min. Wool	35% Non-fibrous (Other)	None Detected
3992-01-02-02-03 *072002909-0037*	Ceiling Tile, 2'x2', White, Pin Holes and Small Gouges	Gray Fibrous Homogeneous	60% Cellulose 5% Min. Wool	35% Non-fibrous (Other)	None Detected
3992-01-02-03-01 *072002909-0038*	Ceiling Tile, 2'x4', White, Pin Holes and Small Gouges	Gray Fibrous Homogeneous	60% Cellulose 5% Min. Wool	35% Non-fibrous (Other)	None Detected
3992-01-02-03-02 *072002909-0039*	Ceiling Tile, 2'x4', White, Pin Holes and Small Gouges	Gray Fibrous Homogeneous	60% Cellulose 5% Min. Wool	35% Non-fibrous (Other)	None Detected
3992-01-02-04-01 *072002909-0040* *This is a composite result of wallboard, jt. compound, and tape*	Wallboard and Joint Compound (Composite Analysis)	Various Non-Fibrous Homogeneous	3% Cellulose	97% Non-fibrous (Other)	None Detected
3992-01-02-04-02 *072002909-0041* *This is a composite result of wallboard, jt. compound, and tape*	Wallboard and Joint Compound (Composite Analysis)	Various Non-Fibrous Homogeneous	3% Cellulose	97% Non-fibrous (Other)	None Detected
3992-01-02-04-03 *072002909-0042* *This is a composite result of wallboard, jt. compound, and tape*	Wallboard and Joint Compound (Composite Analysis)	Various Non-Fibrous Homogeneous	3% Cellulose	97% Non-fibrous (Other)	None Detected

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EMSL Order: 072002909
Customer ID: ENVI40
Customer PO:
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
3992-01-02-05-01 *072002909-0043*	Cove Base Adhesive, Cream (Analyze Adhesive Only)	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-02-05-02 *072002909-0044*	Cove Base Adhesive, Cream (Analyze Adhesive Only)	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-02-05-03 *072002909-0045*	Cove Base Adhesive, Cream (Analyze Adhesive Only)	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-02-06-01-Floor Tile *072002909-0046*	Floor Tile, 12"x12", Beige with Brown Streaks	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-02-06-01-Mastic *072002909-0046A*	Floor Tile, 12"x12", Beige with Brown Streaks	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-02-06-02-Floor Tile *072002909-0047*	Floor Tile, 12"x12", Beige with Brown Streaks	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-02-06-02-Mastic *072002909-0047A*	Floor Tile, 12"x12", Beige with Brown Streaks	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-03-01-01-Floor Tile *072002909-0048*	Floor Tile, 12"x12", White with Peach and Aqua Mottling	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-03-01-01-Mastic *072002909-0048A*	Floor Tile, 12"x12", White with Peach and Aqua Mottling	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-03-01-02-Floor Tile *072002909-0049*	Floor Tile, 12"x12", White with Peach and Aqua Mottling	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-03-01-02-Mastic *072002909-0049A*	Floor Tile, 12"x12", White with Peach and Aqua Mottling	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-03-01-03-Floor Tile *072002909-0050*	Floor Tile, 12"x12", White with Peach and Aqua Mottling	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-03-01-03-Mastic *072002909-0050A*	Floor Tile, 12"x12", White with Peach and Aqua Mottling	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-03-02-01-Floor Tile *072002909-0051*	Floor Tile, 9"x9", Light Gray with Black Streaks	Gray Non-Fibrous Homogeneous		94% Non-fibrous (Other)	6% Chrysotile
3992-01-03-02-01-Mastic *072002909-0051A*	Floor Tile, 9"x9", Light Gray with Black Streaks	Black Non-Fibrous Homogeneous		98% Non-fibrous (Other)	2% Chrysotile

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EMSL Order: 072002909
Customer ID: ENVI40
Customer PO:
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
3992-01-03-02-02 *072002909-0052*	Floor Tile, 9"x9", Light Gray with Black Streaks				Positive Stop (Not Analyzed)
3992-01-03-02-03 *072002909-0053*	Floor Tile, 9"x9", Light Gray with Black Streaks				Positive Stop (Not Analyzed)
3992-01-03-03-01 *072002909-0054*	Cove Base Adhesive, Tan (Analyze Adhesive Only)	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-03-03-02 *072002909-0055*	Cove Base Adhesive, Tan (Analyze Adhesive Only)	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-03-03-03 *072002909-0056*	Cove Base Adhesive, Tan (Analyze Adhesive Only)	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-04-01-01-Floor Tile *072002909-0057*	Floor Tile, 9"x9", Tan	Tan Non-Fibrous Homogeneous		93% Non-fibrous (Other)	7% Chrysotile
3992-01-04-01-01-Mastic *072002909-0057A*	Floor Tile, 9"x9", Tan	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-04-01-02-Floor Tile *072002909-0058*	Floor Tile, 9"x9", Tan				Positive Stop (Not Analyzed)
3992-01-04-01-02-Mastic *072002909-0058A*	Floor Tile, 9"x9", Tan	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-04-01-03-Floor Tile *072002909-0059*	Floor Tile, 9"x9", Tan				Positive Stop (Not Analyzed)
3992-01-04-01-03-Mastic *072002909-0059A*	Floor Tile, 9"x9", Tan	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-04-02-01 *072002909-0060* *This is a composite result of wallboard, jt. compound, and tape*	Wallboard and Joint Compound (Composite Analysis)	Various Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
3992-01-04-02-02 *072002909-0061* *This is a composite result of wallboard, jt. compound, and tape*	Wallboard and Joint Compound (Composite Analysis)	Various Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
3992-01-04-02-03 *072002909-0062*	Wallboard and Joint Compound (Composite Analysis)	Various Non-Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	<1% Chrysotile
3992-01-04-03-01 *072002909-0063*	Cove Base Adhesive (Analyze Adhesive Only)	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-04-03-02 *072002909-0064*	Cove Base Adhesive (Analyze Adhesive Only)	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

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EMSL Order: 072002909
Customer ID: ENVI40
Customer PO:
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
3992-01-04-03-03 *072002909-0065*	Cove Base Adhesive (Analyze Adhesive Only)	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-05-01-01-Floor Tile *072002909-0066*	Floor Tile, 12"x12", Light Gray with Gray Specks	Tan Non-Fibrous Homogeneous		95% Non-fibrous (Other)	5% Chrysotile
3992-01-05-01-01-Mastic *072002909-0066A*	Floor Tile, 12"x12", Light Gray with Gray Specks	Black Non-Fibrous Homogeneous		95% Non-fibrous (Other)	5% Chrysotile
3992-01-05-01-02 *072002909-0067*	Floor Tile, 12"x12", Light Gray with Gray Specks				Positive Stop (Not Analyzed)
3992-01-05-01-03 *072002909-0068*	Floor Tile, 12"x12", Light Gray with Gray Specks				Positive Stop (Not Analyzed)
3992-01-05-02-01 *072002909-0069* *This is a composite result of wallboard, jt. compound, and tape*	Wallboard and Joint Compound (Composite Analysis)	Various Non-Fibrous Homogeneous	3% Cellulose	97% Non-fibrous (Other)	None Detected
3992-01-05-02-02 *072002909-0070* *This is a composite result of wallboard, jt. compound, and tape*	Wallboard and Joint Compound (Composite Analysis)	Various Fibrous Homogeneous	3% Cellulose	97% Non-fibrous (Other)	None Detected
3992-01-05-02-03 *072002909-0071* *This is a composite result of wallboard, jt. compound, and tape*	Wallboard and Joint Compound (Composite Analysis)	Various Non-Fibrous Homogeneous	3% Cellulose	97% Non-fibrous (Other)	<1% Chrysotile
3992-01-05-03-01 *072002909-0072*	Cove Base Adhesive (Analyze Adhesive Only)	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-05-03-02 *072002909-0073*	Cove Base Adhesive (Analyze Adhesive Only)	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-05-03-03 *072002909-0074*	Cove Base Adhesive (Analyze Adhesive Only)	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-05-04-01 *072002909-0075*	Ceiling Finish, White (Analyze Finish Only)	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-05-04-02 *072002909-0076*	Ceiling Finish, White (Analyze Finish Only)	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-01-05-04-03 *072002909-0077*	Ceiling Finish, White (Analyze Finish Only)	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

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EMSL Order:	072002909
Customer ID:	ENVI40
Customer PO:	
Project ID:	

Analyst(s)
Anthony Sanaie (80)
Ibironke Owa (18)

Michael Murphy
or Other Approved Signatory

Initial report from: 04/29/2020 13:17:48

OrderID: 072002909

Chain of Custody

Asbestos Lab Services

EMSL Analytical, Inc.
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1770 The Exchange
Atlanta, GA 30339
Phone: (770) 956-9150
Fax: (770) 956-9181
http://www.emsl.com

Please print all information legibly. 072002909

Company:	Environmental-Materials Consultants, Inc.	***Bill To:***	Environmental-Materials Consultants, Inc.
Address1:	2027 Chestnut Street	*Address1:*	2027 Chestnut Street
Address2:		*Address2:*	
City, State:	Montgomery, Alabama	*City, State:*	Montgomery, Alabama
Zip/Post Code:	36106	*Zip/Post Code:*	36106
Country:		*Country:*	
Contact Name:	Trent Hill	***Attn:***	Trent Hill
Phone:	334-265-4000	*Phone:*	334-265-4000
Fax:	334-265-4043	*Fax:*	334-265-4043
Email:	thill@emcinc.net	*Email:*	thill@emcinc.net
EMSL Rep:		***P.O. Number:***	
Project Name/Number: CCS Middle School/MA-3992			

MATRIX			TURNAROUND			
☐ Air	☐ Soil	☐ Micro-Vac	☐ 3 Hours	☐ 6 Hours	☐ Same Day or 12 Hours*	☐ 24 Hours (1 day)
☑ Bulk	☐ Drinking Water		☐ 48 Hours (2 days)	☑ 72 Hours (3 days)	☐ 96 Hours (4 days)	☐ 120 Hours (5 days)
☐ Wipe	☐ Wastewater		☐ 144+ hours (6-10 days)			

TEM AIR, 3 hours, 6 hours, Please call ahead to schedule. There is a premium charge for 3-hour tat, please call 1-800-220-3675 for price prior to sending samples. You will be asked to sign an authorization form for this service.

***12 hours (must arrive by 11:00a.m. Mon -Fri.), Please Refer to Price Quote**

PCM - Air
- ☐ NIOSH 7400(A) Issue 2: August 1994
- ☐ OSHA w/TWA
- ☐ Other:

PLM - Bulk
- ☑ EPA 600/R-93/116
- ☐ EPA Point Count
- ☐ NY Stratified Point Count
- ☐ PLM NOB (Gravimetric) NYS 198.1
- ☐ NIOSH 9002:
- ☐ EMSL Standard Addition:

SEM Air or Bulk
- ☐ Qualitative
- ☐ Quantitative

TEM Air
- ☐ AHERA 40 CFR, Part 763 Subpart E
- ☐ NIOSH 7402
- ☐ EPA Level II

TEM BULK
- ☐ Drop Mount (Qualitative)
- ☐ Chatfield SOP - 1988-02
- ☐ TEM NOB (Gravimetric) NYS 198.4
- ☐ EMSL Standard Addition:

PLM Soil
- ☐ EPA Protocol Qualitative
- ☐ EPA Protocol Quantitative
- ☐ EMSL MSD 9000 Method fibers/gram

TEM WATER
- ☐ EPA 100.1
- ☐ EPA 100.2
- ☐ NYS 198.2

TEM Microvac/Wipe
- ☐ ASTM D 5755-95 (quantative method)
- ☐ Wipe Qualitative

XRD
- ☐ Asbestos
- ☐ Silica NIOSH 7500

OTHER
- ☐

OrderID: 072002909

Chain of Custody

Asbestos Lab Services

EMSL Analytical, Inc.
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Atlanta, GA 30339
Phone: (770) 956-9150
Fax: (770) 956-9181
http://www.emsl.com

Please print all information legibly.

Client Sample # (s) 3992-01-01-01-01 - 3992-01-05-04-03 **Total Samples #:** 77

Relinquished: HADLEY SMITH **Date:** 4/22/20 **Time:** 4:30 pm

Received: M M **Date:** 4/23/2020 **Time:** 8.25am EST

Relinquished: _____ **Date:** _____ **Time:** _____

Received: _____ **Date:** _____ **Time:** _____

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME (if applicable)
3992-01-01-01-01	plaster	
3992-01-01-01-02	plaster	
3992-01-01-01-03	plaster	
3992-01-01-02-01	floor tile, 12"x12", light gray with brown specks	
3992-01-01-02-02	floor tile, 12"x12", light gray with brown specks	
3992-01-01-02-03	floor tile, 12"x12", light gray with brown specks	
3992-01-01-03-01	wallboard and joint compound (composite analysis)	
3992-01-01-03-02	wallboard and joint compound (composite analysis)	
3992-01-01-03-03	wallboard and joint compound (composite analysis)	
3992-01-01-04-01	floor tile, 12"x12", white with brown and gray streaks	
3992-01-01-04-02	floor tile, 12"x12", white with brown and gray streaks	
3992-01-01-04-03	floor tile, 12"x12", white with brown and gray streaks	
3992-01-01-05-01	elbow and joint mud	
3992-01-01-05-02	elbow and joint mud	

PLEASE STOP ON POSITIVE WITHIN EACH HSA.

OrderID: 072002909

CHAIN OF CUSTODY (continued)

CCS Middle School

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME (if applicable)
3992-01-01-06-01	door caulk, brown	
3992-01-01-06-02	door caulk, brown	
3992-01-01-06-03	door caulk, brown	
3992-01-01-07-01	window caulk, white	
3992-01-01-07-02	window caulk, white	
3992-01-01-07-03	window caulk, white	
3992-01-01-08-01	roofing shingles	
3992-01-01-08-02	roofing shingles	
3992-01-01-08-03	roofing shingles	
3992-01-01-09-01	roofing felt	
3992-01-01-09-02	roofing felt	
3992-01-01-09-03	roofing felt	
3992-01-01-10-01	exterior plaster, gray	
3992-01-01-10-02	exterior plaster, gray	
3992-01-01-10-03	exterior plaster, gray	
3992-01-01-11-01	roof decking	
3992-01-01-11-02	roof decking	
3992-01-02-01-01	floor tile, 12"x12", light gray with brown and white mottling	
3992-01-02-01-02	floor tile, 12"x12", light gray with brown and white mottling	
3992-01-02-01-03	floor tile, 12"x12", light gray with brown and white mottling	
3992-01-02-02-01	ceiling tile, 2'x2', white, pin holes and small gouges	
3992-01-02-02-02	ceiling tile, 2'x2', white, pin holes and small gouges	
3992-01-02-02-03	ceiling tile, 2'x2', white, pin holes and small gouges	
3992-01-02-03-01	ceiling tile, 2'x4', white, pin holes and small gouges	
3992-01-02-03-02	ceiling tile, 2'x4', white, pin holes and small gouges	
3992-01-02-04-01	wallboard and joint compound (composite analysis)	
3992-01-02-04-02	wallboard and joint compound (composite analysis)	
	Please stop on positive within each HSA.	

OrderID: 072002909

CHAIN OF CUSTODY (continued)

CCS Middle School

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME (if applicable)
3992-01-02-04-03	wallboard and joint compound (composite analysis)	
3992-01-02-05-01	cove base adhesive, cream (analyze adhesive only)	
3992-01-02-05-02	cove base adhesive, cream (analyze adhesive only)	
3992-01-02-05-03	cove base adhesive, cream (analyze adhesive only)	
3992-01-02-06-01	floor tile, 12"x12", beige with brown streaks	
3992-01-02-06-02	floor tile, 12"x12", beige with brown streaks	
3992-01-03-01-01	floor tile, 12"x12", white with peach and aqua mottling	
3992-01-03-01-02	floor tile, 12"x12", white with peach and aqua mottling	
3992-01-03-01-03	floor tile, 12"x12", white with peach and aqua mottling	
3992-01-03-02-01	floor tile, 9"x9", light gray with black streaks	
3992-01-03-02-02	floor tile, 9"x9", light gray with black streaks	
3992-01-03-02-03	floor tile, 9"x9", light gray with black streaks	
3992-01-03-03-01	cove base adhesive, tan (analyze adhesive only)	
3992-01-03-03-02	cove base adhesive, tan (analyze adhesive only)	
3992-01-03-03-03	cove base adhesive, tan (analyze adhesive only)	
3992-01-04-01-01	floor tile, 9"x9", tan	
3992-01-04-01-02	floor tile, 9"x9", tan	
3992-01-04-01-03	floor tile, 9"x9", tan	
3992-01-04-02-01	wallboard and joint compound (composite analysis)	
3992-01-04-02-02	wallboard and joint compound (composite analysis)	
3992-01-04-02-03	wallboard and joint compound (composite analysis)	
3992-01-04-03-01	cove base adhesive (analyze adhesive only)	
3992-01-04-03-02	cove base adhesive (analyze adhesive only)	
3992-01-04-03-03	cove base adhesive (analyze adhesive only)	
3992-01-05-01-01	floor tile, 12"x12", light gray with gray specks	
3992-01-05-01-02	floor tile, 12"x12", light gray with gray specks	
3992-01-05-01-03	floor tile, 12"x12", light gray with gray specks	
	Please stop on positive within each HSA.	

OrderID: 072002909

CHAIN OF CUSTODY (continued)

CCS Middle School

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME (if applicable)
3992-01-05-02-01	wallboard and joint compound (composite analysis)	
3992-01-05-02-02	wallboard and joint compound (composite analysis)	
3992-01-05-02-03	wallboard and joint compound (composite analysis)	
3992-01-05-03-01	cove base adhesive (analyze adhesive only)	
3992-01-05-03-02	cove base adhesive (analyze adhesive only)	
3992-01-05-03-03	cove base adhesive (analyze adhesive only)	
3992-01-05-04-01	ceiling finish, white (analyze finish only)	
3992-01-05-04-02	ceiling finish, white (analyze finish only)	
3992-01-05-04-03	ceiling finish, white (analyze finish only)	
	Please stop on positive within each HSA.	

EMSL Analytical, Inc.
2205 Corporate Plaza Parkway SE, Suite 200 Smyrna, GA 30080
Tel/Fax: (770) 956-9150 / (770) 956-9181
http://www.EMSL.com / atlantalab@emsl.com

EMSL Order: 072002916
Customer ID: ENVI40
Customer PO:
Project ID:

Attention: Trent Hill
Environmental Materials Consultants
2027 Chestnut Street
Montgomery, AL 36106

Project: CCS Star Program Bldg. / MA-3992

Phone: (334) 322-1164
Fax: (334) 265-4043
Received Date: 04/23/2020 8:25 AM
Analysis Date: 04/29/2020
Collected Date:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
3992-02-01-01 *072002916-0001*	Ceiling Tile, 2'x4', Pin Holes and Gouges	Gray Fibrous Homogeneous	60% Cellulose	40% Non-fibrous (Other)	None Detected
3992-02-01-02 *072002916-0002*	Ceiling Tile, 2'x4', Pin Holes and Gouges	Gray Fibrous Homogeneous	60% Cellulose	40% Non-fibrous (Other)	None Detected
3992-02-01-03 *072002916-0003*	Ceiling Tile, 2'x4', Pin Holes and Gouges	Gray Fibrous Homogeneous	60% Cellulose	40% Non-fibrous (Other)	None Detected
3992-02-02-01-Floor Tile *072002916-0004*	Floor Tile, 12"x12", Beige with Gray Mottling	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-02-02-01-Mastic *072002916-0004A*	Floor Tile, 12"x12", Beige with Gray Mottling	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-02-02-02-Floor Tile *072002916-0005*	Floor Tile, 12"x12", Beige with Gray Mottling	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-02-02-02-Mastic *072002916-0005A*	Floor Tile, 12"x12", Beige with Gray Mottling	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-02-02-03-Floor Tile *072002916-0006*	Floor Tile, 12"x12", Beige with Gray Mottling	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-02-02-03-Mastic *072002916-0006A*	Floor Tile, 12"x12", Beige with Gray Mottling	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-02-03-01 *072002916-0007*	Sink Undercoating, Black	Black Non-Fibrous Homogeneous	2% Cellulose	98% Non-fibrous (Other)	None Detected
3992-02-04-01 *072002916-0008*	Cove Base Adhesive, Tan (Analyze Adhesive Ony)	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-02-04-02 *072002916-0009*	Cove Base Adhesive, Tan (Analyze Adhesive Ony)	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-02-04-03 *072002916-0010*	Cove Base Adhesive, Tan (Analyze Adhesive Ony)	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-02-05-01-Floor Tile *072002916-0011*	Floor Tile, Underneath HSA 02	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-02-05-01-Mastic 1 *072002916-0011A*	Floor Tile, Underneath HSA 02	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Initial report from: 04/29/2020 13:41:31

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EMSL Order: 072002916
Customer ID: ENVI40
Customer PO:
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
3992-02-05-01-Mastic 2 *072002916-0011B*	Floor Tile, Underneath HSA 02	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-02-05-02-Floor Tile *072002916-0012*	Floor Tile, Underneath HSA 02	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-02-05-02-Mastic 1 *072002916-0012A*	Floor Tile, Underneath HSA 02	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-02-05-02-Mastic 2 *072002916-0012B*	Floor Tile, Underneath HSA 02	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-02-05-03-Floor Tile *072002916-0013*	Floor Tile, Underneath HSA 02	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-02-05-03-Mastic 1 *072002916-0013A*	Floor Tile, Underneath HSA 02	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-02-05-03-Mastic 2 *072002916-0013B*	Floor Tile, Underneath HSA 02	Black Non-Fibrous Homogeneous		96% Non-fibrous (Other)	4% Chrysotile
3992-02-06-01-Shingle 1 *072002916-0014*	Roofing Shingles	Black Fibrous Homogeneous	10% Glass	90% Non-fibrous (Other)	None Detected
3992-02-06-01-Shingle 2 *072002916-0014A*	Roofing Shingles	Various Fibrous Homogeneous	10% Glass	90% Non-fibrous (Other)	None Detected
3992-02-06-02-Shingle 1 *072002916-0015*	Roofing Shingles	Black Fibrous Homogeneous	10% Glass	90% Non-fibrous (Other)	None Detected
3992-02-06-02-Shingle 2 *072002916-0015A*	Roofing Shingles	Various Fibrous Homogeneous	10% Glass	90% Non-fibrous (Other)	None Detected
3992-02-07-01 *072002916-0016*	Roofing Felt	Black Fibrous Homogeneous	10% Glass	90% Non-fibrous (Other)	None Detected
3992-02-07-02 *072002916-0017*	Roofing Felt	Black Fibrous Homogeneous	10% Glass	90% Non-fibrous (Other)	None Detected
3992-02-08-01 *072002916-0018*	Window Caulk, White	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-02-08-02 *072002916-0019*	Window Caulk, White	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Initial report from: 04/29/2020 13:41:31

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EMSL Order:	072002916
Customer ID:	ENVI40
Customer PO:	
Project ID:	

Analyst(s)
Anthony Sanaie (27)
Ibironke Owa (3)

Michael Murphy
or Other Approved Signatory

Initial report from: 04/29/2020 13:41:31

OrderID: 072002916

Chain of Custody

Asbestos Lab Services

EMSL Analytical, Inc.
Suite 135
1770 The Exchange
Atlanta, GA 30339
Phone: (770) 956-9150
Fax: (770) 956-9181
http://www.emsl.com

Please print all information legibly.

072002916

Company:	Environmental-Materials Consultants, Inc.	***Bill To:***	Environmental-Materials Consultants, Inc.
Address1:	2027 Chestnut Street	*Address1.*	2027 Chestnut Street
Address2:		*Address2:*	
City, State:	Montgomery, Alabama	*City, State.*	Montgomery, Alabama
Zip/Post Code:	36106	*Zip/Post Code:*	36106
Country:		*Country:*	
Contact Name:	Trent Hill	***Attn:***	Trent Hill
Phone:	334-265-4000	*Phone.*	334-265-4000
Fax:	334-265-4043	*Fax:*	334-265-4043
Email:	thill@emcinc.net	*Email:*	thill@emcinc.net
EMSL Rep:		***P.O. Number:***	
Project Name/Number: CCS Star Program Bldg./MA-3992			

MATRIX			TURNAROUND			
☐ Air	☐ Soil	☐ Micro-Vac	☐ 3 Hours	☐ 6 Hours	☐ Same Day or 12 Hours*	☐ 24 Hours (1 day)
☑ Bulk	☐ Drinking Water		☐ 48 Hours (2 days)	☑ 72 Hours (3 days)	☐ 96 Hours (4 days)	☐ 120 Hours (5 days)
☐ Wipe	☐ Wastewater		☐ 144+ hours (6-10 days)			

TEM AIR, 3 hours, 6 hours, Please call ahead to schedule. There is a premium charge for 3-hour tat, please call 1-800-220-3675 for price prior to sending samples. You will be asked to sign an authorization form for this service.

***12 hours (must arrive by 11:00a.m. Mon -Fri.), Please Refer to Price Quote**

PCM - Air
- ☐ NIOSH 7400(A) Issue 2· August 1994
- ☐ OSHA w/TWA
- ☐ Other:

PLM - Bulk
- ☑ EPA 600/R-93/116
- ☐ EPA Point Count
- ☐ NY Stratified Point Count
- ☐ PLM NOB (Gravimetric) NYS 198.1
- ☐ NIOSH 9002:
- ☐ EMSL Standard Addition:

SEM Air or Bulk
- ☐ Qualitative
- ☐ Quantitative

TEM Air
- ☐ AHERA 40 CFR, Part 763 Subpart E
- ☐ NIOSH 7402
- ☐ EPA Level II

TEM BULK
- ☐ Drop Mount (Qualitative)
- ☐ Chatfield SOP - 1988-02
- ☐ TEM NOB (Gravimetric) NYS 198.4
- ☐ EMSL Standard Addition:

PLM Soil
- ☐ EPA Protocol Qualitative
- ☐ EPA Protocol Quantitative
- ☐ EMSL MSD 9000 Method fibers/gram

TEM WATER
- ☐ EPA 100.1
- ☐ EPA 100.2
- ☐ NYS 198.2

TEM Microvac/Wipe
- ☐ ASTM D 5755-95 (quantative method)
- ☐ Wipe Qualitative

XRD
- ☐ Asbestos
- ☐ Silica NIOSH 7500

OTHER
- ☐

OrderID: 072002916

Chain of Custody

Asbestos Lab Services

EMSL Analytical, Inc.
Suite 135
1770 The Exchange
Atlanta, GA 30339
Phone: (770) 956-9150
Fax: (770) 956-9181
http://www.emsl.com

Please print all information legibly.

Client Sample # (s) 3992-02-01-01 - 3992-02-08-02 **Total Samples #:** 19

Relinquished: HADLEY SMITH **Date:** 4/22/20 **Time:** 4:30 pm

Received: MM **Date:** 4/23/2020 **Time:** 8:25am EFT

Relinquished: _____ **Date:** _____ **Time:** _____

Received: _____ **Date:** _____ **Time:** _____

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME (if applicable)
3992-02-01-01	ceiling tile, 2'x4', pin holes and gouges	
3992-02-01-02	ceiling tile, 2'x4', pin holes and gouges	
3992-02-01-03	ceiling tile, 2'x4', pin holes and gouges	
3992-02-02-01	floor tile, 12"x12", beige with gray mottling	
3992-02-02-02	floor tile, 12"x12", beige with gray mottling	
3992-02-02-03	floor tile, 12"x12", beige with gray mottling	
3992-02-03-01	sink undercoating, black	
3992-02-04-01	cove base adhesive, tan (analyze adhesive only)	
3992-02-04-02	cove base adhesive, tan (analyze adhesive only)	
3992-02-04-03	cove base adhesive, tan (analyze adhesive only)	
3992-02-05-01	floor tile, undeneath HSA 02	
3992-02-05-02	floor tile, undeneath HSA 02	
3992-02-05-03	floor tile, undeneath HSA 02	
3992-02-06-01	roofing shingles	

PLEASE STOP ON POSITIVE WITHIN EACH HSA.

CHAIN OF CUSTODY (continued)

CCS Star Program Bldg.

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME (if applicable)
3992-02-06-02	roofing shingles	
3992-02-07-01	roofing felt	
3992-02-07-02	roofing felt	
3992-02-08-01	window caulk, white	
3992-02-08-02	window caulk, white	
	Please stop on positive within each HSA.	

EMSL Analytical, Inc.

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EMSL Order: 072002913
Customer ID: ENVI40
Customer PO:
Project ID:

Attention: Trent Hill
Environmental Materials Consultants
2027 Chestnut Street
Montgomery, AL 36106

Project: CCS Gym / MA-3992

Phone: (334) 322-1164
Fax: (334) 265-4043
Received Date: 04/23/2020 8:25 AM
Analysis Date: 04/29/2020
Collected Date:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
3992-03-01-01-Floor Tile *072002913-0001*	Floor Tile, 12"x12", Gray with Dark Gray and White Streaks	Gray Non-Fibrous Homogeneous		97% Non-fibrous (Other)	3% Chrysotile
3992-03-01-01-Mastic *072002913-0001A*	Floor Tile, 12"x12", Gray with Dark Gray and White Streaks	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-03-01-02-Floor Tile *072002913-0002*	Floor Tile, 12"x12", Gray with Dark Gray and White Streaks				Positive Stop (Not Analyzed)
3992-03-01-02-Mastic *072002913-0002A*	Floor Tile, 12"x12", Gray with Dark Gray and White Streaks	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-03-01-03-Floor Tile *072002913-0003*	Floor Tile, 12"x12", Gray with Dark Gray and White Streaks				Positive Stop (Not Analyzed)
3992-03-01-03-Mastic *072002913-0003A*	Floor Tile, 12"x12", Gray with Dark Gray and White Streaks	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-03-02-01 *072002913-0004*	Ceiling Tile, 2'x2', Pin Holes and Gouges	Gray Fibrous Homogeneous	60% Cellulose 10% Glass	30% Non-fibrous (Other)	None Detected
3992-03-02-02 *072002913-0005*	Ceiling Tile, 2'x2', Pin Holes and Gouges	Gray Fibrous Homogeneous	60% Cellulose 10% Glass	30% Non-fibrous (Other)	None Detected
3992-03-02-03 *072002913-0006*	Ceiling Tile, 2'x2', Pin Holes and Gouges	Gray Fibrous Homogeneous	60% Cellulose 5% Glass	35% Non-fibrous (Other)	None Detected
3992-03-03-01 *072002913-0007* *This is a composite result of wallboard, jt. compound, and tape*	Wallboard and Joint Compound (Composite Analysis)	Various Non-Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
3992-03-03-02 *072002913-0008* *This is a composite result of wallboard, jt. compound, and tape*	Wallboard and Joint Compound (Composite Analysis)	Various Non-Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
3992-03-03-03 *072002913-0009* *This is a composite result of wallboard, jt. compound, and tape*	Wallboard and Joint Compound (Composite Analysis)	Various Non-Fibrous Homogeneous	5% Cellulose	95% Non-fibrous (Other)	None Detected
3992-03-04-01 *072002913-0010*	Gym Floor Adhesive, Pink	Pink Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-03-04-02 *072002913-0011*	Gym Floor Adhesive, Pink	Pink Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Initial report from: 04/29/2020 17:17:20

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EMSL Order: 072002913
Customer ID: ENVI40
Customer PO:
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
3992-03-04-03 *072002913-0012*	Gym Floor Adhesive, Pink	Pink Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-03-05-01-Vinyl Floor Tile *072002913-0013*	Sheet Flooring, Gray Tile Pattern	Gray Fibrous Homogeneous	25% Cellulose	75% Non-fibrous (Other)	None Detected
3992-03-05-01-Mastic *072002913-0013A*	Sheet Flooring, Gray Tile Pattern	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-03-05-02-Vinyl Floor Tile *072002913-0014*	Sheet Flooring, Gray Tile Pattern	Gray Fibrous Homogeneous	25% Cellulose	75% Non-fibrous (Other)	None Detected
3992-03-05-02-Mastic *072002913-0014A*	Sheet Flooring, Gray Tile Pattern	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-03-06-01 *072002913-0015*	Pipe Mud	White Non-Fibrous Homogeneous	8% Cellulose	92% Non-fibrous (Other)	None Detected
3992-03-06-02 *072002913-0016*	Pipe Mud	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-03-07-01 *072002913-0017*	Cove Base Adhesive, Yellowish (Analyze Adhesive Only)	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-03-07-02 *072002913-0018*	Cove Base Adhesive, Yellowish (Analyze Adhesive Only)	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-03-08-01-Floor Tile *072002913-0019*	Floor Tile, 12"x12", Black	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-03-08-01-Mastic *072002913-0019A*	Floor Tile, 12"x12", Black	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-03-08-02-Floor Tile *072002913-0020*	Floor Tile, 12"x12", Black	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-03-08-02-Mastic *072002913-0020A*	Floor Tile, 12"x12", Black	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-03-09-01 *072002913-0021*	Cove Base Adhesive, Brown (Analyze Adhesive Only)	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-03-09-02 *072002913-0022*	Cove Base Adhesive, Brown (Analyze Adhesive Only)	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-03-10-01 *072002913-0023*	Cove Base Adhesive, White/Gray (Analyze Adhesive Only)	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-03-10-02 *072002913-0024*	Cove Base Adhesive, White/Gray (Analyze Adhesive Only)	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-03-11-01 *072002913-0025*	Siding Caulk, Black	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Initial report from: 04/29/2020 17:17:20

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EMSL Order:	072002913
Customer ID:	ENVI40
Customer PO:	
Project ID:	

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
3992-03-11-02 *072002913-0026*	Siding Caulk, Black	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-03-11-03 *072002913-0027*	Siding Caulk, Black	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-03-12-01 *072002913-0028*	Winidow Caulk, White	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-03-12-02 *072002913-0029*	Winidow Caulk, White	Gray Non-Fibrous Homogeneous		96% Non-fibrous (Other)	4% Chrysotile
3992-03-12-03 *072002913-0030*	Winidow Caulk, White				Positive Stop (Not Analyzed)

Analyst(s)
Ibironke Owa (34)

Michael Murphy
or Other Approved Signatory

Initial report from: 04/29/2020 17:17:20

OrderID: 072002913

Chain of Custody

Asbestos Lab Services

072002913

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Atlanta, GA 30339
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Fax: (770) 956-9181
http://www.emsl.com

Company:	Environmental-Materials Consultants, Inc.	***Bill To:***	Environmental-Materials Consultants, Inc.
Address1:	2027 Chestnut Street	*Address1:*	2027 Chestnut Street
Address2:		*Address2:*	
City, State:	Montgomery, Alabama	*City, State:*	Montgomery, Alabama
Zip/Post Code:	36106	*Zip/Post Code:*	36106
Country:		*Country:*	
Contact Name:	Trent Hill	***Attn:***	Trent Hill
Phone:	334-265-4000	*Phone:*	334-265-4000
Fax:	334-265-4043	*Fax:*	334-265-4043
Email:	thill@emcinc.net	*Email:*	thill@emcinc.net
EMSL Rep:		***P.O. Number:***	
Project Name/Number: CCS Gym/MA-3992			

MATRIX			TURNAROUND			
☐ Air	☐ Soil	☐ Micro-Vac	☐ 3 Hours	☐ 6 Hours	☐ Same Day or 12 Hours*	☐ 24 Hours (1 day)
☑ Bulk	☐ Drinking Water		☐ 48 Hours (2 days)	☑ 72 Hours (3 days)	☐ 96 Hours (4 days)	☐ 120 Hours (5 days)
☐ Wipe	☐ Wastewater		☐ 144+ hours (6-10 days)			

TEM AIR, 3 hours, 6 hours, Please call ahead to schedule. There is a premium charge for 3-hour tat, please call 1-800-220-3675 for price prior to sending samples. You will be asked to sign an authorization form for this service.

***12 hours (must arrive by 11:00a.m. Mon -Fri.), Please Refer to Price Quote**

PCM - Air
- ☐ NIOSH 7400(A) Issue 2. August 1994
- ☐ OSHA w/TWA
- ☐ Other:

PLM - Bulk
- ☑ EPA 600/R-93/116
- ☐ EPA Point Count
- ☐ NY Stratified Point Count
- ☐ PLM NOB (Gravimetric) NYS 198.1
- ☐ NIOSH 9002:
- ☐ EMSL Standard Addition:

SEM Air or Bulk
- ☐ Qualitative
- ☐ Quantitative

TEM Air
- ☐ AHERA 40 CFR, Part 763 Subpart E
- ☐ NIOSH 7402
- ☐ EPA Level II

TEM BULK
- ☐ Drop Mount (Qualitative)
- ☐ Chatfield SOP - 1988-02
- ☐ TEM NOB (Gravimetric) NYS 198.4
- ☐ EMSL Standard Addition:

PLM Soil
- ☐ EPA Protocol Qualitative
- ☐ EPA Protocol Quantitative
- ☐ EMSL MSD 9000 Method fibers/gram

TEM WATER
- ☐ EPA 100.1
- ☐ EPA 100.2
- ☐ NYS 198.2

TEM Microvac/Wipe
- ☐ ASTM D 5755-95 (quantative method)
- ☐ Wipe Qualitative

XRD
- ☐ Asbestos
- ☐ Silica NIOSH 7500

OTHER
- ☐

OrderID: 072002913

Chain of Custody

Asbestos Lab Services

EMSL Analytical, Inc.
Suite 135
1770 The Exchange
Atlanta, GA 30339
Phone: (770) 956-9150
Fax: (770) 956-9181
http://www.emsl.com

Please print all information legibly.

Client Sample # (s) 3992-03-01-01 - 3992-03-12-03 **Total Samples #:** 30

Relinquished: HOLLY SMITH **Date:** 4/22/20 **Time:** 4:30 pm

Received: MM **Date:** 4/23/2020 **Time:** 8:25am FFT

Relinquished: _____ **Date:** _____ **Time:** _____

Received: _____ **Date:** _____ **Time:** _____

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME (if applicable)
3992-03-01-01	floor tile, 12"x12", gray with dark gray and white streaks	
3992-03-01-02	floor tile, 12"x12", gray with dark gray and white streaks	
3992-03-01-03	floor tile, 12"x12", gray with dark gray and white streaks	
3992-03-02-01	ceiling tile, 2'x2', pin holes and gouges	
3992-03-02-02	ceiling tile, 2'x2', pin holes and gouges	
3992-03-02-03	ceiling tile, 2'x2', pin holes and gouges	
3992-03-03-01	wallboard and joint compound (composite analysis)	
3992-03-03-02	wallboard and joint compound (composite analysis)	
3992-03-03-03	wallboard and joint compound (composite analysis)	
3992-03-04-01	gym floor adhesive, pink	
3992-03-04-02	gym floor adhesive, pink	
3992-03-04-03	gym floor adhesive, pink	
3992-03-05-01	sheet flooring, gray tile pattern	
3992-03-05-02	sheet flooring, gray tile pattern	

PLEASE STOP ON POSITIVE WITHIN EACH HSA.

OrderID: 072002913

CHAIN OF CUSTODY (continued)

CCS Gym

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME (if applicable)
3992-03-06-01	pipe mud	
3992-03-06-02	pipe mud	
3992-03-07-01	cove base adhesive, yellowish (analyze adhesive only)	
3992-03-07-02	cove base adhesive, yellowish (analyze adhesive only)	
3992-03-08-01	floor tile, 12"x12", black	
3992-03-08-02	floor tile, 12"x12", black	
3992-03-09-01	cove base adhesive, brown (analyze adhesive only)	
3992-03-09-02	cove base adhesive, brown (analyze adhesive only)	
3992-03-10-01	cove base adhesive, white/gray (analyze adhesive only)	
3992-03-10-02	cove base adhesive, white/gray (analyze adhesive only)	
3992-03-11-01	siding caulk, black	
3992-03-11-02	siding caulk, black	
3992-03-11-03	siding caulk, black	
3992-03-12-01	window caulk, white	
3992-03-12-02	window caulk, white	
3992-03-12-03	window caulk, white	
	Please stop on positive within each HSA.	

EMSL Analytical, Inc.
2205 Corporate Plaza Parkway SE, Suite 200 Smyrna, GA 30080
Tel/Fax: (770) 956-9150 / (770) 956-9181
http://www.EMSL.com / atlantalab@emsl.com

EMSL Order: 072002917
Customer ID: ENVI40
Customer PO:
Project ID:

Attention: Trent Hill
Environmental Materials Consultants
2027 Chestnut Street
Montgomery, AL 36106

Project: CCS Cafeteria / MA-3992

Phone: (334) 322-1164
Fax: (334) 265-4043
Received Date: 04/23/2020 8:25 AM
Analysis Date: 04/29/2020
Collected Date:

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
3992-04-01-01-Floor Tile *072002917-0001*	Floor Tile, Beige and Brown, Mottled	Tan Non-Fibrous Homogeneous		96% Non-fibrous (Other)	4% Chrysotile
3992-04-01-01-Mastic *072002917-0001A*	Floor Tile, Beige and Brown, Mottled	Black Non-Fibrous Homogeneous		96% Non-fibrous (Other)	4% Chrysotile
3992-04-01-02 *072002917-0002*	Floor Tile, Beige and Brown, Mottled				Positive Stop (Not Analyzed)
3992-04-01-03 *072002917-0003*	Floor Tile, Beige and Brown, Mottled				Positive Stop (Not Analyzed)
3992-04-02-01 *072002917-0004*	Ceiling Tile, 2'x4', Gray Board	Gray Fibrous Homogeneous	60% Cellulose 5% Min. Wool	35% Non-fibrous (Other)	None Detected
3992-04-02-02 *072002917-0005*	Ceiling Tile, 2'x4', Gray Board	Gray Fibrous Homogeneous	60% Cellulose 5% Min. Wool	35% Non-fibrous (Other)	None Detected
3992-04-02-03 *072002917-0006*	Ceiling Tile, 2'x4', Gray Board	Gray Fibrous Homogeneous	60% Cellulose 5% Min. Wool	35% Non-fibrous (Other)	None Detected
3992-04-03-01 *072002917-0007*	Window Glazing, White	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-04-03-02 *072002917-0008*	Window Glazing, White	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-04-03-03 *072002917-0009*	Window Glazing, White	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-04-04-01 *072002917-0010*	Door Caulk, Brown	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-04-04-02 *072002917-0011*	Door Caulk, Brown	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-04-05-01 *072002917-0012*	Ceiling Tile, 2'x4', Gypsum Type	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-04-05-02 *072002917-0013*	Ceiling Tile, 2'x4', Gypsum Type	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
3992-04-06-01 *072002917-0014*	Roof Decking	Black Fibrous Homogeneous		85% Non-fibrous (Other)	15% Chrysotile
3992-04-06-02 *072002917-0015*	Roof Decking				Positive Stop (Not Analyzed)

Initial report from: 04/29/2020 13:42:44

EMSL Analytical, Inc.
2205 Corporate Plaza Parkway SE, Suite 200 Smyrna, GA 30080
Tel/Fax: (770) 956-9150 / (770) 956-9181
http://www.EMSL.com / atlantalab@emsl.com

EMSL Order:	072002917
Customer ID:	ENVI40
Customer PO:	
Project ID:	

Analyst(s)
Anthony Sanaie (11)
Ibironke Owa (2)

Michael Murphy
or Other Approved Signatory

Initial report from: 04/29/2020 13:42:44

OrderID: 072002917

15

Chain of Custody

Asbestos Lab Services

EMSL Analytical, Inc.
Suite 135
1770 The Exchange
Atlanta, GA 30339
Phone: (770) 956-9150
Fax: (770) 956-9181
http://www.emsl.com

Please print all information legibly. 072002917

Company:	Environmental-Materials Consultants, Inc.	***Bill To:***	Environmental-Materials Consultants, Inc.
Address1:	2027 Chestnut Street	*Address1:*	2027 Chestnut Street
Address2:		*Address2.*	
City, State:	Montgomery, Alabama	*City, State.*	Montgomery, Alabama
Zip/Post Code:	36106	*Zip/Post Code:*	36106
Country:		*Country*	
Contact Name:	Trent Hill	***Attn:***	Trent Hill
Phone:	334-265-4000	*Phone:*	334-265-4000
Fax:	334-265-4043	*Fax*	334-265-4043
Email:	thill@emcinc.net	*Email:*	thill@emcinc.net
EMSL Rep:		***P.O. Number:***	
Project Name/Number:	CCS Cafeteria/MA-3992		

MATRIX			TURNAROUND			
☐ Air	☐ Soil	☐ Micro-Vac	☐ 3 Hours	☐ 6 Hours	☐ Same Day or 12 Hours*	☐ 24 Hours (1 day)
☑ Bulk	☐ Drinking Water		☐ 48 Hours (2 days)	☑ 72 Hours (3 days)	☐ 96 Hours (4 days)	☐ 120 Hours (5 days)
☐ Wipe	☐ Wastewater		☐ 144+ hours (6-10 days)			

TEM AIR, 3 hours, 6 hours, Please call ahead to schedule. There is a premium charge for 3-hour tat, please call 1-800-220-3675 for price prior to sending samples. You will be asked to sign an authorization form for this service.

***12 hours (must arrive by 11:00a.m. Mon -Fri.), Please Refer to Price Quote**

PCM - Air
- ☐ NIOSH 7400(A) Issue 2: August 1994
- ☐ OSHA w/TWA
- ☐ Other:

PLM - Bulk
- ☑ EPA 600/R-93/116
- ☐ EPA Point Count
- ☐ NY Stratified Point Count
- ☐ PLM NOB (Gravimetric) NYS 198.1
- ☐ NIOSH 9002:
- ☐ EMSL Standard Addition:

SEM Air or Bulk
- ☐ Qualitative
- ☐ Quantitative

TEM Air
- ☐ AHERA 40 CFR, Part 763 Subpart E
- ☐ NIOSH 7402
- ☐ EPA Level II

TEM BULK
- ☐ Drop Mount (Qualitative)
- ☐ Chatfield SOP - 1988-02
- ☐ TEM NOB (Gravimetric) NYS 198.4
- ☐ EMSL Standard Addition:

PLM Soil
- ☐ EPA Protocol Qualitative
- ☐ EPA Protocol Quantitative
- ☐ EMSL MSD 9000 Method fibers/gram

TEM WATER
- ☐ EPA 100.1
- ☐ EPA 100.2
- ☐ NYS 198.2

TEM Microvac/Wipe
- ☐ ASTM D 5755-95 (quantative method)
- ☐ Wipe Qualitative

XRD
- ☐ Asbestos
- ☐ Silica NIOSH 7500

OTHER
- ☐

OrderID: 072002917

Chain of Custody

Asbestos Lab Services

EMSL Analytical, Inc.
Suite 135
1770 The Exchange
Atlanta, GA 30339
Phone: (770) 956-9150
Fax: (770) 956-9181
http://www.emsl.com

Please print all information legibly.

Client Sample # (s) 3992-04-01-01 - 3992-04-06-02 **Total Samples #:** 15

Relinquished: HADLEY SMITH **Date:** 4/22/20 **Time:** 4:30 pm

Received: MM **Date:** 4/23/2020 **Time:** 8:25am EFT

Relinquished: _____ **Date:** _____ **Time:** _____

Received: _____ **Date:** _____ **Time:** _____

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME (if applicable)
3992-04-01-01	floor tile, beige and brown, mottled	
3992-04-01-02	floor tile, beige and brown, mottled	
3992-04-01-03	floor tile, beige and brown, mottled	
3992-04-02-01	ceiling tile, 2'x4', gray board	
3992-04-02-02	ceiling tile, 2'x4', gray board	
3992-04-02-03	ceiling tile, 2'x4', gray board	
3992-04-03-01	window glazing, white	
3992-04-03-02	window glazing, white	
3992-04-03-03	window glazing, white	
3992-04-04-01	door caulk, brown	
3992-04-04-02	door caulk, brown	
3992-04-05-01	ceiling tile, 2'x4', gypsum type	
3992-04-05-02	ceiling tile, 2'x4', gypsum type	
3992-04-06-01	roof decking	

PLEASE STOP ON POSITIVE WITHIN EACH HSA,

OrderID: 072002917

CHAIN OF CUSTODY (continued)

CCS Cafeteria

SAMPLE NUMBER	SAMPLE DESCRIPTION/LOCATION	VOLUME (if applicable)
3992-04-06-02	roof decking	

CONSTRUCTION BEST MANAGEMENT PRACTICES PLAN

FOR:

A NEW CITY HALL AND MUNICIPAL OFFICE FACILITY

FOR

THE CITY OF CENTRE

350 E. MAIN STREET

CENTRE, AL 35960

PERMITTEE:

TBD

CBMPP CONTACT(S) / QCP:

Ladd Environmental Consultants, Inc.
James Payton, P.E.
1207 CHITWOOD AVENUE, SE
FORT PAYNE, AL 35967-4822
(256) 845-5315
james@laddenv.com

LADD ENVIRONMENTAL
Providing Engineering Solutions

CBMPP PREPARATION DATE:

03/01/2024

Estimated Project Dates:

Project Start Date:	**07/01/2024**
Project Completion Date:	**06/01/2025**

Contents

NOTES FOR CBMPP

1. Read the CBMPP and refer any questions to the Engineer.

2. Obtain and pay for an ADEM Stormwater Permit. This must be performed electronically.

3. Install and maintain a Facility Identification Sign provided in Appendix J.

4. Install a rain gage and perform inspections following 0.75 inch rainfall events. Record daily rainfall totals in the Chart in Appendix H.

5. Install all required BMP measures as detailed in the CBMPP including details in Appendix J.

6. Perform Daily and Weekly Inspections by on-site personnel as listed in Section 5.

7. Perform monthly inspections and inspections following 0.75 inch rainfall events by a QCI or QCP utilizing the form in Appendix D.

8. Perform a Comprehensive Evaluation by a QCP every six (6) months utilizing the form in Appendix D.

9. Record Corrective Actions in the log in Appendix E.

10. Record Grading and Stabilization Activities in the log in Appendix G.

11. Record all Training performed in the log in Appendix I.

12. Upon completion, file a Notice of Termination with ADEM. A QCP must sign for the Termination, and final stabilization, including a stand of grass, must be in place.

13. Portions of the electronic NOI form required to be completed by a QCP will be provided at no additional cost to the Contractor.

14. Refer to the Contract Documents for who is responsible for the cost of stormwater inspections.

SECTION 1: SITE EVALUATION, ASSESSMENT, AND PLANNING

1.1 Project / Site Information

Project/Site Name: A New City Hall and Municipal Office Facility

Project Street/Location: 350 E. Main Street

City: Centre County: Cherokee State: Alabama Zip Code: 35960

Total Disturbed Acres: 2.7 ac. Total Project Acres: 2.97 ac.

Latitude/Longitude of the Project Site.

Latitude: Longitude:

34° 9’ 3.98” N (decimal) -85°40.38.07” W (decimal)

Method for Determining Latitude/Longitude: Google Earth.

1.2 Contact Information / Responsible Parties

Permittee:

TBD

Project Manager(s) or Site Supervisor(s):

TBD

CBMPP Contact(s) / QCP:

Ladd Environmental Consultants, Inc.
James Payton, P.E.
1207 Chitwood Avenue, S.E.
Fort Payne, AL 35967-4822
(256) 845-5315
james@laddenv.com

QCI or Qualified Person(s):

TBD

Emergency 24-Hour Contract:

TBD

1.3 Nature and Sequence of Construction Activity

Table 2. Intended Sequence and BMP Implementation

Estimated Dates of Activity	Construction Activity and BMPs to be Implemented
07/01/2024 to 08/15/2024	Install BMP Measures and Demolish Structures.
08/16/2024 to 09/15/2024	Perform Site Grading and Utility Installation
09/16/2024 – 03/31/2025	Perform Building Construction.
04/01/2025 to 04/30/2025	Install Final Surface Cover (Paving, Concrete)
05/01/2025 to 06/01/2025	Establish Final Stand of Grass and Complete Project.

Proposed Activity(ies) to be Conducted: Demolition, excavation, fill placement, grading, Utilities, building construction, paving and concrete.

1.4 Receiving Waters

Table 3: List of Receiving Water(s)

Receiving Water Name	UT, MS4 or Direct Discharge (DD)	Disturbed Acres	Waterbody Use Classification (WUC)	Priority (Y/N)
Coosa River	UT	2.7	Swimming, Fish and Wildlife	N

Destination of Stormwater Flowing through Project: Refer to Map in Appendix B.

Description of Impaired Waters or Waters Subject to TMDLs: None.

1.5 Stream Buffer Requirements

No streams are in the project area.

1.6 Potential Sources of Pollution

Potential Sources of Sediment to Stormwater Runoff: Soil erosion and tracking due to soil exposure from land disturbance.

Potential Pollutants and Known Sources, other than Sediment, to Stormwater Runoff: None.

1.7 Facility Maps

Refer to Appendix "B".

SECTION 2: EROSION AND SEDIMENT CONTROL BMPS

2.1 Phase Construction Activity

Phase 1: Project activities will include demolition, excavation, clearing, and Land Grading (LG). Disturbing of soil shall be kept to a minimum by stockpiling excavated material adjacent to the disturbed area and Preservation of Vegetation (PV) shall be maximized. Dust Control (DC) and Groundskeeping (GK) shall be monitored throughout the project. Install Type A Silt Barrier (SB-A) and sand bags as shown. Install Inlet Protection (IP) as shown.

Phase II: When final grade is achieved, all disturbed areas shall be stabilized and Permanent Seeding (PS) and Mulching (MU) shall be applied. Temporary Seeding (TS) shall be utilized to establish a stand of grass as required.

Refer to Appendix "J" for Installation Details for BMPs.

2.2 Minimize Disturbed Area and Protect Natural Features

Excavated material shall be placed adjacent to trenches and placed as linework cover immediately after excavation. Care shall be taken to avoid any further grass disturbance by practicing Preservation of Vegetation (PV).

2.3 Control Stormwater Volume and Velocity

Install Sediment Barrier (SB) as shown.

2.4 Stabilize Soils

Perform Dust Control (DC) by applying water as necessary on disturbed areas.

Permanent stabilization with Mulch (MU) and Permanent Seeding (PS) or compacted aggregate where required shall be immediately installed upon completion of disturbance activities.

2.5 Stabilize Slopes

Temporary Erosion Control Blanket (ECB) shall be used to stabilize all disturbed areas with slopes steeper than 3:1. Erosion Control Blankets shall be of a sufficient duration to allow the establishment of permanent vegetation. Erosion Control Blankets shall be

suitable for slope stresses for each location. All other slopes shall be stabilized by Permanent Seeding (PS), Temporary Seeding (TS) and Mulch (MU).

2.6 Protect Storm Drain Inlets

Install Inlet Protection (IP) as shown.

2.7 Establish Perimeter Controls and Type A Silt Barrier

Type A Silt Barrier and sand bags shall be installed as shown.

2.8 Retain Sediment On-Site

No sedimentation ponds will be required. Retain sedimentation using Sediment Barriers (SB).

2.9 Establish Stabilized Construction Exits

Construct Exit Pad (CEP) is required as shown.

Minimize equipment travel to further prevent sediment tracking.

2.10 Treatment Chemicals

No treatment chemicals will be used on the project site.

2.11 Additional BMPs – NOT APPLICABLE.

SECTION 3: GROUNDS KEEPING BMPS

3.1 Material Handling and Waste Management

Construction activities will be policed daily and Groundskeeping (GK) maintained to remove all debris on a daily basis to prevent any solid waste from entering the nearby streams of this project.

3.2 Establish Proper Building Material Staging Areas

Staging area/lay down areas shall be designated by the Contractor and monitored.

3.3 Designated Washout Areas

Concrete washout areas shall be constructed of hay bales lined with plastic and may be above grade or excavated. After concrete washout water has evaporated, solid material shall be removed and landfilled or recycled. Alternative concrete washout methods as descripted in EPA Publication 833-F-11-006 are also approved for use.

3.4 Establish Proper Equipment/Vehicle Fueling and Maintenance Practices

When fueling construction equipment, drip pans shall be used to capture any leaks or spills. Spill kits including raps and/or absorbents shall be readily available to clean-up and contain any potential spills. Replace spill kit equipment immediately after use. Repair any leaking equipment immediately.

3.5 Control Equipment/Vehicle Washing

No equipment or vehicles may be washed on-site.

3.6 Spill Prevention, Control and Management

See the following Spill Prevention Control and Countermeasure (SPCC) Plan.

No permanent fuel or other chemical storage containers shall be stored on-site. Any fuel or other chemical storage containers located on site shall be temporary.

If a spill should occur, the usable fuel within the storage container shall immediately be removed to another storage container. Container(s) shall be available at all times capable of storing 110 percent of the volume from any one fuel or other petroleum product container kept temporarily at the site.

Oil absorbent material shall be used to contain any spills. The unusable fuel oil shall be disposed of in accordance with the existing State and Federal regulations.

Any spills and/or leaks of fuel, oil or other fuels must be excavated as soon as possible. The excavation must extend a minimum of two feet beyond the limits of the spill in all directions, including below the spill.

For minor spills the excavated material shall be placed on a diked containment pad. The containment pad must be located so that no runoff from the contaminated soil can exit the pad nor can any runoff enter the pad area. The containment pad shall be 20' x 20' and have a dike of at least 18-inches in height. The contaminated soil shall be turned regularly to aerate and dissipate the hydrocarbons from the fuel. After sufficient aeration time the soil from the containment pad can be remixed with fresh soil and used in construction.

A written report shall be maintained by the operator of any spill which occurs, the actions taken to properly dispose of any spilled material and the clean-up procedures.

Refueling of equipment shall be performed to meet the requirements and regulations. The equipment shall be attended while filling to prevent overflow and to note visible leaks from the equipment. The operations manager of the facility shall inspect the refueling area to detect signs of minor spills upon completion of each refueling. If spills are evident the containment soil shall be disposed of in accordance with existing State and Federal regulations.

Periodic inspections of equipment shall be made to identify any leaks from the equipment. All leaks should be cleaned-up in accordance with this Plan and all Federal and State requirements. Equipment shall be repaired when necessary to prevent future leaks.

Notification. In the event of a reportable quantity spill, immediately call:

The National Response Center: 1-800-424-8802

And

Alabama Department of Environmental Management: (334) 271-7700

Report the following information:

A. Name, address and telephone number of person reporting spill.

B. Exact location of facility and spill.

C. Company name, phone number and location.

D. Material spilled.

E. Estimated quantity.

F. Source of spill.

G. Cause of spill.

H. Nearest downstream body of water to receive spill.

I. Request actions to take for containment and clean-up.

3.7 Non-Stormwater Discharge Management

Water used for Dust Control (DC) shall be applied in a fine mist to prevent run-off.

Uncontaminated ground water brought to the surface by construction activities shall be routed through BMPs in place for protection of the disturbed areas.

Excavation dewatering shall be routed through Sedimentation Barriers (SB), such as silt fences or straw bales to filter water.

SECTION 4: SELECTING POST-CONSTRUCTION BMPs

The installation of vegetation will be ongoing throughout the duration of construction. Permanent vegetation shall be installed no later than 13 days after completion of construction activities for each area.

SECTION 5: INSPECTIONS

5.1 Inspections

The Contractor shall ensure that the regular, comprehensive site and receiving water inspections are conducted to ensure that effective BMPs are properly designed, implemented, and consistently maintained in accordance with the requirements of the General Permit.

Inspections shall be performed as often as necessary to ensure, document, and certify continuing compliance. If the Construction Best Management Practices Plan is determined to be deficient following an inspection, the Plan shall be revised and the revisions fully implemented within 7 days following inspection.

1. Inspection Personnel: Identify the person(s) who will be responsible for conducting inspections and describe their qualifications:

   Daily Observations: Contractor designated.

   Monthly Inspections: QCI or QCP.

   Precipitation Event Inspections: QCI or QCP.

   Comprehensive CBMPP Evaluation shall be conducted at a minimum of once every 6 months by QCP.

2. Inspection Schedule and Procedures

   Identified problems shall be brought to the Operator's attention. Corrective actions shall be made as soon as possible but not over five (5) days unless prevented by unsafe weather conditions. The Operator shall be responsible for ensuring all corrections are performed and completed within the specified time frame.

   Refer to ADEM Form 23 – ADEM NPDES Construction Stormwater Inspection Report and BMP Certification located in Appendix D.

   A. Daily Observations: Each day there is activity at the site, the Permittee shall visually observe the portion of the construction project where active disturbance, work, or construction occurred to note any rainfall measurements occurring since the previous observation, and any apparent BMP deficiencies in the area of active disturbance. Such daily observations may be performed by appropriate site personnel. The Permittee shall maintain a log of all daily observations and record in such log any rainfall measurements and BMP deficiencies observed.

   B. Site Inspections

      1. A site inspection shall consist of a complete and comprehensive observation of the entire construction site including all areas of land disturbance, areas used for storage of materials that are exposed to precipitation, affected ditches and other stormwater

         conveyances, as well as all outfalls, receiving waters and stream banks to determine if, and ensure that:

a. Effective erosion controls and sediment controls have been fully implemented and maintained in accordance with this permit, the site CMBPP, and the Alabama Handbook.

b. Pollutant discharges have been prevents/minimized to the maximum extent practicable, and

c. Discharges do not result in a contravention of applicable State water quality standards for the receiving stream(s) or other waters impacted or affected by the Permittee.

2. Site inspections shall be performed by a QCI, QCP or a qualified person under the direct supervision of a QCP.

3. For non-linear projects, a site inspection shall be performed once each month, and after qualifying precipitation event, commencing as promptly as possible, but not later than 24-hours after resuming or continuing active construction or disturbance, and completed no later than 72-hours following the qualifying precipitation event.

4. For linear projects where active construction or areas where perennial vegetation has not been fully established, meeting the definition of final stabilization, a site inspection shall be performed after any qualifying precipitation event since the last inspection, beginning as promptly as possible, not no later than 24-hours after resuming or continuing active construction or disturbance and completed no later than five (5) days after the qualifying precipitation event;

5. A site inspection shall also be performed as often as is necessary until any poorly functioning erosion controls or sediment controls, non-compliant discharges, or any other deficiencies observed during a prior inspection are corrected and documented as being in compliance with the requirements of this permit.

6. On all active disturbance, dredging, excavation, or construction undertaken or located within the banks of a waterbody, including but not limited to, equipment/vehicle crossings, pipelines, or other

transmission line installation, conveyor structure installation, and waterbody relocation, streambank stabilization, or other alterations, a site inspection shall be performed at least once a week and as often as is necessary until the disturbance/activity impacting the

waterbody is complete and reclamation or effective stormwater quality remediation is achieved.

5.2 Corrective Action

Corrective Action Log: See Appendix E for the Corrective Action Log.

SECTION 6: RECORDKEEPING AND TRAINING

6.1 Recordkeeping

The following records should be kept at the project site and be available for review:

A. Signed and certified NOI form (Appendix C).

B. A copy of the letter from ADEM acknowledging receipt of a complete NOI application (Appendix C).

C. Inspection Reports (Appendix D).

D. Corrective Action Log (Appendix E).

E. Dates of grading, construction activity and stabilization (Appendix G).

F. Rainfall Data (Appendix H).

G. Training Log (Appendix I).

H. Copy of this CBMPP Plan.

I. Copy of SPCC (Section 3.6).

Records shall be retained for a minimum period of three (3) years from the date of the inspection, sample measurement or report.

6.2 Log of Changes to the CBMPP

See Appendix F for the CBMPP Amendment Log.

6.3 Training

A. Individual(s) Responsible for Training: Designated by Contractor.

B. Describe Training Conducted:

1. General stormwater and BMP awareness training for staff and subcontractors: Refer to Table in Appendix I.

2. Detailed training for staff and subcontractors with specific stormwater responsibilities. Refer to Table in Appendix I.

SECTION 7: FINAL STABILIZATION

Final stabilization shall be achieved by Permanent Seeding (PS). Final stabilization is defined by the perimeter 100% of the soil surface is uniformly covered in vegetation with a density of 85% or greater

SECTION 8: VOLUNTARY TERMINATION

Submit voluntary termination via the Alabama Environmental Permitting and Compliance System once final stabilization is achieved: https://aepacs.adem.alabama.gov/nviro/ncore/external/home

SECTION 9: CERTIFICATION

I certify under penalty of law that a comprehensive Construction Best Management Practices Plan (CBMPP) for the prevention and minimization of all sources of pollution in stormwater and authorized related process wastewater runoff has been prepared under my supervision for this site/activity, and associated regulated areas/activities. The CBMPP meets the requirements of this permit and if properly implemented and maintained by the operator, discharges of pollutants in stormwater runoff can reasonably be expected to be effectively minimized to the maximum extent practicable according to the requirements of ADEM Administrative Code Chapter 335-6-6-.23 and this Permit. The CBMPP describes the erosion and sediment control measures that must be fully implemented and regularly maintained as needed at the permitted site in accordance with sound sediment and erosion control practices to ensure the protection of water quality.

Name: James D. Payton	Title: Professional Engineer
Address: P. O. Box 680869	AL Registration No.: 23783
City, State, Zip Code: Fort Payne, AL 35968	Phone No.: (256) 845-5315

Signature: James Payton Date: 03-20-2024

CBMPP APPENDICES

Attach the following documentation to the CBMPP:

Appendix A – General Location Map

Appendix B – Site Maps (showing all BMPs and outfall locations)

Appendix C – NOI and copy of Permit

Appendix D – Inspection Reports

Appendix E – Corrective Action Log

Appendix F – CBMPP Amendment Log

Appendix G – Grading and Stabilization Activities Log

Appendix H – Rain Gauge Log

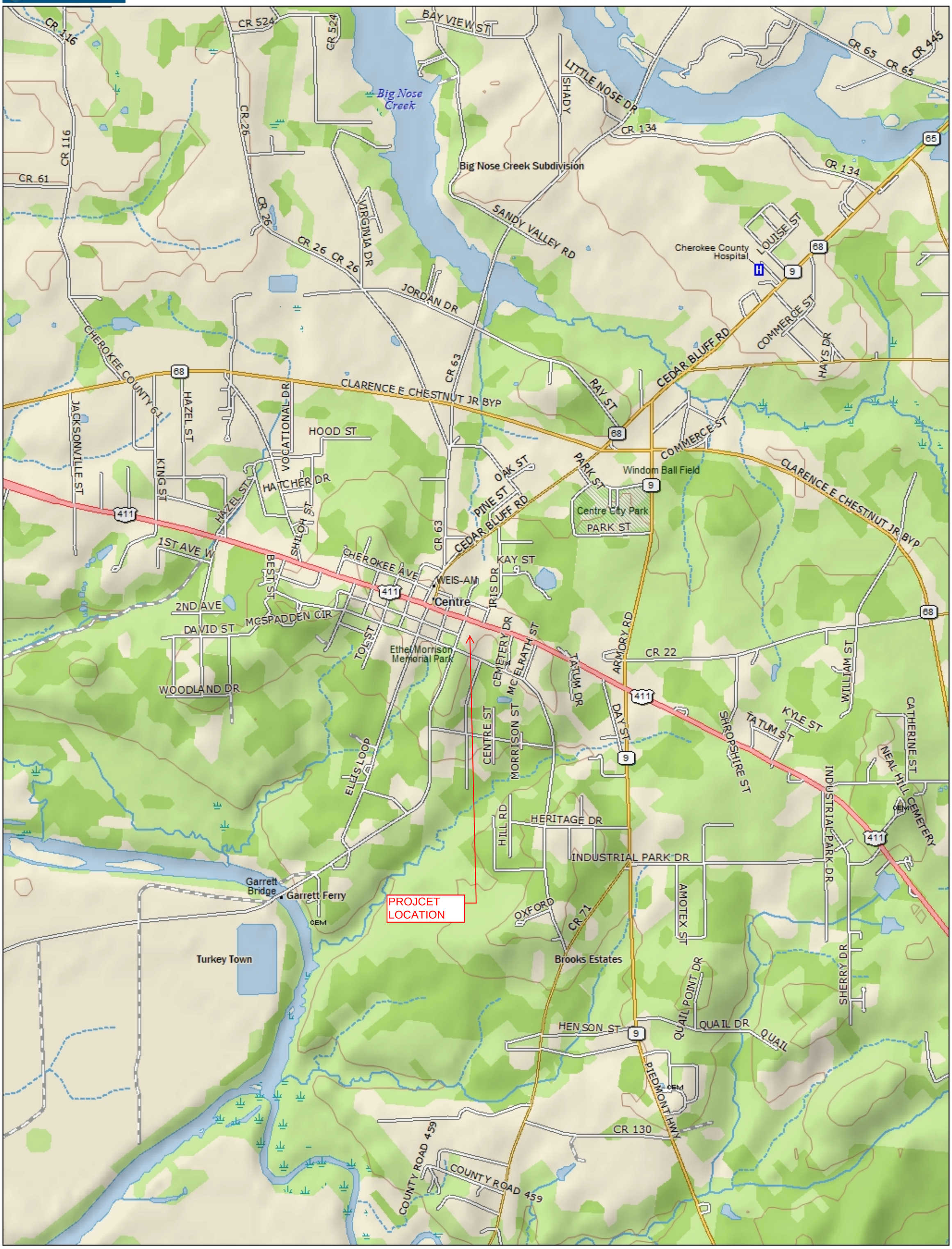
Appendix I – Training Log

Appendix J – Additional Information
Facility Identification Sign
BMP Installation Details

Appendix K– Safety Data Sheet(s) for Treatment Chemicals **– Not Applicable**

APPENDIX A

GENERAL LOCATION MAP



GENERAL LOCATION MAP

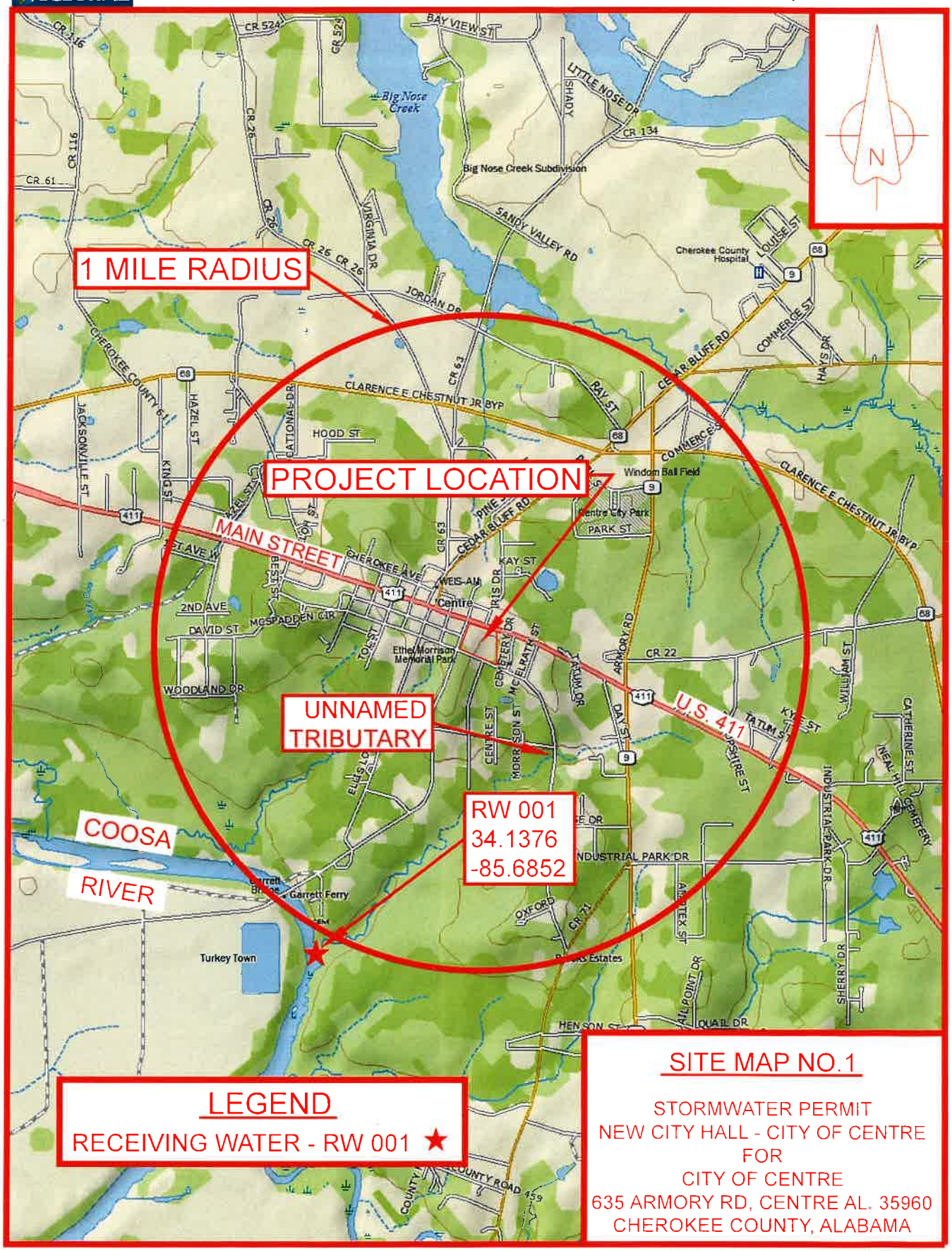
MN (4.9° W)

0 800 1600 2400 3200 4000 ft

Data Zoom 13-1

APPENDIX B

SITE MAPS



LEGEND

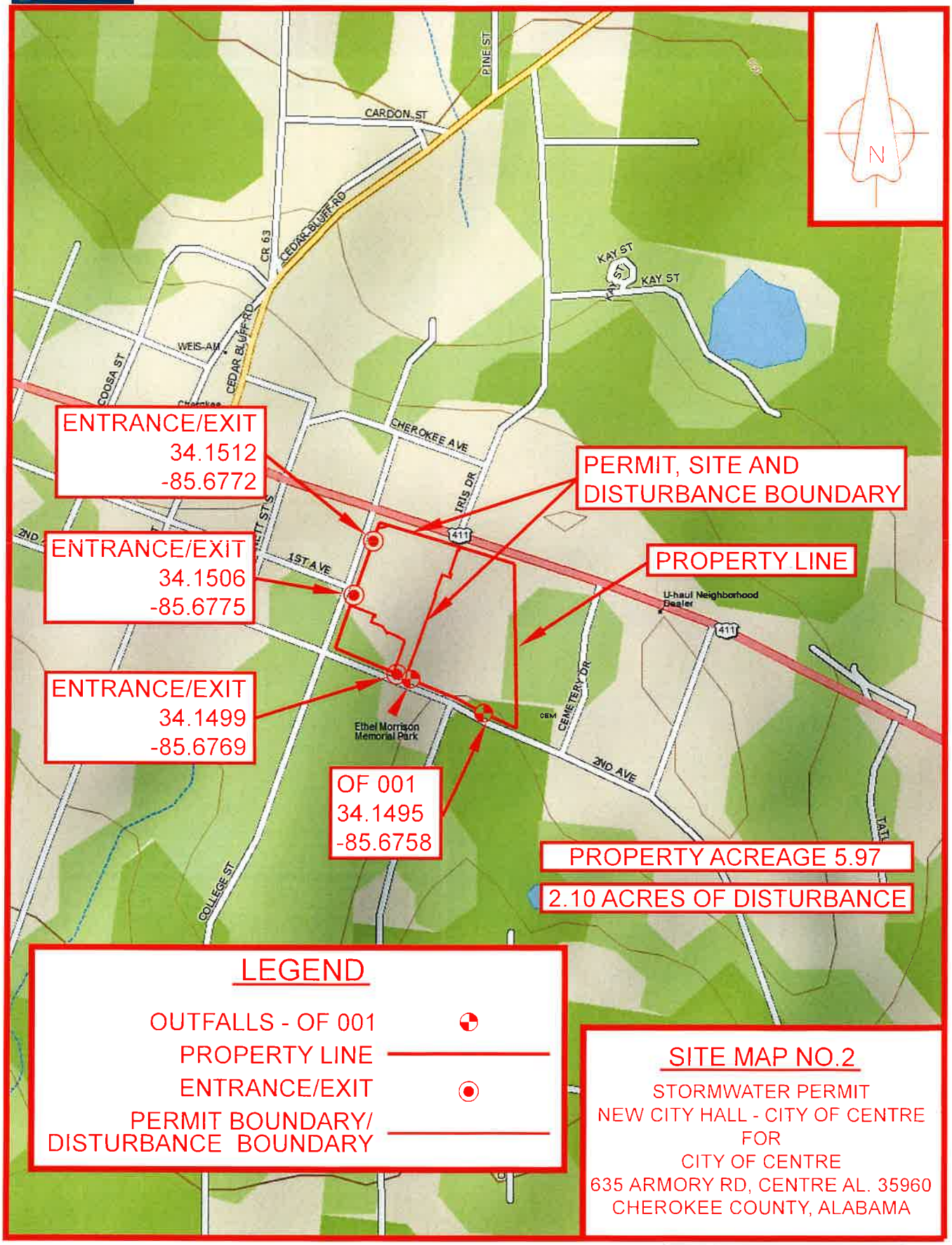
RECEIVING WATER - RW 001 ★

SITE MAP NO.1

STORMWATER PERMIT
NEW CITY HALL - CITY OF CENTRE
FOR
CITY OF CENTRE
635 ARMORY RD, CENTRE AL. 35960
CHEROKEE COUNTY, ALABAMA

MN (4.9° W)

0 800 1600 2400 3200 4000 ft
Data Zoom 13-1



MN (4.9° W)

0 160 320 480 640 800 ft

Data Zoom 15-3

APPENDIX C

NOI COPY OF PERMIT

This CBMPP was prepared as required prior to the NOI being applied for and received. A copy of the approved NOI will be inserted upon approval by ADEM.

APPENDIX D

INSPECTION REPORTS

ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT (ADEM)
NPDES CONSTRUCTION STORMWATER INSPECTION REPORT AND BMP CERTIFICATION

Instructions: Please complete all questions. Respond with "N/A" as appropriate. Forms with incomplete or incorrect answers, or missing signatures will delay processing and may result in appropriate compliance action by the Department.

ITEM I.

Permittee Name:	Facility/Site Name: A New City Hall and Municipal Office Facility for the City of Centre
Permit Number:	County: Cherokee
Facility/Site Entrance Latitude & Longitude: 34° 9' 3.98" N -85°40.38.07" W	Phone Number:
Facility/Site Street Address or Location Description: 350 E. Main Street, Centre, AL 35960	

ITEM II.

List name of current ultimate receiving water(s) (indicate if through MS4) and the number of disturbed acres which drains through each treatment system or BMP: Add additional sheet(s) if necessary.

Receiving Water	Disturbed Acres	Discharge Point #
Coosa River UT	2.7	001

ITEM III.

☐ YES ☐ NO	1. Did discharges of sediment or other pollutants occur from the site? If "Yes", please list a description of the discharge(s) and their location(s):
☐ YES ☐ NO	2. Were BMPs properly implemented and maintained at the time of inspection? If "No", please provide location(s) and descriptions of BMPs that need maintenance:
☐ YES ☐ NO	3. Are BMPs needed in addition to those already present onsite at the time of inspection? If "Yes" please provide a description and location of additional BMPs that are needed:
☐ YES ☐ NO	4. Have any BMPs failed to operate as designed? If "Yes", please provide location(s) and description of BMP(s) that failed:
☐ YES ☐ NO	5. Were there BMPs required by the CBMPP that were not installed or installed in a manner not consistent with the CBMPP? If "Yes", please provide a description and location where the BMPs were not installed or installed incorrectly:

ITEM IV.

Weather Conditions:			
Discharge Point #	**Date, Time, and Location of Samples Collected**	**Sample Results**	**Analytical Method(s)**

"Based upon an inspection conducted on _____ (Date & Time) by the QCP, QCI, or a qualified person (List Name(s):_____) under the direct supervision of the QCP identified below, the QCI or QCP identified below certifies that effective structural and non-structural BMPs have been fully implemented and regularly maintained to the maximum extent practicable for the prevention and minimization of all sources of pollution in stormwater and authorized related process wastewater runoff, **except for those deficiencies noted above**, in accordance with the facility's CBMPP, good sediment, erosion, and other pollution control practices, and the requirements of the permit. I certify that discharges have been tested or evaluated for the presence of non-stormwater and non-authorized process wastewaters. I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I certify that this form has not been altered, and if copied or reproduced, is consistent in format and identical in content to the ADEM approved form. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations."

Name & Designation of QCI or QCP	Signature	Date

Name & Title of Permittee Responsible Official	Signature	Date

APPENDIX E – CORRECTIVE ACTION LOG

Project Name: A New City Hall and Municipal Office Facility for the City of Centre

CBMPP Contact: _____

Inspection Date	Inspector Name(s)	Description of BMP Deficiency	Corrective Action Needed (including planned date/responsible person)	Date Action Taken/Responsible Person

APPENDIX F – CBMPP AMENDMENT LOG

Project Name: A New City Hall and Municipal Office Facility for the City of Centre

CBMPP Contact: _____

Amendment No.	Description of the Amendment	Date of Amendment	Amendment Prepared by [Name(s) and Title}

APPENDIX G – GRADING AND STABILIZATION ACTIVITIES LOG

Project Name: A New City Hall and Municipal Office Facility for the City of Centre

CBMPP Contact: _____

Date Grading Activity Initiated	Description of Grading Activity	Date Grading Activity Ceased (Indicate Temporary or Permanent)	Date When Stabilization Measures are Initiated	Description of Stabilization Measure(s) and Location(s)

APPENDIX H - RAIN GAUGE LOG

Project Name: A New City Hall and Municipal Office Facility for the City of Centre

CBMPP Contact: _____ Year: _____ Initials

January	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
February	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
	16	17	18	19	20	21	22	23	24	25	26	27	28	29			
March	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
April	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
May	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
June	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
July	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
August	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
September	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
October	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
November	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
December	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	

APPENDIX I – TRAINING LOG

Project Name: A New City Hall and Municipal Office Facility for the City of Centre

CBMPP Contact: _____

Date	#Of Attendees	Type (General or Detailed)	Subject(s)	Length

APPENDIX J

ADDITIONAL INFORMATION

FACILITY IDENTIFICATION SIGN

BMP INSTALLATION DETAILS

Pursuant to Part IV.S. [Facility Identification] of the GP, the permittee is required to post and maintain facility identification. The permittee is required to post a sign at the front gate/entrance to identify the site. The permittee may use this example sign or create and use a sign meeting the requirements of Part IV.S. of the permit. If this sign is used, please make copies to post, and keep this original in your files. PLEASE PRINT CLEARLY USING BLUE OR BLACK INK. Areas that contain * are not required to be completed.

ADEM NPDES General Permit #:

ALR100000

ADEM Authorization #:

ALR10_____

Facility Name:

A New City Hall and Municipal Office Facility for the City of Centre

PERMITTEE:	***CONTACT:**	***PHONE #**
***ADDRESS** **350 E. MAIN STREET**		
***City** **CENTRE**	***State:** **AL**	***Zip:** **35960**

Rev 4/01/2011

Alabama Handbook for

Erosion Control, Sediment Control and Stormwater Management on Construction Sites and Urban Areas (The Blue Book)

Volume 2

Installation, Maintenance, and Inspection of Best Management Practices

2022

Alabama Soil and Water Conservation Committee
Montgomery, Alabama

Construction Exit Pad (CEP)

Practice Description

A construction exit pad is a stone base pad or manufactured product designed to provide a buffer area where mud and caked soil can be removed from the tires of construction vehicles to avoid transporting it onto public roads. This practice applies anywhere traffic will be leaving a construction site and move directly onto a public road or street.

Typical Components of the Practice

- Site Preparation
- Grading
- Stabilization with Geotextile Fabric (where needed to provide stability)
- Aggregate Placement
- Construction Verification
- Maintenance

Construction

Prior to start of construction, temporary gravel construction entrance/exit pads should be designed by a qualified design professional and plans and specifications should be available to field personnel.

Site Preparation

Remove all vegetation and other unsuitable material from the foundation area.

Grading

Grade and crown the area for positive drainage.

Utilize a diversion to direct any surface flow away from the construction exit pad.

Install pipe under the pad if needed to maintain drainage ditches along public roads.

Divert all construction exit pad runoff and drainage to a sediment trap or basin.

Stabilization

If project specified, or if wet conditions or soft soils are anticipated, place non-woven geotextile fabric on the graded foundation prior to placing the aggregate to improve stability.

Aggregate Placement

Place specified stone size to lines and grade shown on plans. Leave surface smooth and sloped for drainage.

Construction Verification

Check all components during construction and installation to ensure that specifications are being met for the components.

Common Problems

Consult with a qualified design professional if any of the following occur:

- Inadequate runoff control and sediment washes onto public road: install diversions or other runoff control measures.
- Ruts and muddy conditions develop as stone are pressed into soil; increase stone size or pad thickness, or add geotextile fabric.
- Pad too short for heavy construction traffic: consult design professional about extending pad to the necessary length.

Maintenance

Remove large chunks of mud or caked soil from construction exit pad daily to minimize sediment buildup.

Inspect stone pad and sediment disposal area weekly and after storm events or heavy use.

Reshape pad as needed for drainage and runoff control.

Top-dress with clean specified stone as needed to maintain effectiveness of the practice.

Immediately remove mud or sediment tracked or washed onto public road. Repair any broken road pavement immediately.

Remove unneeded exit pad materials from areas where permanent vegetation will be established.

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Land Grading (LG)

Practice Description

Land grading is reshaping of the ground surface to provide suitable topography for buildings, facilities, and other land uses, to control surface runoff, and to minimize soil erosion and sedimentation both during and after construction. This practice applies to sites where the existing topography must be modified to prepare for another land use, or where adapting proposed development to the existing landscape can reduce the erosion potential of the site and the cost of installing erosion and sediment control measures. In some instances, other practices such as diversions or benches can be used to reduce the length of continuous slopes and reduce erosion potential.

Typical Components of the Practice

- Scheduling
- Runoff Conveyance
- Sediment Control
- Site Preparation
- Grading
- Erosion Control
- Construction Verification
- Maintenance

Construction

Prior to start of construction, the site grading plan should be designed by a qualified design professional. The grading plan should show disturbed areas, cuts, fills, and finished elevations for all graded areas. Plans and specifications should be referred to by field personnel throughout the construction process.

Scheduling

Grading activities should be scheduled to minimize the area disturbed.

Runoff Conveyance

Runoff from disturbed areas should be controlled at the outlets with proper runoff conveyance practices, such as drop structures, riprap-lined swales, or rock outlets.

Sediment Control

Appropriate sediment control measures should be installed to minimize sediment delivery off-site until other measures can be installed to prevent erosion. The measures should be installed as specified and in the sequence shown in the design plan.

Site Preparation

Determine exact location of underground utilities.

Remove and stockpile topsoil (see Topsoiling practice).

Clear and grub areas by removing trees, vegetation, roots and other debris. Check fill to make sure it is does not contain brush, rubbish, oversized rocks or other objectionable material.

Grading

Place fill in layers and compact as specified by the grading plan

Construct slope breaks as shown on the grading plan.

Keep diversions and other water conveyance measures free of sediment during all phases of development, including grading.

Install subsurface drains (see Subsurface Drains practice) in areas where seepage interferes with the grading operations, or where required to improve slope stability or soil bearing capacity.

The final trip over slopes using equipment with tracks should be made up-and-down the slopes to establish cleat marks on the contour (“tracking”).

Erosion Control

Use temporary stabilization measures on graded areas when work is to be interrupted or delayed for 14 calendar days or longer. A shorter period may be appropriate in critical situations (for example, steep bare slopes close to the drainageway that discharges into sensitive waters).

Stabilize graded areas that have "final grading completed" within 10 working days. Use permanent seeding or other appropriate stabilization measures. If grading is completed out of season for the desired vegetation, a temporary planting may be made first and the permanent planting made later during the recommended planting period.

Construction Verification

Check all finished grades for conformance with grading plan and correct as necessary.

Common Problems

Consult with a qualified design professional if any of the following occur:

- Variations in topography on-site indicate grading plan will be ineffective or unfeasible.
- Seepage is encountered during construction. It may be necessary to install drains.
- Subgrade is soft or has high organic content and can hinder proper compaction of fill. It may be necessary to undercut and replace unsuitable subgrade soil.
- Design specifications for sediment control measures, seed variety, seeding dates or other erosion control measures or materials cannot be met. Substitutions may be required. Unapproved substitutions could result in erosion and lead to failure of sediment and erosion control measures.

Maintenance

Periodically check all graded areas and the related erosion and sediment control practices for damage by equipment and especially after heavy rainfalls for damage by runoff. Repair silt fences and other temporary sediment control measures. Clean sediment out of adjacent diversions and other structures as needed. Repair any failures that occur in surface stabilization measures such as plantings.

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Topsoiling (TSG)

Practice Description

Topsoiling is the removal of a desirable soil surface, referred to as topsoil, at a site prior to construction and using it on areas to be vegetated. Topsoiling a site usually improves the quality of the plant growth medium at the site and increases the likelihood of successful plant establishment and performance. This practice applies to sites that are to be disturbed by excavation, compaction, or filling, and to other areas where the subsoil is unsuitable for plant growth.

Typical Components of the Practice

- Scheduling
- Removal of Topsoil (Stripping)
- Stockpiling
- Temporary Erosion Control
- Spreading Topsoil
- Construction Verification
- Maintenance

Construction

Prior to start of construction, topsoiling should be planned by a qualified design professional and incorporated in the development plan. The grading plan should

show disturbed areas and the stockpile area(s). Areas to receive topsoil after grading should be included in the erosion and sediment control plan. Plans and specifications should be referred to throughout the construction process.

Scheduling

Stripping should be scheduled to precede or be done concurrently with land grading.

Stripping

Strip topsoil from areas that will be disturbed by excavation, filling or compaction by equipment. Locations and depths to remove the topsoil should be based on the design plan. In the absence of details in the plan, determine depth of stripping by taking soil cores at several locations within each area to be stripped and remove the friable and loamy surface (typically 4" to 6"). Stumps, roots, trash, noxious weeds, and soils containing toxic chemicals should be removed separately and disposed of according to locally accepted procedures.

Stockpiling

Stockpile topsoil at the site(s) identified in the design plan. In the absence of details in the plan locate the stockpile so that natural drainage is not obstructed. Avoid stockpiling on steep slopes. Side slopes of stockpiles should not exceed 2:1. Use silt fences or other barriers where necessary to complement temporary erosion control and prevent sediment movement.

Temporary Erosion Control

Protect stockpile as specified in the design plan. In the absence of details in the plan use temporary seeding as soon as possible, but not more than 14 working days after formation of the stockpile. Mulching may be substituted for temporary seeding on stockpiles that will be used within 2 months. If stockpiles will not be used within 12 months, they should be stabilized with permanent vegetation to control erosion and weed growth.

Spreading Topsoil

Immediately prior to spreading topsoil, loosen the subgrade of the site to receive the topsoil by disking or scarifying to a depth of at least 2" to ensure bonding of the topsoil and subsoil.

Uniformly spread topsoil to a lightly compacted depth of 4" or greater. For long-term growth of vegetation without irrigation, minimum soil depth (subsoil and topsoil) should be 8" to 12" over loose sand or rock fragments, and 24" of soil depth is needed over bedrock. Established grades should be maintained according to the approved plan and should not be altered by adding topsoil.

Avoid spreading when either soil or subgrade is wet or frozen.

Construction Verification

Check all components of topsoiling that occur on the construction site to ensure that specifications are being met for the components.

Common Problems

Consult with qualified design professional if any of the following occur:

- Depth of surface being stripped is significantly different than anticipated.
- Topsoil appears to contain contaminants.
- Topsoil appears too compacted during spreading; may need to loosen by disking or scarifying.

Maintenance

Inspect topsoiled areas frequently until vegetation is established.

Repair eroded or damaged areas and revegetate.

Repair sloughing on steep slopes—remove topsoil, roughen subgrade and respread topsoil. Consult with qualified design professional if drainage (wetness caused by seepage) or shallowness to bedrock (less than 24") is involved.

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Dust Control (DC)

Practice Description

Dust control includes a wide range of techniques that prevent or reduce movement of wind-borne soil particles (dust) during land disturbing activities. This practice applies to construction routes and other disturbed areas where on-site and off-site damage or hazards may occur if dust is not controlled.

Typical Components of the Practice

- Scheduling
- Erosion Control
- Other Potential Components
  - Sprinkling
  - Barriers
  - Spray-on Adhesives
  - Stone
  - Street Cleaning
- Installation Verification
- Maintenance

Construction

Dust control requirements should be designed by a qualified design professional and plans, and specifications should be made available to field personnel prior to start of construction. Whenever possible, leave undisturbed vegetated buffer areas between graded areas.

Scheduling

Schedule construction operations so that the smallest area is disturbed at any one time.

Erosion Control

Install surface stabilization measures (vegetative cover or mulch) immediately after completing the land grading.

Vegetative Cover

See Temporary or Permanent Seeding practice for guidance. Vegetation provides the most practical method of dust control for areas not subject to traffic.

Mulching

See Mulching practice for guidance on applying mulch and tackifiers or binders. Mulching is not recommended for areas with heavy traffic.

Other Potential Components

Sprinkling

Sprinkle the site with water until the surface is moist. This practice is effective for dust control on haul roads or other traffic routes, but constant repetition is required for effective control.

Barriers

Install board fences perpendicular to the prevailing winds at intervals (distance) of 15 times the barrier height.

Calcium Chloride

Apply with a mechanical spreader at a rate that keeps the surface moist.

Consult with a qualified design professional to determine if a permit is required.

Spray-on Adhesives

Spray adhesives according to the design plan.

Consult with a qualified design professional if spray-on adhesives are specified. A permit may be needed.

In the absence of a detailed plan, use manufacturers' recommendations. Table DC-1 presents examples of spray-on adhesives that have been used successfully for dust control.

Table DC-1 Application Rates for Spray-on Adhesives Used in Dust Control

Adhesive	**Water Dilution** (adhesive : water)	**Type of Nozzle**	**Application Rate** (gallons/acre)
Anionic Asphalt Emulsion	7:1	Coarse	1200
Latex Emulsion	12.5:1	Fine	235
Resin in Water	4:1	Fine	300
Acrylic Emulsion (Non-traffic)	7:1	Coarse	450
Non-Acrylic Emulsion (Traffic)	3.5:1	Coarse	350

Source: Virginia Erosion and Sediment Control Handbook, 1993

Consult with a qualified design professional if spray-on adhesives are specified. A permit may be needed.

Stone

Stone should be placed to the width and thickness specified in the design.

Street Cleaning

Use a street sweeper to remove the source materials.

Construction Verification

Check installation of product(s) to verify use of proper product and quantity.

Common Problems

Drought conditions result in dry soils and increase in dust problems—use greater precautions during these periods.

Maintenance

Check construction site during vehicular traffic or windy conditions to see if measures are working adequately. Maintain dust control measures continuously throughout dry weather periods, until all disturbed areas have been stabilized.

Erosion Control Blanket (ECB)

Photo courtesy of Sunshine Supplies, Inc.

Practice Description

Erosion Control Blanket is a practice using a rolled erosion control product (RECP) composed of processed natural or polymer fibers (straw, jute, wood paper or cotton, plastic, nylon) mechanically, structurally, or chemically bound together to form a continuous matrix used to provide erosion control and most often facilitates vegetation establishment. This practice is best utilized on slopes and channels where the erosion hazard is high, and plant growth is likely to be too slow to provide adequate protective cover. Erosion control blankets are typically used as an alternative to mulching but can also be used to provide structural erosion protection.

Typical Components of the Practice

- Site Preparation
- Erosion Control Planting
- Blanket Installation
- Construction Verification
- Maintenance

Erosion Control Blanket Information

Prior to the start of construction, the application of erosion control blankets should be designed by a qualified design professional and plans and specifications should be available to field personnel.

Numerous products designed to control erosion are available. Product installation procedures for manufactured erosion control blanket products should always be available from the manufacturer. Table ECB-1 lists some of the more common products available.

Table ECB-1 Types of Erosion Control Blankets

Type of Erosion Control	Main Use	Comments
Netting	Synthetic or natural fiber mesh installed over disturbed area to hold organic mulch and/or seed in place.	Provides minimal structural erosion resistance. Mulch applied using standard procedures.
Biodegradable Erosion Control Blanket	Natural fiber blanket held together by netting to provide temporary erosion protection on slopes up to 1:1; and channels with permissible shear stress up to 4 lbs./ft.	Provides 1- to 5-year protection from erosion. Metal staples used as anchors.
Permanent Erosion Control Blanket	Synthetic blanket material which provides permanent erosion control on slopes up to 1:1; channels with increased water flow velocities and increased shear stress.	Provides minimal protection from wave action around ponds and lakes. Permanent erosion control blankets extend the limits of vegetation. Metal staples used as anchors.
Turf Reinforcement Mat	3-dimensional permanent synthetic mat that provides a matrix to greatly reinforce the root system of the desired vegetation for permanent erosion protection in high flow channels and on critical slopes.	Provides a substantial increase in erosion resistance. May provide erosion protection equivalent to stone or concrete liners.

The field inspector should verify that installation is in accordance with the plans and specifications.

Site Preparation

Grade the site in accordance with the approved design to a smooth and uniform surface, free of debris.

Add and incorporate topsoil where needed.

Make sure seedbed is firm yet friable.

Erosion Control Planting

Spread and incorporate lime and fertilizer as described in the design plan.

Spread seed and incorporate as described in the planting specifications.

Blanket Installation

Erosion control blanket products should be installed in accordance with the manufacturer's recommendations and specifications, including check slots and stapling materials.

Anchor product so that a continuous, firm contact (no tenting) with the soil surface/seed bed is maintained. This is best accomplished on slopes by working from the bottom to the top.

Construction Verification

Check finished grade, dimensions and staple spacing of erosion control blankets. Check materials for compliance with specifications.

Common Problems

Consult with a qualified design professional if any of the following occur:

- Movement of the blanket or erosion under the blanket is observed.
- Poor contact between the soil and the erosion control blanket results in surface water flowing under rather than over the blanket, causing erosion; retrench or re-anchor to direct water over blanket.
- Blanket inadequately or improperly stapled results in tenting, blanket movement or displacement; reinstall and ensure blanket is properly anchored.
- Unstable slope results in blanket or slope failure; determine cause of slope failure, stabilize slope and reinstall blanket.
- Variations in topography on site indicate erosion control blanket will not function as intended; changes in plan may be needed, or a blanket with a shorter or longer life may be needed.
- Design specifications for seed variety, seeding dates or erosion control materials cannot be met; substitution may be required. Unapproved substitutions could result in failure to establish vegetation or breach of contract.

Maintenance

Inspect after storm events until vegetation is established for erosion or undermining beneath the blankets. If any area shows erosion, pull back that portion of the blanket, add tamped soil and reseed; then resecure the blankets.

If blankets should become dislocated or damaged, repair or replace and resecure immediately.

Groundskeeping (GK)

Practice Description

Groundskeeping or "good housekeeping" describes the various activities and measures, in addition to the specific practices used for erosion and sediment control that are essential during construction for the protection of environmental quality. Groundskeeping is applicable at all construction sites.

Typical Components of the Practice

Prior to the start of construction, Groundskeeping activities and measures should be identified by a qualified design professional and included in the construction and pollution prevention plan. The essential components of Groundskeeping should be provided to the prime contractor for a project. Groundskeeping activities and measures essential at construction sites vary based on the complexity of the site and the project. Groundskeeping typically includes the following activities and measures:

- Inspections During Construction/Installation of Erosion and Sediment Control and Stormwater Measures (BMPS)
- Spill Prevention and Material Management
- Spill Controls

- Other Potential Activities and Measures (examples: removal of contaminated soils, management of hazardous products, protection of air quality, etc.)

Details about Components

Inspections of BMPs

Inspections should be made regularly and timely to ensure that erosion and sediment control and stormwater management practices are performing as planned and whether or not maintenance is needed. In addition, inspections and reports should meet local and state requirements.

Spill Prevention and Material Management

Alabama Department Environmental Management (ADEM) regulations require that an operator/owner implement a Spill Prevention Control and Counter Measures (SPCC) Plan for all temporary and permanent onsite fuel or chemical storage tanks or facilities to address the safe storage, handling and cleanup of petroleum products and other chemicals.

All vehicles kept on the site need to be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage.

If petroleum products are stored on site, a secondary containment facility will be required if the cumulative storage capacity of all tanks, greater than 55 gallons, at the site exceeds 1,320 gallons. The secondary containment facility must be designed by a qualified design professional.

Petroleum products should be stored in labeled tightly sealed containers.

Any asphalt substances used on-site should be applied according to the manufacturer's recommendations.

Locate petroleum-based activities as far away as possible from waters of the State and stormwater inlets or conveyances so that stormwater coming into contact with these activities cannot reach water of the State. No fueling, servicing, maintenance, or repair of equipment or machinery should be done within 50 feet of a stream, or within 100 feet of a stream classified for public water supply (PWS) or Outstanding Alabama Water (OAW), or designated as an Outstanding National Resource Water (ONRW) or a sinkhole.

Only designated entrances should be used for construction access to the site. Mud tracked from the site onto streets and roads should be cleaned on a daily basis if needed. Only use "dry" methods like sweeping to remove mud from streets. DO NOT use water to flush mud from the street.

Concrete trucks should be allowed to wash only in locations where discharge is appropriately contained and meets any applicable regulatory requirements. All

the concrete truck washout or waste discharge on-site must be contained to be properly removed, recycled, or disposed of later. Containment can be in the form of metal, vinyl, plastic, or poly lined containers or pits, filter bags, or manufactured products. It is best to use proper signage at the concrete washout location. It is not permissible to discharge concrete wash directly to streams or storm drains. Concrete wash can contain sediment, as well as, alkalinity and chemical additives that could be harmful to fish, stream bottom macroinvertebrates and wildlife.

No fuels, oils, lubricants, solvents, or other hazardous materials can be disposed of on the site. All hazardous material must be properly disposed of in accordance with state law.

Waste containers should be located as far away as possible from waters of the State and stormwater inlets or conveyances so that stormwater coming into contact with these activities cannot reach water of the State. The General Contractor is responsible for disposing of all solid waste from the site in accordance with State law. Dumpsters or other collection facilities must be provided as needed. Solid waste may not be buried on the site.

Portable toilets should be located so that accidental spills will not discharge into a storm sewer or concentrated flow area.

Water for pressure testing sanitary sewers, flushing water lines, etc., may be discharged only in approved areas and to prevent discharging to surface waters. Discharge of hydrostatic test water may require additional permitting, particularly if chlorinated public water is used.

Spill Controls

The operator/owner is expected to maintain on-site or have readily available sufficient oil & grease absorbing material and flotation booms to contain and clean-up fuel or chemical spills and leaks.

Equipment and materials include, but are not limited to brooms, dust pans, mops, rags, gloves, goggles, absorbent clay, sand, sawdust, and plastic and metal trash containers specifically for this purpose.

Spills of toxic or hazardous material must be reported immediately. The operator/owner is required to immediately notify ADEM after becoming aware of a significant spill/leak or visible oil sheen in the vicinity of the construction activity. In the event of a spill with the potential to impact groundwater or other waters of the State, the operator/owner is expected to immediately call the National Response Center (NRC) at 1-800-424-8802 and the Alabama Emergency Management Agency (AEMA) at 1-800-843-0699. The caller should be prepared to report the name, address and telephone number of person reporting spill, the exact location of the spill, the company name and location, the material spilled, the estimated quantity, the source of spill, the cause of the spill, the nearest downstream water with the potential to receive the spill, and the actions taken for containment and cleanup.

All spills need to be cleaned up immediately after discovery and properly containerized for proper disposal. Refer to Material Safety Data Sheets for safe handling procedures. Burial is not acceptable.

The spill area must be kept well ventilated and personnel need to wear appropriate protective clothing to prevent injury from contact with a hazardous substance.

The spill prevention plan needs to be adjusted to include measures to prevent any spill from being repeated, and the plan needs to show how to clean up the spill if another one does occur.

Removal of Contaminated Soils and Underground Storage Tanks

Site assessment and removal of contaminated soils and underground storage tanks should be done following a site assessment based on procedures provided by the Alabama Department of Environmental Management.

Management of Hazardous Products

Products must be kept in original containers unless they are not resealable. If a product is transferred to a new container, it must be properly marked and labeled.

Original labels and Material Safety Data Sheets should be retained until the related product is no longer on the site.

If surplus product must be disposed of, disposal must be done in accordance with state (Alabama Department of Environmental Management regulations).

Protection of Air Quality

Smoke

Burning on the site may require a permit from the Alabama Forestry Commission. County and city ordinances may also apply. Starting disposal fires with diesel fuel, petroleum products, or old tires is not a recommended practice. Burn pits with fans to generate hot disposal fires decreases the fire time and minimizes smoke. Burning may be prohibited by State “burn bans” to reduce potential for ground-level ozone.

Dust

Dust should be controlled if it will create a problem either on or off of the site. If measures are not included in the site design plan see the practice Dust Control for potential measures to use to eliminate or minimize dust.

Other Good Groundskeeping Practices

The following measures may be needed:

- All materials stored on-site should be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
- Products should be kept tightly sealed in their original containers with the original manufacturer's label.
- Whenever possible, all of a product should be used up before disposing of the container.
- Manufacturer's recommendations for proper use and disposal must be followed. See Material Safety Data Sheets for product of concern.

The site superintendent or a designated employee should inspect daily to ensure proper usage, storage, and disposal of material.

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Mulching (MU)

Practice Description

Mulching is the application of plant residues such as straw or other suitable materials to the soil surface to minimize erosion. Mulching is used to support permanent and temporary seeding and, also, to provide short-term cover without seeding.

Typical Components of the Practice

- Site Preparation
- Application of Material
- Installation Verification
- Maintenance

Installation

Mulching should be designed by a qualified design professional and plans and specifications should be made available to field personnel prior to start of construction.

Site Preparation

Divert runoff water from areas above the site that will be mulched.

Remove stumps, roots and other debris from the construction area.

Grade area as needed to permit the use of equipment for seeding, mulching and maintenance. Shape area so that it is relatively smooth.

If the area will be seeded, follow seeding specifications in the design plan and apply mulch immediately after seeding.

Application of Material

Spread straw mulch, preferably cereal grain, uniformly over the area with a power blower, hydroseeder or by hand. Mulch should be uniformly spread and not clumped in piles. In a seeded area, about 25% of the ground surface should be visible after mulching. It is important when mulching a seeded area that an excessive quantity of straw is not applied – too much mulch will retard or reduce the future stand. When mulch is used for erosion control without seeding, 100% of the soil surface should be covered.

Hydraulic Erosion Control Products (HECPs) as defined by the Erosion Control Technology Council (ECTC) are also used for mulch and should be applied with the appropriate equipment and at the recommended or specified rates.

Apply mulches at the rates shown in the plan or in Table MU-1 if there is not a plan.

Anchor straw or wood cellulose mulch by one of the following methods:

- Crimp with a mulch anchoring tool, as near on the contour as practical, to punch the straw into the soil.
- Tack with a liquid tackifier designed to hold mulch in place. Use suitable spray equipment and follow manufacturer's recommendations.
- In more erosive areas, cover with netting, using a degradable natural or synthetic mesh. The netting should be anchored according to manufacturer's specifications (see Erosion Control Blanket practice).
- On steep slopes and other areas needing a higher degree of protection, use heavy natural nets without additional mulch, synthetic netting with additional mulch or erosion control mats/blankets. These areas include grassed waterways, swales and diversion channels.
- Install netting and mats/blankets according to manufacturer's specifications making sure materials are properly anchored (see Erosion Control Blanket). Verify wildlife friendly netting when specified.

Table MU-1 Mulching Materials and Application Rates

Material	Rate Per Acre and (Per 1000 ft.^{2})	Notes
Straw (with Seed)	1 ½ - 2 tons (70 lbs - 90 lbs)	Spread by hand or machine; anchor when subject to blowing.
Straw Alone (no seed)	2 ½ - 3 tons (115 lbs - 160 lbs)	Spread by hand or machine; anchor when subject to blowing.
Wood Chips	5-6 tons (225 lbs - 270 lbs)	Treat with 12 lbs. nitrogen/ton.
Bark	35 cubic yards (0.8 cubic yard)	Can apply with mulch blower.
Pine Straw	1-2 tons (45 lbs - 90 lbs)	Spread by hand or machine; will not blow like straw.
Peanut Hulls	10-20 tons (450 lbs - 900 lbs)	Will wash off slopes. Treat with 12 lbs. nitrogen/ton.
HECPs	0.75 – 2.25 tons (35 lbs – 103 lbs)	Refer to ECTC or Manufacturer's Specifications.

Installation Verification

Check materials and installation for compliance with specifications.

Common Problems

Consult with qualified design professional if either of the following occurs:

- Variations in topography on site indicate the mulching materials will not function as intended; changes in plan may be needed.
- Design specifications for mulching materials or seeding requirements cannot be met; substitution may be required. Unapproved substitutions could result in erosion or seeding failure.

Problems that require remedial actions:

- Erosion, washout, and poor plant establishment; repair eroded surface, reseed, re-mulch and anchor mulch.
- Mulch is lost to wind or stormwater runoff; reapply mulch and anchor appropriately by crimping, netting, or tacking.

Maintenance

Inspect all mulched areas periodically and after rainstorms for erosion and damage to the mulch. Repair promptly and restore to original condition. Continue inspections until vegetation is well established. Keep mower height high if netting is used to prevent netting from wrapping around mower blades or shaft.

Permanent Seeding (PS)

Practice Description

Permanent seeding is the establishment of perennial vegetation from seed. This practice is used when vegetation is desired and appropriate to permanently stabilize the soil.

Typical Components of the Practice

- Scheduling
- Seedbed Preparation
- Applying Soil Amendments (lime and fertilizer)
- Planting
- Mulching or Installation of Erosion Control Blanket
- Installation Verification
- Maintenance

Installation

Prior to start of construction, plant materials, seeding rates and planting dates should be specified by a qualified design professional. Plans and specifications should be referred to by field personnel throughout the installation process.

Permanent seeding should be made during the specified planting period whenever possible. When sites are only available for planting outside of the recommended planting period, either an out-of-season permanent seeding, a temporary seeding, mulching or chemical stabilization should be applied. If lime and fertilizer application rates are not specified, take soil samples during final grading from the top 6" in each area to be seeded. Submit samples to a soil testing laboratory for lime and fertilizer recommendations.

Scheduling

The schedule for work at the site should consider the recommended planting period and whenever practical the site work should accommodate seeding during the recommended planting period.

Seedbed Preparation

Grade and loosen the soil to a smooth firm surface to enhance rooting of seedlings and reduce rill erosion. Break up large clods and loosen compacted, hard or crusted soil surfaces with a disk, ripper, chisel, harrow or other tillage equipment. Avoid preparing the seedbed under excessively wet conditions to minimize compaction. Operate the equipment on the contour.

For either broadcast seeding or drill seeding, the tillage, as a minimum, should adequately loosen the soil to a depth of at least 6", alleviate compaction, and smooth and firm the soil for the proper placement of seed.

For no-till drilling, the soil surface should not be loosened unless the site has surface compaction and if compaction exists, special care with soil loosening will be needed to retain the desired residue on the soil surface.

Incorporate lime and fertilizer to a depth of at least 6" with a disk or rotary tiller on slopes of up to 3:1. On steeper slopes, lime and fertilizer may be applied to the surface without incorporation. Lime and fertilizer may be applied through hydroseeding equipment; however, fertilizer should not be added to the seed mixture during hydroseeding. Liming materials such as liquid lime may be added with the seed mixture.

Liming

Follow the design plan or soil test recommendation. If a plan or soil test is not available, use 2 tons/acre of ground agricultural lime on clayey soils (approximately 90 lbs/acre) and 1 ton/acre on sandy soils (approximately 45 lbs/acre). Exception to situation without a design or a soil test: If the cover is tall fescue and clover, use 2 tons of agricultural lime (approximately 135 lbs/1000 ft^2) on both clayey and sandy soils.

Spread the specified amount of lime and incorporate into the top 6" of soil after applying fertilizer.

Fertilizing

Apply a complete fertilizer at rates specified in the design plan or as recommended by soil tests. In the absence of soil tests, use the following as a guide:

Grass Alone

Use 8-24-24 or equivalent – apply 400 lbs/acre (approximately 9 lbs/1000 ft^2) starting. When vegetation has emerged to a stand and is growing, 30 lbs/acre (approximately 0.8 lbs/10000 ft^2) of additional nitrogen fertilizer should be applied.

Grass-Legume Mixture

Use 5-10-10 or equivalent – apply 800 - 1200 lbs/acre (approximately 18 – 27 lbs/1000 ft^2).

Legume Alone

Use 0-20-20 or equivalent – apply 400 - 600 lbs/acre (approximately 9 – 14 lbs/1000 ft^2) at planting.

Note: Fertilizer can be blended to meet exact fertilizer recommendations. Take soil test recommendations to local fertilizer dealer for bulk fertilizer blends. This may be more economical than bagged fertilizer.

Planting

Plant the species specified in the plan at the rate and depth specified. In the absence of plans and specifications, plant species and seeding rates may be selected by qualified persons using Figure PS-1 and Table PS-1.

Apply seed uniformly using a cyclone seeder, drop-type spreader, drill, cultipacker seeder or hydroseeder.

When using a drill seeder, plant grasses and legumes ¼" to ½" deep. Calibrate equipment in the field.

When planting by methods other than a drill seeder, cover seed by raking, or dragging a chain, brush, or mat. Then firm the soil lightly with a roller. Seed can also be covered with hydro-mulched wood fiber and tackifier. Legumes require inoculation with nitrogen-fixing bacteria to ensure good growth. Purchase inoculum specific for the seed and mix with seed prior to planting.

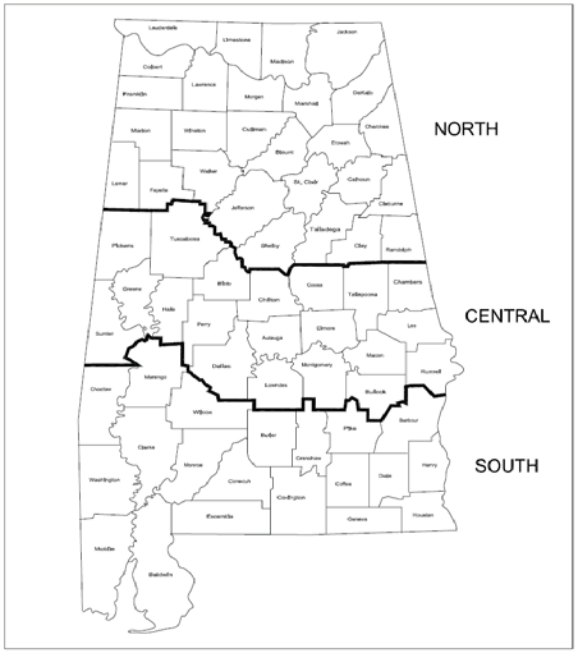

Figure PS-1 Geographical Areas for Species Adaptation

Note: Site conditions related to soils and aspect in counties adjacent to or close to county boundaries may justify adjustments in adaptable areas by qualified design professionals.

Mulching

Mulching is extremely important for successful seeding. Whether the mulching material is straw or a hydraulic erosion control product (HECP, also referred to as hydromulch), the material needs to be applied properly. Uniformly spread organic mulches by hand or with a mulch blower at a rate which provides about 75% ground cover. Spread HECPs utilizing appropriate equipment and at rates as specified in the plan or by the manufacturer. Caution, an over-application of wheat straw will reduce stand success – do not over-apply wheat straw when mulching a seeding! (See Mulching practice for more details).

Table PS-1 Commonly used Plants for Permanent Cover with Seeding Rates and Dates[1]

Species	Seeding Rates/Ac PLS[2]	North	Central	South
		Seeding Dates		
Bahiagrass, Pensacola	40 lbs	--	Mar 1-Jul y 1	Feb 1-Nov 1
Bermudagrass, Common	10 lbs	Apr 1-July 1	Mar 15-July 15	Mar 1-July 15
Bahiagrass, Pensacola Bermudagrass, Common	30 lbs 5 lbs	--	Mar 1-July 1	Mar 1-July 15
Bermudagrass, Hybrid (Lawn Types)	Solid Sod	Anytime	Anytime	Anytime
Bermudagrass, Hybrid (Lawn Types)	Sprigs 1/sq ft	Mar 1-Aug 1	Mar 1-Aug 1	Feb 15 - Sep 1
Fescue, Tall	40-50 lbs	Sep 1-Nov 1	Sep 1-Nov 1	--
Sericea	40-60 lbs	Mar 15-July 15	Mar 1-July 15	Feb 15 -July 15
Sericea & Common Bermudagrass	40 lbs 10 lbs	Mar 15 -July 15	Mar 1-July 15	Feb 15-July 15
Switchgrass, Alamo	4 lbs	Apr 1-Jun 15	Mar 15-Jun 15	Mar 15-June 15

1 DO NOT USE Seeding Rates as part of a mixture unless shown as a mixture in this table.
2 PLS means Pure Live Seed and is used to adjust seeding rates. For example, to plant 10 lbs PLS of a species with germination of 80% and purity of 90%, PLS= 0.8 X 0.9 = 72%. 10lbs PLS = 10/0.72 = 13.9 lbs of the species to be planted.

Hydroseeding

Surface roughening is particularly important when hydroseeding, as roughened slope will provide some natural coverage for lime, fertilizer, and seed. The surface should not be compacted or smooth. Smooth seedbed preparation is not necessary for hydroseeding operations; large clods, stones, and irregularities provide cavities in which seeds can lodge.

Mix seed, inoculant if required, and a seed carrier with water and apply as a slurry uniformly over the area to be treated. The seed carrier should be a cellulose fiber, natural wood fiber or cane fiber mulch material which is dyed an appropriate color to facilitate uniform application of seed. If adding a legume, and it does not have an inoculant included in the coating, include the correct legume inoculant at 4 times the recommended rate when adding seed to the hydroseeder slurry. The mixture should be applied within one hour after mixing to reduce damage to seed.

Fertilizer should not be mixed with the seed-inoculant mixture because fertilizer salts may damage seed and reduce germination and seedling vigor.

Fertilizer may be applied with a hydroseeder as a separate operation after seedlings are established.

Agricultural lime is usually applied as a separate operation and spread in dry form. It is not normally applied with a hydraulic seeder because it is abrasive and, also, may clog the system. On the other hand, liquid lime is applied with a hydraulic seeder but because of cost is used primarily to provide quick action for benefit of plants during their seedling stage with the bulk of liming needs to be provided by agricultural lime. Dry lime may be applied with the fertilizer mixture.

Installation Verification

Check materials and installation for compliance with specifications during installation of products.

Common Problems

Consult with a qualified design professional if the following occurs:

- Design specifications for seed variety, seeding dates or mulching cannot be met; substitutions may be required. Unapproved substitutions could lead to failure.
- Seeding at the wrong time of the year results in an inadequate stand. Reseed according to specifications of a qualified design professional (see recommendations under Maintenance)
- Inadequate mulching results in an inadequate stand, bare spots, or eroded areas - prepare seedbed, reseed, cover seed evenly and tack or tie down mulch, especially on slopes, ridges and in channels (see recommendations under Maintenance).

Maintenance

Generally, a stand of vegetation cannot be determined to be fully established until vegetative cover has been maintained for 1 year from planting.

Reseeding

Inspect seedings monthly for stand survival and vigor. Also, inspect the site for erosion.

If stand is inadequate identify the cause of failure (choice of plant materials, lime and fertilizer quantities, poor seedbed preparation or weather) and take corrective action. If vegetation fails to grow, have the soil tested to determine whether pH is in the correct range or nutrient deficiency is a problem.

Stand conditions, particularly the coverage, will determine the extent of remedial actions such as seedbed preparation and reseeding. A qualified design professional should be consulted to advise on remedial actions. Consider drill seeding where possible.

Eroded areas should be addressed appropriately by filling and/or smoothing, and reapplication of lime, fertilizer, seed, and mulch.

Fertilizing

Satisfactory establishment may require fertilizing the stand in the second growing season. Follow soil test recommendations or the specifications provided to establish and maintain the planting. After the second year, fertilizing is often needed annually or periodically to maintain a healthy stand and cover sufficient for erosion control.

Mowing

Mow vegetation on structural practices such as embankments and grass-lined channels to prevent woody plants from invading.

Other areas should be mowed to compliment the use of the site.

Certain species can be weakened by mowing regimes that significantly reduce their food reserves stored for the next growing season: fescue should not be mowed close during the summer; sericea should not be mowed close in late summer.

Bermudagrass and bahiagrass are tolerant of most mowing regimes and can be mowed often and close, if so desired, during their growing season.

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Preservation of Vegetation (PV)

Practice Description

Preservation of vegetation is the avoidance of an area during land disturbing and construction activity to prevent mechanical and other injury to desirable plants in the planned landscape. The practice provides erosion and sediment control and is applicable where vegetative cover is desired and the existing plant community is compatible with the planned landscape.

Typical Components of the Practice

- Mark Plant Area for Retention
- Plant Protection
- Treating Damaged Plants
- Practice Verification
- Maintenance

Installation

Preservation requirements should be designed by a qualified design professional and plans should be made available to field personnel prior to start of construction

Mark Plant Area for Retention

Clearly indicate the areas to be avoided by marking with tape (flagging), barricade netting or other appropriate means.

Plant Protection

Protect plants that are identified for preservation from compaction by equipment, cutting and filling operations, trenching, and tunneling.

Treating Damaged Plants

Treat damaged trees and shrubs as soon after damage as practical. Treatment may include shaping a wound for proper healing, pruning of jagged roots, pruning of damaged limbs and fertilization to enhance growth.

Practice Verification

Check to determine that specifications are met as the areas are identified for retention, as the plants are protected during construction and that damaged plants are treated or replaced.

Common Problems

Consult with a qualified design professional if any of the following occur:

- Soil compaction appears to be retarding plant growth or affecting plant health.
- Damage to plants appears to be severe and life threatening.
- Plants appear of poor quality and are undesirable for retention.

Problems during construction that require remedial actions:

- Erosion – eroded areas should be vegetated to grass or a suitable ground cover.
- Severely damaged trees, shrubs or vines should be replaced.

Maintenance

Enhance and maintain plant growth and health according to the maintenance plan. This may involve applying fertilizer, spreading mulch and pruning trees and shrubs.

Replace dead plants as needed to maintain desired landscape cover. Additional information about plantings is found in the following practices: Permanent Seeding: Shrub, Vine and Groundcover Planting: and Tree Planting on Disturbed Areas.

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Sodding (SOD)

Practice Description

Sodding is transplanting harvested sod to provide immediate ground cover. Sodding is well suited for stabilizing erodible areas such as grass-lined channels, slopes around storm drain inlets and outlets, diversions, swales, and slopes and filter strips that cannot be established by seed or that need immediate cover.

Typical Components of the Practice

- Plant Selection
- Surface Preparation
- Application of Soil Amendments (lime and fertilizer)
- Installing the Sod
- Irrigation
- Practice Verification
- Maintenance

Installation

Prior to start of installation, Typical Components of the Practice should be specified by a qualified design professional. Plans and specifications should be referred to by field personnel throughout the installation process.

Failure to remove compaction and to address pH and soil fertility deficiencies will likely cause a sodded stand to perform poorly or fail.

Plant Selection

Use plants specified in plan. If not specified, select a variety using Figure SOD-1 and Tables SOD-1 and SOD-2.

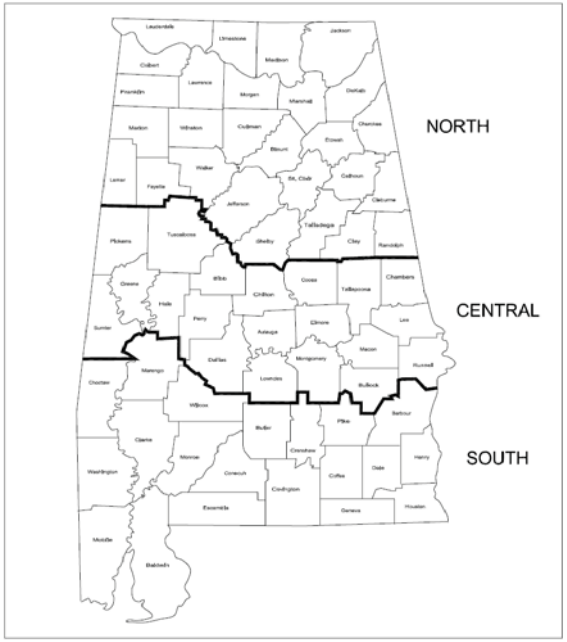

Figure SOD-1 Geographical Areas for Species Adaptation

Note: Site conditions related to soils and aspect in counties adjacent to or close to county boundaries may justify adjustments in adaptable areas by qualified design professionals.

Table SOD-1 Grasses Adapted for Sodding in Alabama

Warm Season Species	Variety	Area Adapted
Bermudagrass	Tifway, TifSport, Celebration, TifGrand, Common	North, Central, South
Bahiagrass	Pensacola	Central, South
Centipede	Common, TifBlair	Central, South
St. Augustine	Common, and a few commercial varieties	South
Zoysia	Any selection available in Alabama, Zenith is seeded	Central, South
Cool Season Species		
Tall Fescue	Kentucky 31, Rebel (turf type)	North

Table SOD-2 Adaptation and Maintenance of Grasses Used for Sodding

Species	Tolerance Ratings					Maintenance	
	Shade	Heat	Cold	Drought	Wear	Mowing Height	Mowing Frequency
Bermudagrass	No	Good	Poor	Excel.	Excel.	1"	High
Bahiagrass	Fair	Good	Poor	Excel.	Good	2-3"	High
Centipede	Fair	Good	Poor	Good	Poor	1 ½"	Low
Tall Fescue	Good	Fair	Good	Good	Good	3"	High
St. Augustine	Good	Good	Poor	Poor	Poor	2-3"	Medium
Zoysia	Fair	Good	Fair	Excel.	Good	1"	High

Surface Preparation

Clear the area of clods, rocks, etc. and smooth the area. Grade and loosen the soil to a smooth firm surface to enhance rooting. Break up large clods and loosen compacted, hard or crusted soil surfaces with a disk, ripper, chisel, harrow or other tillage equipment. Avoid preparing the seedbed under excessively wet conditions. Operate the equipment on the contour.

Where topsoiling is specified, additional steps will be done based on the design plan or, if not available, according to the Topsoiling practice.

Application of Soil Amendments

Apply fertilizer and lime according to the plan or by soil test recommendations. In the absence of a plan or soil test recommendations apply agricultural limestone at the rate of 2 tons per acre (90 lbs. per 1000 sq. ft.) and 10-10-10 fertilizer at the rate of 1000 lbs. per acre (25 lbs per 1000 ft.^{2}) Apply ground agricultural limestone unless a soil test shows a pH of 6.0 or greater. Incorporate amendments to depth of 4" to 6" with a disk or rotary tiller.

Rake or harrow to achieve a smooth, final grade on which to lay the sod. Surface should be loose, and free of plants, trash and other debris.

During high temperatures, moisten the soil immediately prior to laying sod. This cools the soil and reduces root burning and dieback.

Installing the Sod

Lay the first row of sod in a straight line with subsequent rows placed parallel to and butting tightly against each other. Stagger joints to create a brick-like pattern and promote more uniform growth and strength. Ensure that sod is not stretched or overlapped and that all joints are butted tight to prevent spaces which would cause drying of the roots (See Figure SOD-2).

On slopes 3:1 or steeper, or wherever concentrated flow may be a problem, lay sod with staggered joints and secure by stapling or pegging. Install sod with the length perpendicular to the water flow (on the contour). See Figure SOD-3. Staple firmly at the corners and middle of each strip. Jute or synthetic netting may be pegged over the sod for further protection against washout during establishment. When netting is used consider wildlife friendly netting.

Irrigation

Immediately after laying the sod, roll or tamp it to provide firm contact between roots and soil, then irrigate sod deeply so that the underside of the sod pad and the soil 6" below the sod is thoroughly wet.

Until a good root system develops, water sod during dry periods as often as necessary to maintain moist soil to a depth of at least 4".

Practice Verification

Check materials and installation for compliance with specifications.

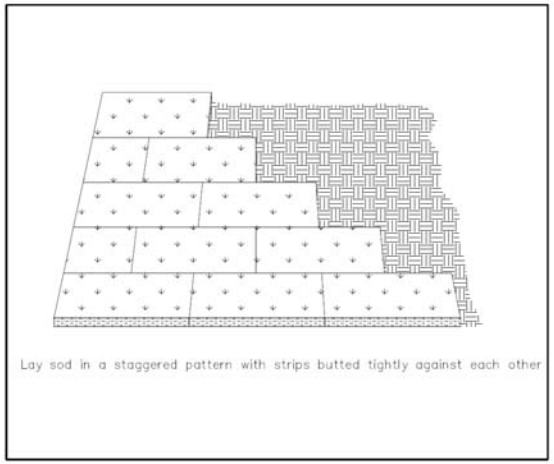

Figure SOD-2 Typical Installation of Grass Sod

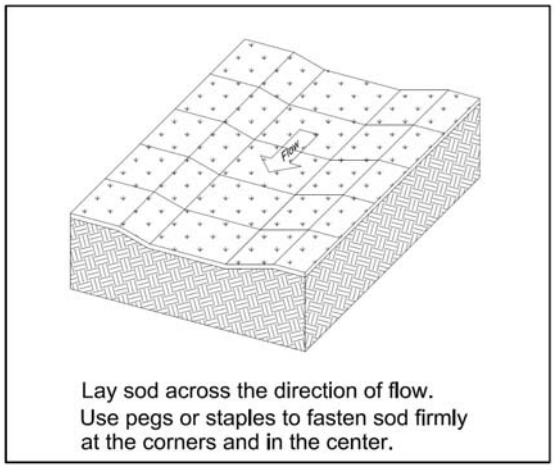

Figure SOD-3 Installation of Sod in Waterways

Common Problems

Consult with a qualified design professional if any of the following occur:

- Variations in topography on site indicate the sodding materials will not function as intended; changes in plan may be needed.
- Design specifications for sod variety cannot be met or irrigation is not possible; substitution or seeding may be required. Unapproved substitutions could result in erosion or sodding failure.
- Sod laid on poorly prepared soil or unsuitable surface and grass dies because it is unable to develop a root system with the soil: remove dead sod, prepare surface properly and resod.
- Sod not adequately irrigated after installation; may cause root dieback or grass does not root rapidly and is subject to drying out: irrigate sod and underlying soil to a depth of 4" and keep moist until roots are established.
- Sod not anchored properly may be loosened by runoff: use guidance under Site Preparation to repair the damaged areas, lay healthy sod, anchor properly and irrigate as planned.
- Slow growth due to lack of nitrogen: apply additional fertilizer.

Maintenance

Keep sod moist until it is fully rooted.

Mow to a height of 2" to 3" after sod is well-rooted, frequently in 2 to 3 weeks. Do not remove more than ⅓ of the leaf blade in any mowing.

Permanent, fine turf areas require yearly fertilization. Fertilize warm-season grass in late spring to early summer; fertilize cool-season grass in early fall and late winter. Fertilize at rates recommended by a soil test.

Temporary Seeding (TS)

Practice Description

Temporary seeding is the establishment of fast-growing annual vegetation from seed. Temporary vegetation provides economical erosion control for up to a year and reduces the amount of sediment moving off the site.

This practice applies where short-lived vegetation can be established before final grading or in a season not suitable for planting the desired permanent species. It helps prevent costly maintenance operations on other practices such as sediment basins and sediment barriers. In addition, it reduces problems of mud and dust production from bare soil surfaces during construction. Temporary or permanent seeding is necessary to protect earthen structures such as dikes, diversions, grass-lined channels and the banks and dams of sediment basins.

Typical Components of the Practice

- Scheduling
- Seedbed Preparation
- Applying Soil Amendments (lime and fertilizer)
- Planting
- Mulching or Installation of Erosion Control Blanket
- Installation Verification
- Maintenance

Installation

Prior to start of installation, plant materials, seeding rates and planting dates should be specified by a qualified design professional. Plans and specifications should be referred to by field personnel throughout the installation process.

Plantings should be made during the specified planting period if possible. When sites become available to plant outside of the recommended planting period, either a temporary seeding, mulching or chemical stabilization should be applied. If lime and fertilizer application rates are not specified, take soil samples during final grading from the top 6" in each area to be seeded. Submit samples to a soil testing laboratory for lime and fertilizer recommendations.

Seedbed Preparation

Grade and loosen soil to a smooth firm surface to enhance rooting of seedlings and reduce rill erosion. If compaction exists, loosen the surface to 6" to 8". Break up large clods and loosen compacted, hard or crusted soil surfaces with a disk, ripper, chisel, harrow or other tillage equipment. Avoid preparing the seedbed under excessively wet conditions to minimize soil compaction. Operate the equipment on the contour.

For either broadcast seeding or drill seeding, loosen the soil to a depth of at least 6".

For no-till drilling, the soil surface does not need to be loosened unless the site has surface compaction. If shallow compaction exists, the area should be chiseled across the slope at least 6". If compaction exists between 6" and 12" the area should be chiseled or subsoiled at least 12".

Lime and fertilizer should be incorporated during seedbed preparation.

Applying Soil Amendments

Liming

Follow the design plan or soil test recommendation. If a plan or soil test is not available, use 2 tons/acre of ground agricultural lime on clayey soils (approximately 90 lbs/1,000 ft^2.) and 1 ton/acre on sandy soils (approximately 45 lbs/ft^2).

Spread the specified amount of lime and incorporate into the upper 6" of soil following seedbed preparation and applying fertilizer.

Agricultural lime is usually applied as a separate operation and spread in dry form. It is not normally applied with a hydraulic seeder because it is abrasive and, also, may clog the system. On the other hand, liquid lime is applied with a hydraulic seeder but because of cost, liquid lime is used primarily to provide quick action for benefit of plants during their seedling stage with the bulk of

liming needs to be provided by agricultural lime. Dry lime may be applied with the fertilizer mixture.

Fertilizing

Apply a complete fertilizer at rates specified in the design plan or as recommended by soil tests. In the absence of soil tests, use the following as a guide:

8-24-24 or equivalent – apply 400 lbs/acre (approximately 9 lbs/1000 ft^2) at planting.

When vegetation has emerged to a stand and is growing, 30 to 40 lbs/acre (approximately 0.8 lbs/1000 ft^2) of additional nitrogen fertilizer should be applied.

Note: Fertilizer can be blended to meet exact fertilizer recommendations. Take soil test recommendations to local fertilizer dealer for bulk fertilizer blends. This may be more economical than bagged fertilizer.

Incorporate lime and fertilizer to a depth of at least 6" with a disk or rotary tiller on slopes of up to 3:1.

On steeper slopes, lime and fertilizer may be applied to the surface without incorporation. Lime and fertilizer may be applied together; however, fertilizer should not be added to the seed mixture during hydroseeding. Lime may be added with the seed mixture.

Planting

Plant the species specified in the plan at the rate and depth specified. In the absence of plans and specifications, plant species and seeding rates may be selected by qualified persons from Table TS-1.

Apply seed uniformly using a cyclone seeder, drop-type spreader, drill, drill seeder, cultipacker seeder, by hand, or with a hydroseeder on a fresh, firm friable seedbed.

When using a drill seeder, plant seed ¼" to ½" deep. Calibrate equipment in the field.

When planting by methods other than a drill seeder or hydroseeder, cover seed by raking, or dragging a chain, brush, or mat. Then firm the soil lightly with a roller. Seed can also be covered with a hydromulch product.

Cover broadcast seed by raking or chain dragging; then firm the surface with a roller or cultipacker to provide good seed contact. Small grains should be planted no more than 1" deep and grasses and legume seed no more than ½" deep.

Table TS-1 Commonly Used Plants for Temporary Cover[1]

Species	Seeding Rate/Ac PLS[2]	North	Central	South
		Seeding Dates		
Millet, Browntop or German	40 lbs	May 1-Aug 1	Apr 1-Aug 15	Apr l-Aug 15
Rye	3 bu	Sept 1-Nov 15	Sept 15-Nov 15	Sept 15-Nov 15
Ryegrass	30 lbs	Aug l-Sept 15	Sept l-Oct 15	Sept 1 -Nov 15
Sorghum-Sudan Hybrids	40 lbs	May l-Aug 1	Apr 15-Aug 1	Apr l-Aug 15
Sudangrass	40 lbs	May l-Aug I	Apr 15-Aug 1	Apr l-Aug 15
Wheat Common	3 bu	Sept 1-Nov 1	Sept 15-Nov 15	Sept 15-Nov 15
Common Bermudagrass	10 lbs	Apr 1-July 1	Mar 15-July 15	Mar 1-July 15
Crimson Clover	10 lbs	Sept 1-Nov 1	Sept 1-Nov 1	Sept 1-Nov 1

1 DO NOT USE Seeding Rates as part of a mixture unless shown as a mixture in this table.
2 PLS means Pure Live Seed and is used to adjust seeding rates. For example, to plant 10 lbs PLS of a species with germination of 80% and purity of 90%, PLS= 0.8 X 0.9 = 72%. 10lbs PLS = 10/0.72 = 13.9 lbs of the species to be planted.

Hydroseeding

Surface roughening is particularly important when hydroseeding, as roughened slope will provide some natural coverage for lime, fertilizer, and seed. The surface should not be compacted or smooth. Fine seedbed preparation is not necessary for hydroseeding operations; large clods, stones, and irregularities provide cavities in which seeds can lodge.

Mix seed, inoculant if required, and a seed carrier with water and apply as a slurry uniformly over the area to be treated. The seed carrier should be a cellulose fiber, natural wood fiber or cane fiber mulch material which is dyed an appropriate color to facilitate uniform application of seed. Use the correct legume inoculant at 4 times the recommended rate when adding inoculant to a hydroseeder slurry. The mixture should be applied within one hour after mixing to reduce damage to seed.

Fertilizer should not be mixed with the seed-inoculant mixture because fertilizer salts may damage seed and reduce germination and seedling vigor. Fertilizer may be applied with a hydroseeder as a separate operation after seedlings are established.

Whenever possible, it is often best to incorporate lime and fertilizer with a disk.

Mulching

Mulching is extremely important for successful seeding. Whether the mulching material is straw or a hydraulic erosion control product (HECP, also referred to as hydromulch), the material needs to be applied properly. Uniformly spread organic mulches by hand or with a mulch blower at a rate which provides about 75% ground cover. Spread HECPs utilizing appropriate equipment and at rates as specified in the plan or by the manufacturer. Caution, an over-application of straw mulch (wheat, oat, or rye) will reduce stand success – do not over-apply straw mulch when mulching a seeding! *(See Mulching practice for more details).* In lieu of mulch, erosion control blanket may be used (see Erosion Control Blanket practice for more details).

Installation Verification

Check materials and installation for compliance with specifications during installation of products.

Common Problems

Consult with a qualified design professional if the following occurs:

- Design specifications for seed variety, seeding dates or mulching cannot be met; substitutions may be required. Unapproved substitutions could lead to failure.
- Seeding outside of the recommended results in an inadequate stand. Reseed according to specifications of a qualified design professional (see recommendations under Maintenance).

Maintenance

Reseeding

Inspect seedings weekly until a stand is established and thereafter at least monthly for stand survival and vigor. Also, inspect the site for erosion.

Eroded areas should be addressed appropriately by filling and/or smoothing, and reapplication of lime, fertilizer, seed, and mulch.

A stand should be uniform and dense for best results. Stand conditions, particularly the coverage, will determine the extent of remedial actions such as seedbed preparation and reseeding. A qualified design professional should be consulted to advise on remedial actions. Consider drill seeding when doing a remedial planting.

Fertilizing

If vegetation fails to grow, have the soil tested to determine whether pH is in the correct range or nutrient deficiency is a problem.

Satisfactory establishment may require re-fertilizing the stand, especially if the planting is made early in the planting season. Follow soil test recommendations or the specifications provided to establish the planting.

Mowing

Temporary plantings may be mowed and baled or simply mowed to compliment the use of the site.

Millet, sorghum-sudan hybrids, sudangrass, rye and wheat may be mowed, but no lower than 6" (closer moving may damage the stand).

Ryegrass is tolerant of most mowing regimes and may be mowed often and as close as 4" to 6" if this regime is started before it attains tall growth (over 8").

Bermudagrass is tolerant of most mowing regimes and can be mowed often and close, if so desired, during its growing season.

Check Dam (CD)

Practice Description

A check dam (also referred to as a "ditch check") is a barrier constructed across a conveyance to impound water for the purpose of velocity reduction by flattening the flow gradient and reducing shear stress within the channel. This practice applies in small open channels and drainageways, including temporary and permanent swales.

Check dams are not to be used in a live stream. Situations of use include areas in need of protection during establishment of grass and areas that cannot receive a temporary or permanent non-erodible lining for an extended period.

Typical Components of the Practice

- Site Preparation
- Materials Installation
- Erosion and Sediment Control
- Construction Verification
- Maintenance

Construction

Prior to start of construction a qualified design professional should determine the location, elevation, and size of the structure to optimize flattening of channel grade. Usually, check dam dimensions are taken from a standard drawing. Check dams are typically constructed using materials specified in a contract which

could be rock, wattles, sand bags, or other suitable material, including manufactured products. Most check dams are constructed of rock.

Site Preparation

Determine location of any underground utilities.

Locate and mark the site for each check dam in strategic locations (to avoid utilities and optimize effectiveness of each structure in flattening channel grade).

Remove debris and other unsuitable material which would interfere with proper placement of the check dam materials.

In highly erosive soil conditions it may be specified to excavate a shallow keyway (12"-24" deep and at least 12" wide) across the channel and into each abutment for each check dam. For other soils, geotextile alone without a keyway is often used on the soil.

Materials Installation

For all check dams on compacted soil, install a non-woven geotextile fabric underlayment that extends at least 3 feet up and downstream of the check dam. Bury the upstream edge of the geotextile underlayment, staple it to the trench bottom, and place compacted backfill in the trench. Ensure the geotextile is secured by stapling along its edges.

Always ensure that water flows over and not around the check dam.

Rock Check Dam. Construct the dam of the class riprap specified with a minimum 2:1 side slopes. Position rock to form a parabolic top, perpendicular to channel flow, with the center portion at the elevation shown in the design so that the flow goes over the structure and not around the structure. Small graded aggregate and/or geotextile may be specified on the upstream face of the rock check dam to increase the sediment trapping efficiency.

Wattle Check Dam. Place the specified wattle in a parabolic shape to ensure water flows over and not around the wattle. Staple the wattle in place with sod staples on approximate 6-inch centers on each side of the wattle to prevent flotation, and place wooden stakes over the top in a non-destructive tee-pee fashion.

Silt Fence Check Dam. Construct the silt fence check dam in an upstream "V" configuration and notch the silt fence as shown on the plans.

Sand Bag Check Dam. Ensure the sand bags are properly oriented in each layer as shown on the plans.

Erosion and Sediment Control

Install vegetation (temporary or permanent seeding) or mulching to stabilize other areas disturbed during the construction activities.

Construction Verification

Check finished size, grade and shape for compliance with standard drawings and materials list (check for compliance with specifications if included in contract specifications).

Common Problems

Consult with a qualified design professional if any of the following occur:

- Variations in topography on site indicate check dam will not function as intended. Change in plan will be needed.
- Materials specified in the plan are not available.

Maintenance

Inspect the check dam for material displacement and abutments for erosion around the ends of the dam after each significant rainfall event. Repair as needed.

Inspect the channel after each significant rainfall event. If channel erosion exceeds expectations, consult with the design professional and consider adding another check dam to reduce channel flow grade.

Sediment should be removed if it reaches a depth of ½ the original dam height. If the area behind the dam fills with sediment, there is a greater likelihood that water will flow around the end of the check dam and cause the practice to fail.

Check dams should be removed when their useful life has been completed. The area where check dams are removed should be stabilized immediately. In rare instances check dams should be left as a permanent measure to support channel stability.

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Inlet Protection (IP)

Practice Description

Inlet protection is a temporary practice installed around, above, or within a storm drain to minimize the conveyance of sediment. This practice applies where early use of the storm drain system is necessary prior to stabilization of the disturbed drainage area.

Typical Components of the Practice

- Site Preparation
- Geotextile Installation
- Structure Installation
- Grading
- Stabilization
- Construction Verification
- Maintenance

Installation

Prior to start of construction, inlet protection structures should be designed by a qualified professional. Plans and specifications should be available to field personnel.

Site Preparation

The soil around the drop inlet should be well compacted. The area around the drop inlet should be shaped, if necessary, to store the runoff on an almost level area. If runoff could bypass the protected inlet, a temporary dike should be planned and force the runoff to be trapped by the protective device.

Geotextile Installation

An 8 oz. non-woven geotextile is used as an underlayment prior to the structure placement. The geotextile should extend from the stormwater inlet to the required distance in front of the structure. The geotextile underlayment should be securely fastened to the compacted soil with staples to prevent undermining.

Structure Installation

The structure can be constructed of silt fencing materials, concrete blocks and gravel, sand bags, wattles, or premanufactured devices. The structures should be structurally sound to prevent buckling, sagging, or undermining. Check to ensure the following installation practices are followed:

Silt Fence Inlet Protection

- Use geotextile underlayment on the compacted earth surface from the inlet to at least 1 ft. beyond the silt fence. The geotextile must be securely pinned at 5-inch centers at the inlet and around the outside edge of the geotextile.
- Use steel T-posts on maximum 3 ft. centers around the inlet.
- Do not trench the silt fence. Install the wire backing tightly from the compacted earth surface to the top of the posts, and secure to the posts.
- Add 2 x 4 bracing at the top of the posts and diagonally across the corners. Drill holes to fit over T-posts once T-posts are installed to ensure a proper fit.
- Install a dewatering device to remove water from the impoundment within 48 hours. A 2 x 4 vertical board with graduated holes (smallest a bottom and largest at top) has been found to work well. The fabric should be secured to the board with staples and the geotextile punctured at each hole.
- Install the geotextile (4 oz. non-woven) Type A silt fence. The top of the geotextile shall be folded over the 2 x 4 bracing and stapled. The bottom of the geotextile shall extend about 8 inches horizontally from the bottom of the fence and secured with pins every 5 inches. The bottom of the fabric at the corners shall be cut and pinned securely to prevent water undermining. Attach the geotextile to the wire as normally done for a silt fence.

Figure IP-1 Silt Fence Inlet Protection Installation. (Showing silt fence, geotextile underlayment, steel T-posts, 2 x 4 bracing, and dewatering device.)
(Photo courtesy of AU-SRF. See Appendix for CAD files)

Block and Gravel Inlet Protection

- Use geotextile underlayment on the compacted earth surface that extends from the inlet, under the blocks and at least 1 ft. beyond the blocks, and securely pinned at 5 inches centers at the inlet and around the outside edge of the geotextile. A second underlay that extends from the inlet, under the blocks, and to the top of the blocks between the blocks and gravel. Note: place geotextile vertically on the blocks surface after blocks and hardware cloth are installed.
- Use 8-inch cinder blocks no more than two blocks high. Stacked the second layer of blocks in a staggered fashion. All blocks are placed in a normal orientation with at least one block turned sideways for dewatering.
- The dewatering block(s) shall be at the lowest elevation, faced with hardware cloth, and the geotextile cut out in a three-inch-tall rectangular section for dewatering.
- Place aggregate (ALDOT no. 4 stone) in a triangular cross-section to the top of the blocks with the aggregate extending out 1 ft. at the top from the blocks before sloping down at a 1:1 ft./ft. slope.

Figure IP-2 Block and Gravel Inlet Protection Installation. (Showing geotextile underlayment, gravel, and dewatering device.)
(Photo courtesy of AU-SRF. See Appendix for CAD files)

Figure IP-3 Block and Gravel Inlet Protection Installation. (Showing dewatering device.)
(Photo courtesy of AU-SRF. See Appendix for CAD files)

Sand Bag Inlet Protection

- Use geotextile underlayment on the compacted earth surface that extends from the inlet to at least 1 ft. beyond the sand bags. Pin the geotextile securely at the inlet and around the edges on 5-inch centers.
- Place sand bags tight against each other around an inlet in a circular fashion with at least a 1 ft. space between the bags and the inlet.
- Orient the three layers of bags into a triangular cross-section with the first layer consisting of two bags oriented tangent to the circle, the second layer consisting of one bag perpendicular to the circle, and the third layer consisting of one bag tangent to the circle.

Figure IP-4 Sand Bag Inlet Protection Installation.
(Photo courtesy of AU-SRF. See Appendix for CAD files)

Wattle Inlet Protection

- Use geotextile underlayment on the compacted earth surface that extends from the inlet to at least 1 ft. beyond the wattles. Pin the geotextile securely at the inlet and around the edges on 5-inch centers.
- Use a wattle that is denser and less porous to ensure ponding occurs.
- Place the wattle in a circular fashion at least 1 ft. from the inlet. Wattle ends should be overlapped at least 18 inches and secured with grade stakes or hardwood stakes a T-Pee or A-Frame type installation method.
- Stake the wattles with T-Pee stakes at least 2 ft. on centers.
- Prevent the wattles from floating by securing with sod staples on each side of the wattle on approximate 6-inch centers.

Figure IP-5 Wattle Inlet Protection Installation.
(Photo courtesy of AU-SRF. See Appendix for CAD files)

Premanufactured Inlet Protection Structures

Premanufactured inlet protective structures should be installed and maintained according to the manufacturer's requirements.

As a minimum, insure that the premanufactured inlet protection structure accomplishes the following:

- Is structurally supported to withstand sediment and hydrostatic loads.
- Ponds water to allow for coarse sediment to settle out of suspension.
- Does not float or undermine.
- Does not cause erosion of the soil surface between the device and the inlet.
- Has a dewatering mechanism to prevent prolonged flooding.

Grading

If needed to prevent bypass flow or ensure adequate storage, construct a temporary dike on the down slope side of the structure. Material from within the sediment pool may be used for dike construction. To be effective, the site must create the specified volume of ponding around the fabric structure.

Stabilization

Stabilize all bare areas that drain to the inlet with temporary seeding and mulching unless construction will disturb it within 13 days.

Construction Verification

Check finished grades and dimensions of fabric drop inlet protection structures.

Common Problems

Consult with a qualified design professional if any of the following occur:

- Variations in site conditions indicate that the practice will not function as intended; change in plan may be needed.
- Sediment not removed from pool resulting in inadequate storage volume for the next storm.
- Top of structure is too high; resulting in flow bypassing the inlet.
- Geotextile underlayment is not adjacent to the inlet exterior surface; resulting in erosion and undercutting of the structure.

Maintenance

Inspect fabric barrier after each rainfall event and make needed repairs immediately.

Remove sediment from the pool area when sediment has reached ½ the fabric height. Take care not to damage or undercut the fabric during the sediment removal.

When the contributing drainage area has been adequately stabilized, remove all materials and unstable sediment and dispose of properly. Fill the disturbed area to the grade of the drop inlet. Stabilize disturbed areas in accordance with the plans.

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Sediment Barrier (SB)

Practice Description

A sediment barrier is a temporary sediment control practice installed downstream of a disturbed area intended to remove large-sized suspended sediment from sheet flow runoff by facilitating settling and to a lesser extent filtration. The most commonly used sediment barrier is a silt fence made up of a geotextile fabric that is anchored into the ground and attached to supporting posts and possibly reinforced with a wire fence or polypropylene netting. Other barrier materials could include sand bags, wattles, and various man-made materials and devices that can be used in a similar manner as a silt fence.

This practice applies downstream of small disturbed areas that yield runoff volumes less than the design storage volume. Barriers intercept runoff from upslope to form impoundments that temporarily detain runoff and allow sediment to settle out of the water and remain on the construction site.

Typical Components of the Practice

- Site Preparation
- Installation
- Erosion Control
- Construction Verification
- Maintenance

Construction

Prior to start of construction, sediment barriers should be designed by a qualified professional. Plans and specifications should be referred to by field personnel throughout the construction process.

Note: Silt fence is the only barrier installation being covered in this handbook.

Site Preparation

Determine exact location of underground utilities so that locations for digging or placement of stakes can be selected where utilities will not be damaged.

Smooth the construction zone to provide a broad, nearly level area for the fence. The area should be wide enough throughout the length of the fence to provide storage of runoff and sediment behind the fence.

Silt Fence Installation

Fence should be installed generally on the contour with each end turned upslope, in "C" configurations, or "J" hooks, so that runoff can be intercepted as sheet flow. Ends should be flared uphill to provide temporary storage of water. Fence should be placed so that runoff from disturbed areas must pass through the fence. Fence should not be placed across concentrated flow areas such as channels or waterways unless specifically designed as a temporary check dam. When placed near the toe of a slope, the fence should be installed far enough from the slope toe to provide a broad flat area for adequate storage capacity for sediment. An off-set installation with a trench or slice is now the preferred method of installation. Dig a trench or make a slice at least 6" deep along the fence alignment as shown in Figures SB-1 and SB-3 for Types A & B fences.

Drive posts to the depth specified 6 inches downslope of the trench. Space posts a maximum of 10 feet for Type A fencing, or 6 feet for Type B fencing. In areas where water is ponded, the fence posts may be specified at half the spacing.

For Type A fence, fasten support wire fence to upslope side of posts, extending to the ground surface as shown in the Figure SB-1.

Attach continuous length of fabric to upslope side of fence posts and through the trench. Minimize the number of joints. Type A fence joints should be installed according to Figure SB-2. Type B fence should be joined by rolling the ends together using the "roll joint" method illustrated in Figure SB-4 or as detailed in the specifications. Avoid joints at low points in the fence line. When specified, install the overflow/dewatering device and splash pad at the low point in the fence.

Install tie backs as specified on the ends of the silt fence.

Backfill the trench with compacted earth as shown in Figures SB-1 and 3.

Provide good access in areas of heavy sedimentation for clean out and maintenance.

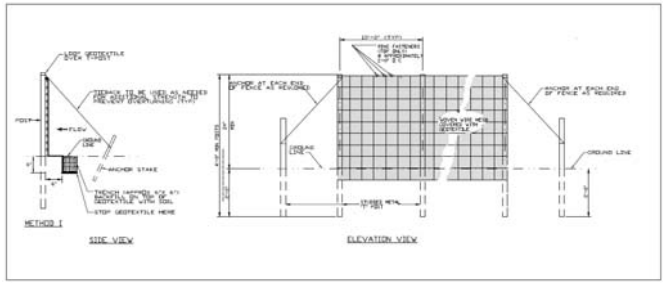

Figure SB-1 Silt Fence - Type A
(For post material requirements see Tables SB-2 and SB-3 (Volume I of Handbook))

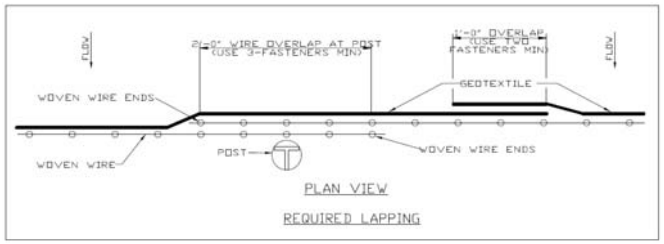

Figure SB-2 Type A Silt Fence Overlap

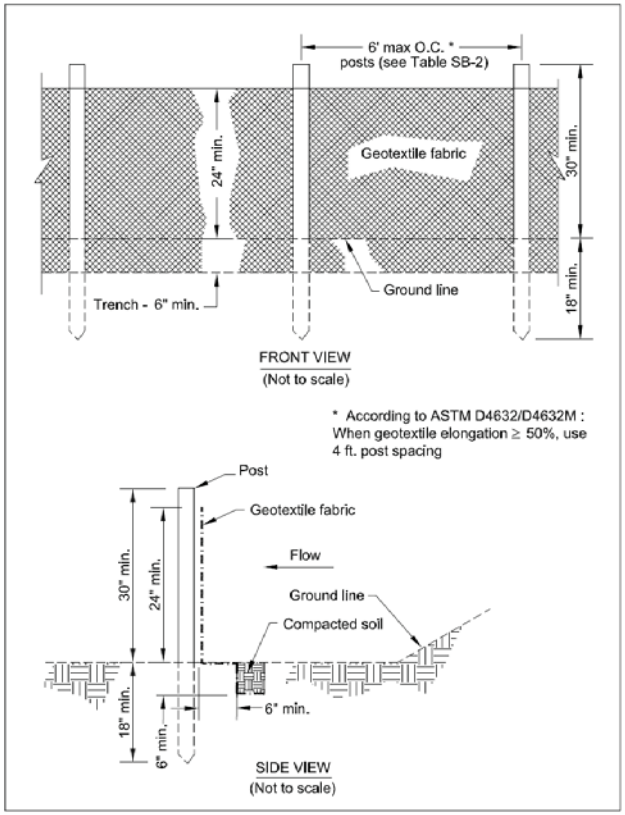

Figure SB-3 Silt Fence - Type B
(For post material requirements see Tables SB-2 and SB-3 (Volume I of Handbook))

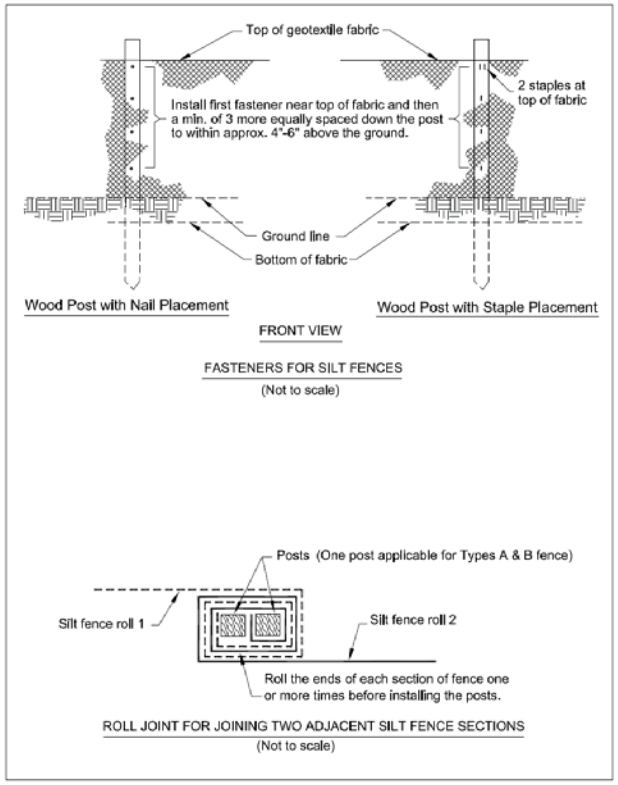

Figure SB-4 Type B Silt Fence Installation Details

Erosion Control

Stabilize disturbed areas in accordance with vegetation plan. If no vegetation plan exists, consider planting and mulching as a part of barrier installation and select planting information from appropriate planting practice, Permanent Seeding or Temporary Seeding. Select mulching information from the Mulching practice.

Construction Verification

Check finished grades and dimensions of the sediment fence. Check materials for compliance with specifications.

Common Problems

Consult with a qualified design professional if any of the following occur:

- Variations in topography onsite indicate sediment fence will not function as intended or alignment is not on contour or fence crosses concentrated flow areas; changes in plan may be needed.
- Design specifications for filter fabric, support posts, support fence, gravel or riprap cannot be met; substitutions may be required. Unapproved substitutions could lead to failure.
- Drainage area appears to exceed ¼ acre for 100 feet of non-reinforced silt fence and ½ acre for reinforced fence.
- The runoff exceeds the storage volume of the silt fence.

Maintenance

Inspect silt fences at least once a week and after each significant rain event.

Make required repairs immediately.

Should the fabric of silt fence collapse, tear, decompose or become ineffective, replace it promptly.

Remove sediment deposits when they reach a depth of ½ the height of the fence as installed to provide adequate storage volume for the next rain and to reduce pressure on the fence.

After the contributing drainage area has been properly stabilized, remove all barrier materials and unstable sediment deposits, bring the area to grade and stabilize it with vegetation.

Buffer Zone (BZ)

Practice Description

A buffer zone is a strip of plants adjacent to land-disturbing sites or bordering streams, lakes, and wetlands which provides streambank stability, reduces scour erosion, reduces storm runoff velocities and filters sediment in stormwater. This practice applies on construction sites and other disturbed areas that can support vegetation and can be particularly effective on floodplains, next to wetlands, along stream banks and on steep, unstable slopes.

Typical Components of the Practice

- Preservation and Protection of Existing Vegetation
- Site Preparation
- Soil Amendments (lime and fertilizer)
- Planting Desired Vegetation
- Mulching
- Maintenance

Installation (Preservation)

Prior to start of construction, buffer zones should be designed by a qualified design professional. Plans and specifications should be referred to by field personnel throughout the installation process.

Preserve vegetation on designated areas shown in plan. In the absence of a plan, maintain a buffer of existing vegetation with a minimum width for shoreline or stream bank protection of at least 35 feet. Local ordinances may require a wider buffer. Narrower buffer zones may be sufficient on steep slopes that are narrower than 35 feet.

Installation (Plantings)

Prior to start of construction, buffer zones should be designed by a qualified design professional. Plans and specifications should be referred to by field personnel throughout the installation process.

Site Preparation

Install planned measures such as silt fences and diversions before grading and seedbed preparation. In the absence of a plan and before grading and seedbed preparation, install other necessary measures which may include silt fences and diversions. Clear area of clods, rocks, etc. that would interfere with seedbed preparation; smooth the area before the soil amendments are applied and firm the soil after the soil amendments are applied.

Soil Amendments (lime and fertilizer)

Apply lime and fertilizer according to the plan or by soil test recommendations. In the absence of a plan or soil test recommendations, apply agricultural limestone at the rate of 2 tons per acre (90 lbs per 1000 ft^2.) and 10-10-10 fertilizer at the rate of 1000 lbs per acre (25 lbs per 1000 ft^2.). Apply ground agricultural limestone unless a soil test shows pH of 6.0 or greater. Incorporate amendments to a depth of 4” to 6” with a disk or chisel plow.

Planting Desired Vegetation

Plant desired vegetation according to the design plan. In the absence of a plan use installation guidelines for Permanent Seeding, Tree Planting on Disturbed Areas, or Shrub, Vine and Groundcover Planting.

Mulching

Spread mulch according to guidelines in the Mulching practice.

Common Problems

Consult with qualified design professional if any of the following occur:

- Soil compaction can prevent adequate plant growth. Compaction should be addressed during site preparation.

- Design specifications for plants (variety, seeding/planting dates) and mulch cannot be met; substitutions may be required. Unapproved substitutions could lead to failure.

Problems that require remedial actions:

- Erosion, washout and poor plant establishment – repair eroded surface, reseed, reapply mulch and anchor.
- Mulch is lost to wind or stormwater runoff – reapply mulch and anchor.

Maintenance

Replant trees, grass, shrubs or vines where needed to maintain adequate cover for erosion control. Maintain grass plantings with periodic applications of fertilizer and mowing.

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APPENDIX K

SAFETY DATA SHEET(S) FOR TREATMENT CHEMICALS

NOT APPLICABLE

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 ACTION SUBMITTALS

A. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

B. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

C. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

1. Location of construction joints is subject to approval of the Architect.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer manufacturer testing agency.

B. Welding certificates.

C. Material Test Reports: For the following, from a qualified testing agency:

1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

E. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field-Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1.8 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and as follows:

1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301 (ACI 301M).
2. ACI 117 (ACI 117M).

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

a. High-density overlay, Class 1 or better.
b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.

c. Structural 1, B-B or better; mill oiled and edge sealed.
d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

3. Overlaid Finnish birch plywood.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

E. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

F. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

G. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
2. Furnish ties that, when removed, leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive damp proofing or waterproofing.

2.3 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

C. Plain-Steel Welded-Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

2.4 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 CONCRETE MATERIALS

A. Regional Materials: Concrete shall be manufactured within 500 miles (800 km) of Project site from aggregates and cementitious materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

C. Cementitious Materials:

1. Portland Cement: ASTM C 150/C 150M, Type I/II gray.
2. Fly Ash: ASTM C 618, Class F.

D. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1 inch (25 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

E. Air-Entraining Admixture: ASTM C 260/C 260M.

F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

G. Water: ASTM C 94/C 94M and potable.

2.6 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A, except with maximum water-vapor permeance of. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Grace Construction Products, W. R. Grace & Co.; Florprufe 120.
b. Insulation Solutions, Inc.; Viper VaporCheck 16.
c. Meadows, W. R., Inc.; Perminator 15 mil.
d. Raven Industries Inc.; Vapor Block 15 10.
e. Reef Industries, Inc.; Griffolyn Type-105 Type-65G 15 mil Green.
f. Stego Industries, LLC; Stego Wrap 15 mil Class A.

2.7 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Construction Chemicals - Building Systems; Confilm.
b. ChemMasters; SprayFilm.
c. Conspec by Dayton Superior; Aquafilm.
d. Dayton Superior Corporation; Sure Film (J-74).
e. Edoco by Dayton Superior; BurkeFilm.
f. Euclid Chemical Company (The), an RPM company; Eucobar.
g. Meadows, W. R., Inc.; EVAPRE.
h. Metalcrete Industries; Waterhold.
i. Nox-Crete Products Group; MONOFILM.
j. Sika Corporation; SikaFilm.
k. SpecChem, LLC; Spec Film.
l. Symons by Dayton Superior; Finishing Aid.
m. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
n. Unitex; PRO-FILM.
o. Vexcon Chemicals, Inc.; Certi-Vex Envio Set.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

C. Water: Potable.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following

a. BASF Construction Chemicals - Building Systems; Kure 200.
b. ChemMasters; Safe-Cure Clear.
c. Conspec by Dayton Superior; W.B. Resin Cure.
d. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
e. Edoco by Dayton Superior; Res X Cure WB.
f. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
g. Meadows, W. R., Inc.; 1100-CLEAR.
h. Nox-Crete Products Group; Resin Cure E.
i. Right Pointe; Clear Water Resin.
j. SpecChem, LLC; Spec Rez Clear.
k. Symons by Dayton Superior; Resi-Chem Clear.
l. TK Products, Division of Sierra Corporation; TK-2519 DC WB.
m. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

2.8 RELATED MATERIALS

A. Reglets: Fabricate reglets of not less than 0.022-inch- (0.55-mm-) thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

B. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.9 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 (ACI 301M).

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.10 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.11 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301 (ACI 301M), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M).

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 75 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORING AND RESHORING INSTALLATION

A. Comply with ACI 318 (ACI 318M) and ACI 301 (ACI 301M) for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

3.5 VAPOR-RETARDER INSTALLATION

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

3.6 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide

joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M).

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view.

3.10 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in one direction.

1. Apply scratch finish to surfaces indicated.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until

surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated.
2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:

    a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
    b. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEM INSTALLATION

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 6 inches ((150 mm)) high unless otherwise indicated, and extend base not less than 6 inches (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
3. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.

5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.12 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 (ACI 301M) for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

    a. Water.
    b. Continuous water-fog spray.
    c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

    a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.

b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one six month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1-part portland cement to 2-1/2 parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

C. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

D. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Verification of use of required design mixture.
4. Concrete placement, including conveying and depositing.
5. Curing procedures and maintenance of curing temperature.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.

    a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M.

    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
8. Strength of each concrete mixture will be satisfactory if every average of any three-consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

E. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 24 hours of finishing.

END OF SECTION 033000

SECTION 03355 – STAMPED & COLORED CONCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 SUMMARY

A. Types of work in this section include integrally-colored and color-hardened Portland cement concrete paving with imprinted pattern and stain/sealer treatments.

B. Extent of stamped and colored concrete work is indicated on Drawings and Schedules, and the following:

(1) Covered Entrance Porch Slab at Door 100 (Main Entrance Covered Porch).

(a) Integrally-colored concrete with imprinted pattern indicated.

(2) Formed Concrete Steps and Slab Borders / Edges:

(a) Integrally-colored concrete with textured finish, to match porch color and texture on steps and slab edges.
(b) Occurs at steps and porch slab borders/edges at Covered Main Entrance Porch.

1.03 RELATED SECTIONS

A. Section 02300 “Earthwork” for preparation of subgrade at stained and colored concrete installations.

B. Section 07920 “Joint Sealants” for sealant at joints integral to stained and colored concrete installations.

C. See Division 2 Sections and Civil Drawings for concrete paving at vehicular traffic areas.

1.04 REFERENCES

A. ACI 301: Specifications for Structural Concrete for Buildings
B. ACI 302: Guide for Concrete Floor and Slab Construction
C. ACI 303: Guide to Cast-in-Place Architectural Concrete Practice
D. ACI 305R: Hot Weather Concreting
E. ACI 306R: Cold Weather Concreting
F. ACI 308: Standard Practice for Curing Concrete
G. ACI 309: Standard Practice for Consolidation of Concrete
H. ACI 347: Guide to Formwork for Concrete
I. ASTM C33: Standard Specifications for Concrete Aggregates
J. ASTM C150: Standard Specifications for Portland Cement
L. ASTM C260: Standard Specifications for Air-Entraining Admixtures for Concrete

M. ASTM C309: Standard Specifications for Liquid Membrane Forming Compounds for Curing Concrete

N. ASTM C494: Standard Specifications for Chemical Admixtures for Concrete
O. ASTM C618: Standard Specifications for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
P. ASTM A185: Standard Specifications for Steel Welded Wire Reinforcement, Plain, for Concrete
Q. ASTM C94: Standard Specification for Ready-Mixed Concrete
R. ASTM C233: Standard Test Method for Air-Entraining Admixtures for Concrete
S. ASTM C979: Standard Specification for Pigments for Integrally Colored Concrete

1.05 SUBMITTALS

A. Submit under provisions of Section 01300 “Submittals”.

B. Product Data: Manufacturer’s data sheets on each product to be used, including:

(1) Preparation instructions and recommendations;
(2) Storage and handling requirements and recommendations;
(3) Installation Methods.

C. Testing:

(1) Coordinate with Owner’s designated Testing Agency for testing and analysis under provisions of Section 01400.
(2) Submit proposed mix design for each class of concrete for review prior to commencement of work.
(3) Owner’s Testing Agency will take cylinders and perform slump and air-entrainment tests in accordance with ACI 301.
(4) Four concrete test cylinders will be taken for each class of concrete placed each day.
(5) One slump test will be taken for each set of test cylinders taken.

1.06 QUALITY ASSURANCE

A. Installer Qualifications:

(1) The Installer shall provide a qualified foreman or supervisor who has a minimum of three (3) years of experience with imprinted and textured concrete, and who has successfully completed at least five (5) imprinted concrete installations of high quality and similar in scope to that required for this Project.
(2) The concrete shall be cast-in-place, on the job site, by trained and experienced workers who shall be employed by a firm that is a licensed and certified Imprint Licensed Contractor by the Manufacturer.
(3) Work shall be performed in accordance with ACI 301, 302, and 303.
(4) Installer shall obtain materials from the same source throughout.

B. Ready-Mixed Supplier Qualifications:

(1) Supplier of ready-mixed concrete products shall comply with ASTM C94 requirements for production facilities an equipment. Supplier shall be certified according to NCRMA’s “Certification of Ready Mixed Concrete Production Facilities Quality Control Manuals.”

C. Mock-Up:

(1) Provide field samples of surface colors, textures and patterns specified, for Architect's approval prior to beginning work.

(2) Do not proceed with work until workmanship, color and sheen are approved by Architect.

1.07 DELIVERY, STORAGE AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jusridiction.

1.08 PROJECT CONDITIONS

A. Do not place concrete pavements when base surface or ambient temperature is less than 40 degrees F (4 degrees C) or if base surface is wet or frozen.

B. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by Manufacturer of optimum results. Do not install products under environmental conditions outside Manufacturer's absolute limits.

1.09 WARRANTY

A. Stamped and colored concrete work shall be warranted by the Installer for a period of One (1) Year from the Date of Substantial Completion.

PART 2 – PRODUCTS

2.01 APPROVED MANUFACTURER AND INSTALLER

A. For the purpose of determining minimum performance and quality standards, this specification is based upon the integral colored and color-hardened Portland cement concrete paving and imprinting system, as manufactured by the following:

(1) The Bomanite Company, 8789 Auburn Folsom Rd. #108, Granite Bay, CA 95746

B. Approved Installer: Jeffco Concrete Contractors, Tuscaloosa, AL

C. Equal systems by other manufacturers and their certified, licensed installers will be considered, subject to submittal for approval, in accordance with Part 1 Section "Prior Approvals."

2.02 SYSTEMS

A. Supporting Structure

(1) Mix Design:

(a) Mix and deliver concrete in accordance with ASTM C94, Alternate 2. Refer to Structural Drawings for concrete strength requirements.

(b) Use accelerating admixtures containing no calcium chloride in cold weather only when approved by Architect and Testing Agency. Use of admixtures will not relax cold weather placement requirements.
(c) Use set-retarding admixtures during hot weather only when approved by Architect and Testing Agency.
(d) Add air-entraining agent to concrete mix for concrete work exposed to exterior, in amounts of 4 to 7 percent of total concrete volume, or as otherwise recommended by Testing Agency.
(e) Add coloring admixture where scheduled, in quantities recommended by coloring admixture manufacturer to achieve selected color.
(f) Maintain water-cement ratio to produce a minimum of 3 inch to a maximum of 5-inch slump.
(g) Use of calcium chloride is strictly prohibited.

B. Reinforcement: Welded Steel Wire Fabric; Plain type; ANSI/ASTM A185; in flat sheets; uncoated finish.

C. Integral Color:

(1) Integral Coloring Admixture: Synthetic oxide pigment, meeting ASTM C979 and C494; equal to **Integral Color by The Bomanite Company**.
(2) Type A, cement dispersing/water reducing.
(3) Color: As selected by the Architect and Owner from manufacturer's full range of available colors.

D. Color Hardener:

(1) Equal to **Bomanite Color Hardener**.
(2) Color: As selected by Architect from manufacturer's full range of available colors.

E. Tools Selection:

(1) Imprinting Tools: Mat-type imprinting tools for texturing freshly-placed concrete, in pattern/texture as selected by the Architect.
(2) Imprinting tools used in the execution of this project shall be equal to those manufactured by The Bomanite Company.

F. Textures and Patterns:

(1) Basis of Design: **Bomacron** TL-21063 Used Brick Pattern "**Herringbone Used Brick**".
(2) Final texture and pattern determination subject to approval of site mock-up.
(3) Tool Size: 35 3/4" x 25 3/8"
(4) Stone Size: 4"x8"
(4) Joint Detail: 0.198 x 0.266
(5) Stone Relief Dimension: 0.067

G. Release Agent: Powdered release agent equal to Bomanite Release Agent.

(1) Color: As selected by Architect from manufacturer's full range of available colors.

H. Secondary Antique or Coloration:

(1) Topical Stain equal to Bomanite Topical Stain.

(2) Color: As selected by Architect from manufacturer's full range of available colors.

I. Cure Agent: Silicate Cure and Densifier, equal to Bomanite Con Shield.

J. Sealing and Finish Coatings: Equal to Bomanite Hydrolock.

2.03 RELATED MATERIALS

A. Cement: ASTM C150, Type 1, Portland Cement, Gray Color.

B. Fine and Coarse Aggregates: ASTM C33.

C. Water: Clean and not detrimental to concrete.

D. Form Material: Conform to ACI 301. If using metal, material shall be free from deformities. If using wood, use construction grade lumber, sound and free of warp, minimum 2 inches (51 mm) nominal thickness, except where short radii of curves require thinner forms.

E. Contraction Joint Devices: Galvanized sheet metal, keyed profile, with knock-outs for reinforcing and dowel steel.

F. Tie Wire: Annealed steel, minimum 16 gauge (1.519 mm) size.

G. Dowels: ASTM A615; Grade 40; plain steel; uncoated finish.

H. Miscellaneous Reinforcing Accessories: Spacers, chairs, ties and other devices necessary for properly placing, spacing, supporting and fastening reinforcement in place.

I. Form Release Agent: As acceptable to concrete colorant manufacturer, non-staining, dissipative type.

J. Vapor Retarding Membrane (denoted on Drawings as "vapor barrier"): 10 mil (0.2540 mm) reinforced polyethylene.

K. Air-Entraining Admixture: ASTM C 206.

(1) Air Entrained Concrete shall be used whenever concrete is exposed to freezing weather. Proportions of entrained air, as determined by ASTM C233 and C260.

L. Non-Asphaltic Joint Fillers: ASTM D1752, Type 1.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that compacted subgrade and stone base is ready to support concrete paving and imposed loads, free of frost, smooth and properly compacted as determined by Testing Agency.

B. Verify that gradients and elevations of base are correct, and proper drainage has been provided, so water does not stand in the area to receive paving.

C. Beginning of installation means acceptance of substrate conditions.

3.02 PREPARATION

A. Notify Architect and Testing Agency, a minimum of 24 hours prior to the commencement of concreting operations.

3.03 FORMING

A. Construct and remove forms in accordance with ACI 347.

B. Place and secure forms to correct location, dimension and profile. Adequately brace to withstand loads applied during concrete placement.

C. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

D. Place joint fillers vertical in position, in straight lines. Secure to formwork during concrete placement.

3.04 INSERTS AND ACCESSORIES

A. Make provisions for installation of inserts, accessories, anchors and sleeves.

B. Place vapor retarder (vapor barrier) continuously over stone subgrade. Overlap joints a minimum of 12 inches (305 mm) and seal with a joint tape of same permeance as sheeting material.

3.05 REINFORCEMENT

A. Accurately place reinforcement in middle of slabs-on-grade.

B. Discontinue reinforcement at expansion joints.

C. Place reinforcement to achieve slab alignment as detailed.

D. Steel shall be free of rust, mill scale, dirt and oil.

E. Provide doweled joints at interruptions of concrete with one end of dowel set in capped sleeve to allow longitudinal movement. Provide support at both ends of dowels.

F. Support reinforcing on bar chairs. Securely saddle tie at intersections. Rigidly secure in place to minimize displacement during concrete pour.

3.06 JOINTS

A. Intentional stoppage of concrete placing shall be a planned location of either an expansion joint or contraction joint.

B. When stoppage occurs at an expansion joint, install joint assembly with a bulkhead of sufficient section drilled to accommodate required dowels. Provide expansion joints at maximum 20 feet (6 m) o.c.e.w. at pedestrian paving.

C. When stoppage occurs at a contraction joint, install sheet metal joint assembly of sufficient section to prevent deflection, shaped to concrete section. Drill bulkhead to permit continuation of longitudinal reinforcing steel through construction joint.

D. Place joint filler between concrete and building or other appurtenances.

3.07 PLACING CONCRETE

A. Place concrete in accordance with ACI 301, 302 and 304. Deposit concrete so that specified slab thickness will be obtained after vibrating and finishing operations. Minimize handling to prevent segregation. Consolidate concrete by suitable means to prevent formation of voids or honeycombs. Exercise care to prevent disturbance of forms and reinforcing and damage to vapor retarder. Place concrete to lines and levels shown, properly sloped to drain as designed.

(1) Hot Weather Placement: ACI 305.
(2) Cold Weather Placement: ACI 306.
(3) Ensure reinforcement, inserts, embedded parts and formed joints are not disturbed during concrete placement.
(4) Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

B. After consolidation and screeding, float concrete to gradients indicated. Use a straight edge to level and test surface in longitudinal direction to required grade. Finish edges to provide a smooth dense surface with 1/8-inch (3 mm) radius.

C. Apply Color Hardener prior to application of pattern. Apply at rate recommended by Manufacturer, evenly to the surface of the fresh concrete by the dry-shake method. Apply in two or more shakes, floated after each shake and troweled only after the final floating.

D. While concrete is still in its plastic state, apply the tool/texture pattern to the surface of the concrete. Properly tamp tools into the surface to achieve the required texture, with uniformity of pattern and depth of stamping. Utilize bond breaker to keep tools from sticking to fresh concrete.

(1) Release material shall be applied to the troweled surface prior to imprinting.

E. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with Manufacturer’s instructions.

F. Apply secondary stain treatment as scheduled to achieve design.

G. Apply finish sealer per approved mock-up or as specified to achieve design required.

3.08 FIELD QUALITY CONTROL

A. Field inspection and testing of subgrade and concrete will be performed by the Owner’s Testing Agency, under the provisions of Section 01400.

3.09 PROTECTION

A. Immediately after placement, protect stamped and colored concrete from premature drying, excessive hot or cold temperatures, and mechanical injury.

END OF SECTION 03350

SECTION 04230 - CALCIUM SILICATE MASONRY UNITS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and other Part 1 Specification sections, apply to this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 SUMMARY

A. Extent of calcium silicate masonry units is indicated on drawings, and denoted as “Stone”.

B. Concrete masonry units, mortar for unit masonry, masonry anchors and reinforcement, wall control joints, and weeps are specified in Section 04810 - Unit Masonry.

C. Non-load-bearing exterior metal stud framing, sheathing and air infiltration barriers are specified in Section 05400 - Cold Formed Metal Framing.

D. Loose steel lintels are specified in Section 05500 – Metal Fabrications

E. Joint sealers and backers for masonry wall control joints are specified in Section 07920-Joint Sealants.

F. Through wall flashings concealed in unit masonry are specified in Section 04850-Membrane Flashing.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's detailed technical data for materials, fabrication, and installation.

B. Shop Drawings: Submit shop drawings for fabrication and erection of calcium silicate masonry units not fully described by product drawings, templates, and instructions for installation.

C. Samples: Submit samples for each type of unit required, to illustrate color and texture.

1.04 QUALITY ASSURANCE

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible, to ensure proper fitting of work. However, allow for adjustments within specified tolerances wherever taking of field measurements before fabrication might delay work.

B. Coordination: Coordinate installation of inserts and anchorages which must be built into other work for installation of calcium silicate masonry units and related work.

1.05 REFERENCES

A. ACI 530: Building Code Requirements for Masonry Structures.
B. ACI 530.1: Specifications for Masonry Structures.
C. Masonry Advisory Council: Hot and Cold Weather Construction.

1.06 QUALITY ASSURANCE

A. Installer: Company or person specializing in commercial masonry work and approved by the materials manufacturer.
B. Installation of Masonry Work: Comply with ACI 530 and ACI 530.1.

1.07 MOCKUPS

A. Construct one (1) mockup panel (48" x 96") to illustrate masonry units, coursing, mortar joints, movement control joints, backup wall construction, weep holes, and through wall flashing.

B. Mockups may remain part of the finished Work.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver masonry units and dimension limestone to the site in approved protective film. Prevent damage to units.

B. Lift skids with proper and sufficiently long slings or forks with protection to prevent damage to units. Protect edges and corners.

C. Store masonry units in a manner designed to prevent damage and staining.

D. Stack units on timbers or platforms at least 3" above grade.

E. Place polyethylene or other plastic film between wood and other finished surfaces of units when stored for extended periods of time.

F. Cover stored units with protective enclosure if exposed to weather.

G. Do not use salt or calcium-chloride to remove ice from masonry surfaces.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 52 degrees F. prior to and 48 hours after completion of masonry work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. The following performance specification is intended to meet specific design, maintenance and functional requirements necessary to this project. It is not intended to limit competitive bidding, but rather encourage participation from all qualified manufacturers which have the performance criteria as outlined in Part 2 of this specification. Equal products by other manufacturers will be acceptable subject to compliance with these specifications.

2.01 MANUFACTURERS (continued)

B. The following manufacturer has been accorded prior approval. Other manufacturers desiring to their product must submit in accordance with the Prior Approval section of these specifications:

(1) Arriscraft International Inc., *Renaissance Masonry Units*

C. Proposed substitutions during Bidding: In this section under Products heading, where only one specific data by Arriscraft is indicated, including material, finish, color or other specific identification, it is to indicate standards required. If other unnamed manufacturers propose to bid on the Work, they shall submit (using Prior Approval Form bound elsewhere in this Manual) full data to the Architect no later than ten (10) days prior to bid date, and shall gain specific approval on specific products prior to bidding. In the event submitted data of any manufacturer gains approval through this method, the manufacturer and the specific products will be published in an addendum prior to bid date. No other manufacturer or their products will be considered without prior written consent from the Architect. NO VERBAL APPROVALS WILL BE CONSIDERED.

2.02 MANUFACTURED UNITS

A. Calcium Silicate Masonry Units: ASTM C73, Grade SW; solid units having been pressure formed and autoclaved; 3-5/8" or 4-5/8" bed depth as indicated; modular sizes as scheduled and as indicated on Drawings; smooth or rocked finish as scheduled on exposed faces and ends; special shapes as indicated; “Limestone” color as scheduled; and having the following typical average properties when tested to the identified standard:

(1) Compressive Strength: 6,600 psi, to ASTM C170.
(2) Absorption: 8.8 percent (8.8%), to ASTM C97.
(3) Density: 129 lbs/ft3, to ASTM C97.
(4) Modulus of Rupture: 770 psi, to ASTM C99.

2.03 FABRICATION TOLERANCES

A. Fabricate calcium silicate masonry units to the following tolerances:

(1) Unit Length: Plus or minus 1/16".
(2) Unit Height: Plus or minus 1/16".
(3) Deviation from Square: Plus or minus 1/16", with measurement taken using the longest edge as the base.
(4) Bed Depth: Plus or minus 1/8".
(5) Custom Dimensions: Plus or minus 1/8".
(6) Unit Face Deviations: Plus or minus 3/8".

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that site conditions are ready to receive work.

B. Beginning of installation means acceptance of site conditions.

3.02 PREPARATION

A. Install metal anchors, reinforcement and accessories furnished by another Section. Direct correct placement.

B. Verify that items provided by other Sections of the Work are properly sized and located.

3.03 CUTTING OF MASONRY UNITS

A. Cut masonry units with wet-saw.

B. Pre-soak units using clean water prior to cutting.

C. Clean cut units using a stiff fiber brush and clean water. Allow units to surface dry prior to placement.

3.04 COURSING

A. Place masonry to lines and levels indicated.

B. Maintain masonry courses to uniform width. Make vertical and horizontal joints equal and of uniform thickness.

C. Lay masonry units in half-running bond.

D. Maintain mortar joint thickness of 3/8".

E. Tool joints to a concave finish.

3.05 PLACING AND BONDING

A. Lay masonry in full bed of mortar, properly jointed with other work. Buttering corners of joints, and deep or excessive furrowing of mortar joints will not be accepted.

B. Fully bond intersections, and external corners.

C. Isolate masonry partitions from vertical structural framing members with a control joint, as indicated.

D. Do not adjust masonry units after laying. Where resetting of masonry is required, remove, clean units and reset in new mortar.

3.06 CAVITY WALL

A. Install weeps in veneer at 24" o.c. minimum at bottom of wall, above through wall flashing, and at all other locations indicated on Drawings.

3.07 TOLERANCES

A. Variation in Alignment from Unit to Adjacent Unit: 1/16".
B. Variation of Mortar Joint Thickness: 1/8" every 36".

3.08 REINFORCEMENT AND ANCHORAGES

A. Place bed joint reinforcement in mortar beds, spaced vertically as indicated on Drawings.

B. Embed wall ties in masonry or stud back-up for veneer at horizontal and vertical spacings as indicated on Drawings.

C. Increase quantity of wall ties around perimeter of openings, at wall terminations and corners, and along parapet walls, placed within 8" of openings and edges of masonry.

3.09 MASONRY FLASHING

A. Extend flashing through veneer; turn up and bed into mortar joint of masonry, or seal to concrete, or seal into sheathing over metal stud framed back-up.

B. Lap end joints and seal watertight.

3.09 LINTELS

A. Install loose steel lintels as detailed.

3.10 MOVEMENT CONTROL JOINTS

A. Construct movement joints in locations as indicated on Drawings.

B. Do not continue horizontal joint reinforcing across movement control joints.

C. Form movement control joints by leaving head joints between stacked units void of mortar, ready for application of bond breaker and joint sealant.

D. Size joints in accordance with Section 07920 for sealant performance.

3.11 CLEANING

A. Clean masonry as work progresses. Allow mortar droppings on masonry to partially dry, then remove by means of brushing with a stiff fiber brush.

B. Post-Construction: Clean a 10 square foot area of wall as directed below and leave for one week. If no harmful effects appear and after mortar has set and cured, clean masonry as follows:
   (1) Protect windows, sills, doors, trim and other work from damage.
   (2) Remove large particles with stiff fiber brushes or wood paddles, without damaging surface. Saturate masonry with clean water and flush off loose mortar and dirt.
   (3) Scrub with cleaning solution as recommended by masonry unit manufacturer, using methods in accordance with manufacturer’s printed cleaning instructions.
   (4) Repeat cleaning process as often as recommended by manufacturer, until satisfactory results are achieved.

C. Use alternative cleaning solutions and methods for difficult-to-clean masonry, only after consultation with masonry unit manufacturer.

3.12 PROTECTION

A. Protect masonry units from damage resulting from subsequent construction operations.

B. Use protection materials and methods which will not stain or damage masonry units.

C. Remove protection materials upon Substantial Completion of the Work, or when risk of damage is no longer present.

3.13 SCHEDULE OF CALCIUM SILICATE MASONRY UNITS

TYPE 1: Consisting of Arriscraft *Renaissance* **RS115 Smooth Finish** Units. Color: **Limestone**.

TYPE 2: WATERTABLE: Consisting of Arriscraft *Renaissance* **RS758 Smooth Finish** Chamfered Units (at Watertable) and Arriscraft *Renaissance* **RS758 Smooth Finish** Washed Units (at Window Sills). Color: **Limestone**. Note: Modify all Type 2 Units for **4-5/8" Bed Depth**. Profiles as indicated on Drawings.

END OF SECTION 04230

SECTION 04720 - ARCHITECTURAL CAST STONE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

B. This Section Includes all labor, materials and equipment to provide the Architectural Cast Stone shown on Drawings and as described in this section, and the following:

1. Cast Stone Quoins and Canopy column base cap, formed to shapes and dimensions as indicated on Drawings at the following locations:

(a) At locations as indicated on the drawings.

C. Installing contractor shall unload, store, furnish all anchors, set, patch, clean and seal the Cast Stone as required.

1.2 RELATED SECTIONS

A. Part 1, Section 01300 “Submittals.”

B. Division 4, Section 04810 “Unit Masonry” for installing cast stone units on unit masonry.

C. Division 7 Section 07920 “Joint Sealants” for sealing joints in cast stone.

1.3 REFERENCES

A. Cast Stone Institute® Technical Manual (Current Edition)

1.4 DEFINITIONS

A. Cast Stone: A refined architectural concrete building unit manufactured to simulate natural cut stone, used in unit masonry applications.

1. Dry Cast Concrete Products – manufactured from zero slump concrete.

(a) Vibrant Dry Tamp (VDT) casting method: Vibratory ramming of earth moist, zero- slump concrete against a rigid mold until it is densely compacted.

(b) Machine casting method: manufactured from earth moist, zero-slump concrete compacted by machinery using vibration and pressure against a mold until it becomes densely consolidated.

2. Wet Cast Concrete Products – manufactured from measurable slump concrete.

(a) Wet casting method: manufactured from measurable slump concrete and vibrated into a mold until it becomes densely consolidated.

1.5 SUBMITTAL PROCEDURES

A. Comply with Section 01300 “Submittals.”

B. Product Data: For each type of product indicated.

1. For cast stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

C. Shop Drawings: Show fabrication and installation details for cast stone units. Include dimensions, details of reinforcement and anchorages, and indication of finished faces.

1. Include elevations and sections showing layout of units and locations of joints and anchors.

2. Indicate pertinent dimensioning, layout, anchorages, construction details, method of installation and adjacent construction.

3. Submit installation instructions and field erection drawings.

D. Anchorage Design: Cast Stone manufacturer is responsible for designing anchorage for each cast stone installation as indicated on Drawings. Submit complete design drawings and calculations which verify that the proposed special cast stone shapes and units, and their anchorage system meet the specified structural requirements. If necessary, engage a qualified professional engineer to prepare design calculations, shop drawings and other structural data. These submittals shall be stamped and signed by the designing structural engineer,

E. Samples for Initial Selection: For colored mortar.

F. Samples for Verification:

1. For color and texture of cast stone required, 10 inches square in size.
2. For colored mortar. Make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicated types and amounts of pigments used.
3. Each type of anchorage device proposed for the work.

G. Full-Size Samples: For each color, texture and shape of cast stone unit required.

1. Make available for Architect's review at Project site.

2. Approved Samples may be installed in the Work.

H. Qualification Data: For manufacturer and testing agency.

1. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C 1364, including test for resistance to freezing and thawing. Provide test reports based on testing within previous two years.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. A qualified manufacturer of cast stone units similar to those indicated for this Project, who has sufficient plant facilities to produce the shapes, quantities and size of Cast Stone required in accordance with the project schedule. Manufacturer shall have a minimum of ten (10) years experience in producing cast stone.

2. Obtain cast stone units through single source from single manufacturer.

B. Standards: Comply with the requirements of the Cast Stone Institute® Technical Manual and the project specifications. Where a conflict may occur, the contract documents shall prevail.

1.7 DELIVERY, STORAGE AND HANDLING

A. Mark production units with the identification marks as shown on the shop drawings.

B. Package units and protect them from staining or damage during shipping and storage.

C. Provide an itemized list of products to support the bill of lading.

PART 2 – PRODUCTS

2.1 AVAILABLE MANUFACTURERS: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following:

A. Bassco Caststone, Elkmont, AL

B. Melton Classics Incorporated, Lawrenceville, GA

C. Corbelstone, Inc., Flowery Branch, GA

2.2 ARCHITECTURAL CAST STONE

A. Comply with ASTM C 1364

1. Physical properties: Provide the following:

2 Compressive Strength - ASTM C 1194: 6,500 psi (45 Mpa) minimum for products at 28 days.

3. Absorption - ASTM C 1195: 6% maximum by the cold water method, or 10% maximum by the boiling method for products at 28 days.

4. Air Content – ASTM C173 or C 231, for wet cast product shall be 4-8% for units exposed to freeze-thaw environments. Air entrainment is not required for VDT products.

5. Freeze-thaw – ASTM C 1364: The CPWL shall be less than 5% after 300 cycles of freezing and thawing.

6. Linear Shrinkage – ASTM C 426: Shrinkage shall not exceed 0.065%.

2.3 RAW MATERIALS

A. Portland cement – Type I or Type III, white and/or grey, ASTM C 150.

B Coarse aggregates - Granite, quartz or limestone, ASTM C 33, except for gradation, and are optional for the VDT casting method.

C. Fine aggregates - Manufactured or natural sands, ASTM C 33, except for gradation.

D. Colors - Inorganic iron oxide pigments, ASTM C 979 except that carbon black pigments shall not be used.

E. Admixtures- Comply with the following:

1 ASTM C 260 for air-entraining admixtures.

2. ASTM C 494/C 495M Types A - G for water reducing, retarding, accelerating and high range admixtures.

3 Other admixtures: integral water repellents and other chemicals, for which no STM Standard exists, shall be previously established as suitable for use in concrete by proven field performance or through laboratory testing.

4. STM C 618 mineral admixtures of dark and variable colors shall not be used n surfaces intended to be exposed to view.

5. STM C 989 granulated blast furnace slag may be used to improve physical properties. Tests are required to verify these features.

F. Water – Potable

2.4 COLOR AND FINISH

A. Match color and finish of approved sample. Cast Stone Sample approved during shop drawing submittal and review will be maintained at the site, to judge conformance of actual stone installed at site with approved sample.

B. All surfaces intended to be exposed to view shall have a fine-grained texture similar voids shall be less than 3 occurrences per any 1 in.2 (25 mm2) and not obvious under direct daylight illumination at a 5 ft (1.5m) distance.

C. Units shall exhibit a texture approximately equal to the approved sample when viewed under direct daylight illumination at a 10 ft (3 m) distance.

1. ASTM D 2244 permissible variation in color between units of comparable age subjected to similar weathering exposure.

a. Total color difference – not greater than 6 units.

b. Total hue difference – not greater than 2 units.

D. Minor chipping resulting from shipment and delivery shall not be grounds for rejection. Minor chips shall not be obvious under direct daylight illumination from a 20-ft (6 m) distance.

E. Remove cement film, if required, from exposed surfaces prior to packaging for shipment.

2.5 ANCHORS, REINFORCING AND MISCELLANEOUS

A. Reinforce the units as required for safe handling and structural stress.

B. Minimum reinforcing shall be 0.25 percent of the cross section area.

C. Anchors: Type and size as required, fabricated from Type 304 stainless steel complying with ASTM A240/A240M, ASTM A 276, or ASTM A666.

D. Dowels: ½ inch diameter, round bars, fabricated from Type 304 stainless steel complying with ASTM A240/A240M, ASTM A 276, or ASTM A666.

E. Reinforcement shall be noncorrosive where faces exposed to weather are covered with less than 1.5 in. (38 mm) of concrete material. All reinforcement shall have minimum coverage of twice the diameter of the bars.

F. Panels, soffits and similar stones greater than 24 in. (600 mm) in one direction shall be reinforced in that direction. Units less than 24 in. (600 mm) in both their length and width dimension shall be non-reinforced unless otherwise specified.

G. Welded wire fabric reinforcing shall not be used in dry cast products.

H. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cast stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.

   Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Diedrich Technologies, Inc.
   b. EaCo Chem, Inc.
   c. ProSoCo, Inc.

I. Water Repellant: Silane or siloxane sealer, as recommended by cast stone manufacturer.

2.6 CURING

A. Cure units in a warm curing chamber approximately 100°F (37.8°C) at 95 percent relative humidity for approximately 12 hours, or cure in a 95 percent moist environment at a minimum 70°F (21.1°C) for 16 hours after casting. Additional yard curing at 95 percent relative humidity shall be 350 degree-days (i.e. 7 days at 50°F/10°C or 5 days at 70°F (21°C) prior to shipping. Form cured units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

2.7 MANUFACTURING TOLERANCES

A. Cross section dimensions shall not deviate by more than 1/8 in. (3 mm) from approved dimensions.

B. Length of units shall not deviate by more than length/ 360 or 1/8 in. (3 mm), whichever is greater, not to exceed 1/4 in. (6 mm).

1. Maximum length of any unit shall not exceed 15 times the average thickness of such unit unless otherwise agreed by the manufacturer.

C. Warp, bow or twist of units shall not exceed length/ 360 or 1/8 in. (3 mm), whichever is greater.

D. Location of dowel holes, anchor slots, flashing grooves, false joints and similar features – On formed sides of unit, 1/8 in. (3 mm), on unformed sides of unit, 3/8 in. 9 mm) maximum deviation.

2.8 MORTAR MIXES

A. Comply with requirements in Division 4 Section "Unit Masonry" for mortar mixes.

B. Do not use admixtures including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.

C. Comply with ASTM C 270, Proportion Specification.

1. For setting mortar, use Type S.
2. For pointing mortar, use Type N.

D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.

1. Pigments shall not exceed 10 percent of portland cement by weight.
2. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
3. Mix to match Architect's sample.
4. Application: Use pigmented mortar for exposed mortar joints.

E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.

1. Mix to match Architect's sample.
2. Application: Use colored aggregate mortar for exposed mortar joints.

2.9 CAST STONE UNIT SHAPES

A. All cast stone units shall be custom-fabricated to shapes and dimensions as shown on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Installing contractor shall check Cast Stone materials for fit and finish prior to installation. Do not set unacceptable units. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING TOLERANCES

A. Comply with Cast Stone Institute® Technical Manual.

B. Set stones 1/8 in. (3 mm) or less, within the plane of adjacent units.

C. Joints, plus - 1/16 in. (1.5 mm), minus - 1/8 in. (3 mm).

3.3 JOINTING

A. Joint size:

1. At stone/brick joints 3/8 in. (9.5 cm).
2. At stone/stone joints in vertical position 1/4 in. (6 mm) (3/8 in. (9.5 mm) optional).
3. Stone/stone joints exposed on top 3/8 in. (9.5 mm).

B. Joint materials:

1. Mortar, Type N, ASTM C 270.
2. Use a full bed of mortar at all bed joints.
3. Flush vertical joints full with mortar.
4. Leave all joints with exposed tops or under relieving angles open for sealant.

C. Location of joints:

1. As shown on approved shop drawings. See Architectural Drawings for suggested joint locations.

3.4 SETTING

A. Drench units with clean water prior to setting.

B. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

C. Set units in full bed of Type S mortar, unless otherwise detailed.

D. Rake mortar joints 3/4 in. (18 mm) in. for pointing.

E. Remove excess mortar from unit faces immediately after setting.

F. Tuck point unit joints to a slight concave profile.

3.5 JOINT PROTECTION

A. Comply with requirements of Division 7 Section 07920 “Joint Sealants”.

B. Prime ends of units, insert properly sized backing rod and install required sealant.

3.6 REPAIR AND CLEANING

A. Repair chips with touchup materials furnished by manufacturer.

B. Saturate units to be cleaned prior to applying an approved masonry cleaner.

C. Consult with manufacturer for appropriate cleaners.

3.7 INSPECTION AND ACCEPTANCE

A. Inspect finished installation according to Bulletin #36.

B. Do not field apply water repellant until repair, cleaning, inspection and acceptance is completed.

3.8 WATER REPELLANT

A. Apply silane or siloxane water repellant for weatherproofing cast stone in accordance with manufacturer's instructions.

B. Apply water repellant after pointing, repair, cleaning, inspection, and acceptance are completed.

END OF SECTION 04720

SECTION 04810 - UNIT MASONRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 DESCRIPTION OF WORK

A. Extent of each type of masonry work is indicated on drawings and schedule.

B. Types of masonry work required include:

(1) Reinforced unit masonry
(2) Concrete unit masonry
(3) Brick masonry
(4) Wall control joints (w.c.j.)
(5) Unit masonry reinforcement, anchors and accessories
(6) Mortar and grout for unit masonry

C. Flashings and Joint Sealers related to Unit Masonry are specified in Division 7 Sections.

1.03 QUALITY ASSURANCE

A. Single Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.

B. Single Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.

C. Fire Performance Characteristics: Where indicated, provide materials and construction identical to those of assemblies whose fire resistance has been determined per ASTM E 119 by a testing and inspecting organization, by equivalent concrete masonry thickness, (Per 2021 International Building Code), or by another means, as acceptable to authorities having jurisdiction.

D. Field Constructed Mock-ups: Prior to installation of masonry work, erect sample wall panels to further verify selections made for color and textural characteristics, under sample submittals of masonry units and mortar, and to represent completed masonry work for qualities of appearance, materials and construction; build mock-ups to comply with the following requirements:

(1) Locate mock-ups on site in locations as directed by Architect.
(2) Building mock-ups for the following types of masonry in sizes of approximately 4' long by 2' high by full thickness.

(a) Typical exterior face brick with areas depicting typical concrete block back-up.
(b) Retain mock-ups during construction as standard for judging completed masonry work. When directed, demolish mock-ups and remove from site.

(3) Preconstruction Tests by Unit Test Methods: Test the following materials by methods indicated:

(a) Brick: Test each type and grade of brick per ASTM C 67. If coefficient of variation of compression samples tested exceeds 12%, obtain compressive strengths by multiplying average compressive strengths by (1-1.5) x (0.01 x coefficient of variation) - (0.12).
(b) Concrete Masonry Units: Test each type, class and grade of concrete masonry unit per ASTM C 140.
(c) Mortar Tests: Test each mortar type per ASTM C 780.

1.04 SUBMITTALS

A. Products data: Submit manufacturer's product data for each type of masonry unit, accessory, and other manufactured products, including certifications that each type complies with all specified requirements, including fire performance requirements.

B. Samples for initial selection purposes: Submit samples of the following materials:

(1) Unit masonry samples in small scale form showing full extent of colors and textures available for each type of exposed masonry unit required.

1.05 DELIVERY, STORAGE AND HANDLING:

A. Deliver masonry materials to project in undamaged condition.

B. Store and handle masonry units to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion or other causes.

(1) Limit moisture absorption of concrete masonry units during delivery and until time of installation to the maximum percentage specified for Type I units for the average annual relative humidity as reported by the U.S. Weather Bureau Station nearest project site.

C. Store cementitious materials off the ground, under cover and in dry location.

D. Store aggregates where grading and other required characteristics can be maintained.

E. Store masonry accessories including metal items to prevent deterioration by corrosion and accumulation of dirt.

1.06 PROJECT CONDITIONS

A. Protection of work: During erection, cover top of walls with waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress.

B. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

C. Do not apply uniform floor or roof loading for at least 12 hours after building masonry walls or columns.

D. Do not apply concentrated loads for at least 3 days after building masonry walls or columns.

E. Staining: Prevent grout or mortar or soil from staining the face of masonry to be left exposed or painted. Remove immediately grout or mortar in contact with such masonry.

F. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.

G. Protect sills, ledges and projections from droppings of mortar.

H. Cold weather protection:
(1) Do not lay masonry units which are wet or frozen.
(2) Remove any ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.
(3) Remove masonry damaged by freezing conditions.

I. For clay masonry units with initial rates of absorption (suction) which require them to be settled before laying, comply with the following requirements.
(1) For units with surface temperatures above 32 degrees F (0 degrees C), wet with water heated to above 70 degrees F (21 degrees C).
(2) For units with surface temperatures below 32 degrees F (0 degrees C), wet with water heated to above 130 degrees F (54 degrees C).

J. Perform the following construction procedures while masonry work is progressing. Temperature ranges indicated below apply to air temperatures existing at time of installation except for grout. For grout, temperature ranges apply to anticipated minimum night temperatures. In heating mortar and grout materials, maintain mixing temperatures selected with 10 degrees F (6 degrees C).
(1) 40 degrees F (4 degrees C) to 32 degrees F (0 degrees C):
Mortar: Heat mixing water to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C).
Grout: Follow normal masonry procedures.
(2) 32 degrees F (0 degrees C) to 25 degrees F (-4 degrees C):
Mortar: Heat mixing water and sand to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C); maintain temperature of mortar on boards above freezing.
Grout: Heat grout materials to 90 degrees F (32 degrees C) to produce in place grout temperatures of 70 degrees F (21 degrees C) at end of work day.
(3) 25 degrees F (-4 degrees C) to 20 degrees F (-7 degrees C):
Mortar: Heating mixing water and sand to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C); maintain temperature of mortar on boards above freezing.
Grout: Heat grout materials to 90 degrees F (32 degrees C) to produce in place grout temperature of 70 degrees F (21 degrees C) at end of work day.
Heat both sides of walls under construction using salamanders or other heat sources.
Use windbreaks or enclosures when wind is in excess of 15 mph.

(4) 20 degrees F (-7 degrees C) and below:
Mortar: Heat mixing water and sand to produce mortar temperatures between 40 degrees F (4 degrees C) and 120 degrees F (49 degrees C).

Grout: Heat grout materials to 90 degrees F (32 degrees C) to produce in place grout temperature of 70 degrees F (21 degrees C) at end of work day.
Masonry Units: Heat masonry units so that they are above 20 degrees F (-7 degrees C) at time of laying.
Provide enclosure and auxiliary heat to maintain an air temperature of at least 40 degrees F (4 degrees C) for 24 hours after laying units.

(5) Do not heat water for mortar and grout to above 160 degrees F (71 degrees C).

K. Protect completed masonry and masonry not being worked on in the following manner. Temperature ranges indicated apply to mean daily air temperatures except for grouted masonry. For grouted masonry, temperature ranges apply to anticipated minimum night temperatures.

(1) 40 degrees F (4 degrees C) to 32 degrees F (0 degrees C):
Protect masonry from rain or snow for at least 24 hours by covering with weather-resistive membrane.

(2) 32 degrees F (0 degrees C) to 25 degrees F (-4 degrees C):
Completely cover masonry with weather-resistive membrane for at least 24 hours.

(3) 25 degrees F (-4 degrees C) to 20 degrees F (-7 degrees C):
Completely cover masonry with weather-resistive insulating blankets or similar protection for at least 24 hours, 48 hours grouted masonry.

(4) 20 degrees F (-7 degrees C) and below:
Except as otherwise indicated, maintain masonry temperature above 32 degrees F (0 degrees C) for 24 hours using enclosures and supplementary heat, electric heating blankets, infrared lamps or other methods proven to be satisfactory. For grouted masonry maintain heated enclosure to 40 degrees F (4 degrees C) for 48 hours.

PART 2 - PRODUCTS

2.01 BRICK MADE FROM CLAY OR SHALE

A. Comply with referenced standards and other requirements indicated below applicable to each form of brick required.

(1) Size: Provide bricks manufactured to the following actual dimensions:

(a) Standard Modular: 3-5/8" thick x 2-1/4" high x 7-5/8" long.

(2) For sills, caps and similar applications resulting in exposure of brick surfaces which otherwise would be concealed from view provide un-cored or un-frogged units with all exposed surfaces finished.

B. Face Brick: ASTM C216, and as follows:

(1) Grade SW.
(2) Type FBS.
(3) Application: Use where brick is exposed, unless otherwise indicated.
(4) Texture and Color: Provide face brick of colors and textures as follows:

C. For purpose of determining minimum performance and quality standards, face brick specification is based upon products as supplied by ACME Brick Company.

(1) Equal products of other brick suppliers will be considered, subject to submission in accordance with Part 1 Section “Prior Approval”.

(2) **Main Face Brick:** Face Brick (where denoted on the Drawings as “Face Brick”) will be selected by the Architect using an allowance of **$700.00 per thousand**.

C. Building (Common) Brick: ASTM C 62, and as follows:

(1) Grade SW.
(2) Application: Use where brick is indicated for concealed locations.

2.02 CONCRETE MASONRY UNITS

A. General: Comply with referenced standards and other requirements indicated below applicable to each form of concrete masonry unit required.

(1) Provide special shapes where required for lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions.
(2) Provide bull nose units for outside corners, except where specifically indicated on Drawings as square-edged units.

B. Concrete block: Provide units complying with characteristics indicated below for grade, type, face size, exposed face and, under each form of block included, for weight classification.

(1) Grade N except Grade S may be used above grade in exterior walls with weather protective coatings and in walls not exposed to weather.
(2) Size: Manufacturer's standard units with nominal face dimensions of 16" long x 8" high (15-5/8" x 7-5/8" actual) x thicknesses indicated.
(3) Type I, moisture-controlled units.

(a) Cure units by autoclave treatment at a minimum of 350 degrees F (176 degrees C) and a minimum pressure of 125 psi.

(4) Exposed faces: Manufacturer's standard color and texture, unless otherwise indicated.
(5) Hollow Load bearing Block: ASTM C90 and as follows:

(a) Weight Classification: Lightweight.
(b) Fire rated units where indicated.

C. Concrete Building Brick: Provide units complying with ASTM C55 and characteristics indicated below for grade, type, size and weight classification.

(1) Grade: Same as indicated for concrete block.
(2) Type: Same as indicated for concrete block.
(3) Size: Standard Modular 2" x 3-5/8" x 7-5/8"
(4) Weight Classification: Lightweight

2.03 MORTAR AND GROUT MATERIALS

A. Portland cement: ASTM C150, Type I, except Type III may be used for cold weather construction. Provide natural color or white cement as required to produce required mortar color.

(1) Mortar mix type and color shall be selected by the Architect using an allowance of **$25.00 per bag** for all exposed face brick and accent brick applications.

B. Hydrated lime: ASTM C207, Type S.

C. Aggregate for mortar: ASTM C144, except for joints less than 3/8" use aggregate graded with 100% passing the No. 16 sieve.

(1) White Mortar Aggregates: Natural white sand or ground white stone.

D. Aggregate for grout: ASTM C404.

E. Water: Clean and potable.

2.04 ADJUSTABLE MASONRY VENEER ANCHORS

A. GENERAL: Provide two-piece assemblies allowing vertical or horizontal differential movement between wall and framework parallel to plane of wall, but resisting tension and compression forces perpendicular to fit; for attachment over sheathing to metal studs; and with the following structural performance characteristics:

(1) Structural Performance Characteristics: Capable of withstanding a 100 lb load in either tension or compression without deforming over, or developing play in excess of 0.05 inch.

B. SCREW-ATTACHED MASONRY VENEER ANCHORS:

(1) Wire Tie Shape: Triangular; 3/16" diameter; hot-dipped galvanized.
(2) Wire Tie Length: As required to extend 1-1/2 inches minimum into masonry wythe of veneer face.
(3) Anchor Section: 14 gauge hot-dipped galvanized sheet metal plate, with screw holes top and bottom and with raised, rub-stiffened strap stamped into center to provide slot between strap and plate for connection of wire tie; of overall size indicated below.
    (a) Size: Plate and strap size: 1-1/4 inches wide for plate, 5/8 inch for strap by lengths indicated below; slot clearance formed between face of plate and back of strap at maximum rib projection: 1/32 inch plus diameter of wire tie.
    (b) Plate and Strap Lengths: 6 inches and 3-5/8 inches; with both sides of plate stiffened by ribs.
    (c) Steel Drill Screws for Steel Studs: ASTM C954 except manufactured with hex washer head and neoprene washer, #10 diameter by lengths required to penetrate steel stud flange by not less than 3 exposed threads, and with the following corrosion protective coating.
        (1) Organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B117.
        (2) Screws for attachment of anchors to aluminum canopy columns shall be STAINLESS STEEL.

(d) Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to the following:
(1) Screw-attached Masonry Veneer Anchors; Heckmann Building Products; Hohmann & Barnard, Inc.; Wire-Bond.

(e) Locations:
(1) At brick veneer over steel stud back-up framing with sheathing;
(2) At brick veneer or concrete unit masonry over cast-in-place concrete walls;
(3) See Drawings for extent.

2.05 JOINT REINFORCEMENT, TIES AND ANCHORING DEVICES

A. Materials: Comply with requirements indicated below for basic materials and with requirements indicated under each form of joint reinforcement, tie and anchor for size and other characteristics:

(1) Zinc-coated (galvanized) steel wire: ASTM A82 for uncoated wire and with ASTM A641 for zinc coating of class indicated below:

(a) Class 3 (0.80 oz. per sq. ft. of wire surface).
(b) Application: Use where indicated.

B. Joint reinforcement: Provide welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10', with prefabricated corner and tee units, and complying with requirements indicated below:

(1) Width: Fabricate joint reinforcement in units with widths of approximately 2" less than nominal width of walls and partitions as required to provide mortar coverage of not less than 5/8" on joint faces exposed to exterior and 2" elsewhere.
(2) For single-wythe and multi-wythe masonry provide type as follows with single pair of side rods:
(a) Truss design with continuous diagonal cross rods spaced not more than 16" o.c.
(3) For multi-wythe masonry with brick veneer or split-face concrete masonry veneer, provide type as follows:
(a) Ladder design with perpendicular cross spaced not more than 16" o.c. and number of side rods as follows: Three (3)
(b) Exterior Walls with Face Brick Veneer or Smooth-Face Concrete Masonry Veneer over Concrete Block: Equal to DUR-O-WAL "D/A 360" LADUR-EYE.

C. Anchor bolts: Where wood blocking and other items are bolted to unit masonry, provide steel bolts with hex nuts and flat washers complying with ASTM A307, Grade A, hot-dip galvanized to comply with ASTM C153, Class C, in sizes and configurations indicated on drawings.

D. Available manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following:

AA Wire Products Co.
Dur-O-Wall, Inc.
Heckman Building Products, Inc.
Hohmann & Barnard, Inc.
Masonry Reinforcing Corp. of America
National Wire Products Corp.

2.06 CONCEALED FLASHING MATERIALS

A. Sheet metal flashing: Sheet metal flashing is specified in Division 7, "Flashing and Sheet Metal".

B. Membrane flashing: Membrane flashing is specified and furnished under Division 7, "Membrane Flashing". Installation of membrane flashing is specified in this section.

2.07 MASONRY CLEANERS

A. Acidic cleaner: Manufacturer's standard strength general purpose cleaner designed for new masonry surfaces of type indicated; composed of blended organic and inorganic acids combined with special wetting of systems and inhibitors; expressly approved for intended use by manufacturer of masonry units being cleaned.

(1) Available products: Subject to compliance with requirements, a product which may be used to clean unit masonry surfaces includes, but is not limited to the following:
(a) "Sure Klean" No. 600 detergent; ProSoCo, Inc.
(b) Use products only as recommended by block manufacturer for cleaning colored concrete masonry units.

2.08 MORTAR AND GROUT MIXES

A. General: Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, anti-freeze compounds or other admixtures, unless otherwise indicated.

(1) Do not use calcium chloride in mortar or grout.

B. Mixing: Combine and thoroughly mix cementitious, water and aggregates in a mechanical batch mixer; comply with referenced ASTM standards for mixing time and water content.

C. Mortar for unit masonry: Comply with ASTM C270, proportion specification, for types of mortar required, unless otherwise indicated.

(1) Limit cementitious materials in mortar to portland cement-lime.
(2) Use Type M mortar for masonry below grade and in contact with earth and where indicated.
(3) Use Type S mortar for reinforced masonry and where indicated.

D. Grout for unit masonry: Comply with ASTM C476 for grout for use in construction of reinforced and non-reinforced unit masonry. Use grout of consistency indicated or if not otherwise indicated, of consistency (fine or coarse) at time of placement which will completely fill all spaces intended to receive grout.

(1) Use fine grout in grout spaces less than 2" in horizontal direction unless otherwise indicated.
(2) Use coarse grout in grout spaces 2" or more in least horizontal dimension unless otherwise indicated.

2.09 MISCELLANEOUS MASONRY ACCESSORIES

A. Reinforcing Bars: Deformed steel, ASTM A615, Grade 60 for bars No. 3 to No. 18.

B. Pre-molded control joint strips: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated on Drawings. Indicated as "W.C.J." on drawings.

(1) Polyvinyl chloride complying with ASTM D2287, General Purpose Grade, Type PVC 654-4.

C. Anchors for connecting masonry to structural steel framework:

(1) General: Assemblies as detailed and/or noted on Structural Drawings.
(2) Products of Heckmann Building Products, Inc., or equal.
(3) Coordinate required anchor types with spray-on fireproofing system (if applicable).

D. Weep Holes: 5/16" sash-type cotton weep cords (well greased) for use at all weep holes

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Wetting Clay Brick: Wet brick made from clay or shale which have ASTM C 67 initial rates of absorption (suction) of more than 30 grams per 30 sq. in. per minute. Using wetting methods which ensure each clay masonry unit being nearly saturated by dry when laid.

B. Do not wet concrete masonry units.

C. Cleaning reinforcing: Before placing, remove loose rust, ice and other coatings from reinforcing.

D. Thickness: Build cavity and composite walls, floors and other masonry construction to the full thickness shown. Build single-wythe walls (if any) to the actual thickness of the masonry units, using units of nominal thickness indicated.

E. Build chases and recesses as shown or required for the work of other trades.

F. Leave openings for equipment to be installed before completion of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to the opening.

G. Cut masonry units using motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining work. Use full size units without cutting where possible.

(1) Use dry cutting saws to cut concrete masonry units.

3.02 CONSTRUCTION TOLERANCES

A. Variation from plumb: For vertical lines and surfaces of columns, walls and arises do not exceed 1/4" in 10', or 3/8" in a story height not to exceed 20', nor 2" in 40' or more. For external corners, expansion joints, control joints and other conspicuous lines, do not exceed 1/4" in any story or 20' maximum, nor 2" in 40' or more. For vertical alignment of head joints do not exceed plus or minus 1/4" in 10', 3/8" maximum.

B. Variation from level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines, do not exceed 1/4" in any bay or 20' maximum, nor 2"

in 40' or more. For top surface of bearing walls do not exceed 1/8" between adjacent floor elements in 10' or 1-16" within width of a single unit.

C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls and partitions, do not exceed 2" in any bay or 20' maximum, nor 3/4" in 40' or more.

D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4" nor plus 2".

E. Variation in mortar joint thickness: Do not exceed bed joint thickness indicated by more than plus or minus 1/8" with a maximum thickness limited to 2". Do not exceed head joint thickness indicated by more than plus or minus 1/8".

3.03 LAYING MASONRY WALLS

A. Layout walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to accurately locate openings, movement type joints, returns and offsets. Avoid the use of less-than-half-size units at corners, jambs and wherever possible at other locations.

B. Lay-up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other work.

C. Concrete Unit Masonry Pattern Bond: Lay all exterior and interior exposed concrete unit masonry in **RUNNING BOND PATTERN**. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2". Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4" horizontal face dimensions at corners or jambs.

D. Face Brick Pattern Bond: Unless specifically shown or noted otherwise on Drawings, lay exposed face brick in **RUNNING BOND PATTERN**, with vertical joint in each course centered on units in courses above and below. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2". Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4" horizontal face dimensions at corners or jambs.

E. Stopping and Resuming Work: Rack back 2 of unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if specified to be wetted) and remove loose masonry units and mortar prior to laying fresh masonry.

F. Built-In Work: As the work progresses, build-in items specified under this and other sections of these specifications. Fill in solidly with masonry around built-in items.

(1) Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.
(2) Where the hollow metal frame and masonry work make contact, the joint shall be raked clear of mortar and sealed under Division 7 Section "Joint Sealants".
(3) All cells of the masonry units for the extent of door anchors shall be filled solid with mortar the height of jambs.
(4) Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
(5) Fill cores in hollow concrete masonry units with grout 3 courses (24") under bearing plates, beams, lintels, posts and similar items, unless otherwise indicated.

3.04 MORTAR BEDDING AND JOINTING

A. Lay solid brick size masonry units with completely filled bed and head joint; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints.

B. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or filled with concrete or grout. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.

C. Maintain joint widths shown, except for minor variations required to maintain bond alignment. If not shown, lay walls with 3/8" joints.

D. Cut joints flush for masonry walls which are to be concealed or to be covered by other materials, unless otherwise indicated.

E. Tool exposed joints slightly concave using a jointer larger than joint thickness, unless otherwise indicated.

F. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners or jambs to shift adjacent stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.

3.05 STRUCTURAL BONDING OF MULTI-WYTHE MASONRY

A. Use continuous horizontal joint reinforcement installed I horizontal mortar joints for bond tie between wythes. Install at not more than 16" o.c. vertically.

B. Corners: Provide interlocking masonry unit bond in each course at corners, unless otherwise shown.

(1) For horizontally reinforced masonry, provide continuity at corners with prefabricated "L" units, in addition to masonry bonding.

C. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, provide same type of bonding specified for structural bonding between wythes and space as follows:

(1) Provide continuity with horizontal joint reinforcement using prefabricated "T" units.

D. Non-bearing Interior Partitions: Build to a height indicated on Drawings, except where indicated to be built tight to underside of roof deck above.

(1) Wedge non-bearing partitions against structure above with small pieces of tile, slate or metal. Fill joint with mortar after dead load deflection of structure above approaches final position.
(2) At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 7 Section "Fire-Safing."

3.06 CAVITY WALLS

A. Bond wythes of cavity walls together using one of the following methods:

1. Masonry Joint Reinforcement: Installed in horizontal mortar joints.

a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes or tab-type reinforcement.
b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.

2. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.

B. Keep cavity clean of mortar droppings and other materials during construction. Strike joints facing cavity flush.

C. Tie exterior wythe to back-up with continuous horizontal joint reinforcing, installed in mortar joints at not more than 16" o.c. vertically.

D. Coat cavity face of backup wythe to comply with Division 7 Section "Bituminous Damp-proofing."

E. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry, cast-in-place concrete or other construction as shown.

1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry or concrete substrate.

F. Provide weep holes in exterior wythe of cavity wall located immediately above ledges and flashing, spaced 2'-0" o.c. unless otherwise indicated.

3.07 HORIZONTAL JOINT REINFORCEMENT

A. General: Provide continuous horizontal joint reinforcement as indicated. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8" on exterior side of walls, 2“ elsewhere. Lap reinforcing a minimum of 6".

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Reinforce walls with continuous horizontal joint reinforcing unless specifically noted to be omitted.

D. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.

E. Space continuous horizontal reinforcement as follows:
(1) For multi-wythe walls (solid or cavity) where continuous horizontal reinforcement acts as structural bond or tie between wythes, space reinforcement as required by code, but not more than 16" o.c. vertically.
(2) For single-wythe walls, space reinforcement at 16" o.c. vertically unless otherwise indicated.

F. Reinforce masonry openings greater than 1'-0" wide, with horizontal joint reinforcement placed in 2 horizontal joints approximately 8" apart, immediately above the lintel and

immediately below the sill. Extend reinforcement a minimum of 2'-0" beyond jambs of the opening except at control joints.

(1) In addition to wall reinforcement, provide additional reinforcement at openings as required to comply with the above.

3.08 ANCHORING MASONRY TO STRUCTURAL STEEL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural steel members to comply with the following:

(1) Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
(2) Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
(3) Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.09 ANCHORING SINGLE-WYTHE MASONRY VENEER TO METAL STUDS

A. Anchor single-wythe masonry veneer to sheathed metal studs, cast-in-place concrete or fully grouted masonry, with masonry veneer anchors to comply with the following requirements:

(1) Fasten each anchor section through sheathing to metal studs, concrete or masonry with 2 metal fasteners of type indicated.
(2) Embed tie section in masonry joints. Provide not less than 1-1/2" air space between back of masonry veneer wythe and face of sheathing.
(3) Locate anchor section relative to course in which tie section is embedded to allow maximum vertical differential movement of tie up and down.
(4) Space anchors as indicated but not more than 18 inches o.c. vertically and 24 inches o.c. horizontally with not less than one anchor for each 2 sq. ft. of wall area. Install additional anchors within 1'-0" of openings and at intervals around perimeter not exceeding 8 inches.

3.10 INSTALLATION OF REINFORCED UNIT MASONRY

A. General: Install reinforced unit masonry to comply with requirements of referenced unit masonry standard and Structural Drawings and Specifications.

B. Temporary Formwork: Construct formwork and shores to support reinforced masonry elements during construction.
(1) Construct formwork to conform to shape, line, and dimensions shown. Make sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.

C. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.

D. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

3.11 CONTROL AND EXPANSION JOINT

A. General: Provide vertical and horizontal expansion, control and isolation joints in masonry where shown. Build-in as the masonry work progresses.

B. Build-in non-metallic joint fillers at locations indicated on Drawings.

3.12 LINTELS

A. Install steel lintels where indicated. See Architectural and Structural Drawings.

B. Provide masonry lintels where shown and wherever openings of more than 1'0" for brick size units and 2'0" for block size units are shown without structural steel or other supporting lintels. Provide pre-cast or formed-in-place masonry lintels. Cure pre-cast lintels before handling and installation. Temporarily support formed-in-place lintels.

(1) For hollow concrete masonry unit walls, use specially formed U-shaped lintel units with reinforcement bars placed as shown filled with coarse grout. See Architectural and Structural drawings.

C. Provide minimum bearing of 8" at each jamb unless otherwise indicated.

3.13 FLASHING OF MASONRY WORK

A. General: Provide concealed flashing in masonry work at or above shelf angles, lintels, ledges and other obstructions to the downward flow of water in the wall so as to divert such water to the exterior. Prepare masonry surfaces smooth and free from projections which could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with mastic before covering with mortar. Extend flashings through exterior face of masonry and turn down to form drip.

B. Extend flashing the full length of lintels and shelf angles and minimum of 4" into masonry each end. Extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4" and through the inner wythe to within 5/8" of the interior face of the wall in exposed work. Where interior surface of inner wythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 2". At heads and sills turn up ends not less than 2" to form a pan.

C. Interlock end joints of deformed metal flashings by overlapping deformations not less than 1-1/2" and seal lap with elastic sealant.

D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry or concrete.

D. Provide specified weep holes in the head joints of the first course of masonry immediately above concealed flashings. Space 24" o.c., unless otherwise indicated.

3.14 REPAIR, POINTING AND CLEANING

A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Pointing up all joints including corners, openings and adjacent work to provide a neat, uniform appearance, prepared for application of sealants.

C. Final Cleaning: After mortar is thoroughly set and cured, clean masonry as follows:

(1) Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.
(2) Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film or waterproof masking tape.
(3) Saturate wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
(4) Use bucket and brush hand cleaning method described in BIA "Technical Note No. 20 Revised" to clean brick masonry made from clay or shale, except use masonry cleaner indicated below.
(a) Acidic Cleaner; apply in compliance with directions of cleaner manufacturer.

(5) Clean concrete unit masonry to comply with masonry manufacturer's directions and applicable NCMA "Tek" bulletins.

D. Protection: Provide final protection and maintain conditions in a manner acceptable to installer, which ensures unit masonry work being without damage and deterioration at time of substantial completion.

END OF SECTION 04810

SECTION 04850 - MEMBRANE FLASHING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 DESCRIPTION OF WORK

A. Membrane flashing shall be installed at locations as shown on drawings.

1.03 RELATED SECTIONS

A. Division 4, Section 04810 “Unit Masonry”
B. Division 4, Section 04230 “Calcium Silicate Masonry Units”

1.03 SUBMITTALS

A. Furnish sample and manufacturer's data for Architect's approval.

PART 2 - PRODUCTS

2.01 MATERIALS – GENERAL

A. Flexible Flashing: For flashing not exposed to the exterior, use one of the following, unless otherwise indicated:

1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.030 inch.

a. Available Products:

1) Advanced Building Products Inc.; Peel-N-Seal.
2) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
3) Dayton Superior Corporation, Dur-O-Wal Division; Dur-O-Barrier-44.
4) Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
5) Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
6) Hohmann & Barnard, Inc.; Textroflash.
7) Polyguard Products, Inc.; Polyguard 300.
8) Polytite Manufacturing Corp.; Poly-Barrier Self-Adhering Wall Flashing.
9) Williams Products, Inc.; Everlastic MF-40.

2. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy as follows:

a. Monolithic Sheet: Elastomeric thermoplastic flashing, 0.040 inch thick.

b. Self-Adhesive Sheet: Elastomeric thermoplastic flashing, 0.025 inch thick, with a 0.015-inch- thick coating of rubberized-asphalt adhesive.

c. Self-Adhesive Sheet with Drip Edge: Elastomeric thermoplastic flashing, 0.025 inch thick, with a 0.015-inch- thick coating of rubberized-asphalt adhesive. Where flashing extends to face of masonry, rubberized-asphalt coating is held back approximately 1-1/2 inches from edge.

1) Color: Black.

d. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

1) Hyload, Inc.; Hyload Cloaked Flashing System, or approved equal.

3. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D 4637, 0.040 inch thick.

a. Available Products:

1) Carlisle Coatings & Waterproofing; Pre-Kleened EPDM Thru-Wall Flashing.
2) Firestone Building Products; FlashGuard.
3) Heckmann Building Products Inc.; No. 81 EPDM Thru-Wall Flashing.

B. Adhesives, Primers and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

PART 3 - EXECUTION

3.01 INSTALLATION

A. All surfaces to receive the flashing shall be reasonably smooth and free from irregularities. On all horizontal surfaces, the flashing shall be laid above a trowel coat of mastic. Vertical surfaces shall be spot tacked, to hold flashing in place.

B. Installation shall be done under Division 4 Unit Masonry Section.

END OF SECTION 04850

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Exterior non-load-bearing wall framing.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
   1. Design Loads: As indicated.
   2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
      a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height.
   3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
   4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
      a. Upward and downward movement of 1/2 inch.

B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
   1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
   2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
   3. Roof Trusses: Design according to AISI's "Standard for Cold-Formed Steel Framing - Truss Design."

1.4 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal trusses; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
   1. For cold-formed metal trusses indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Qualification Data: For professional engineer and testing agency.

E. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:
   1. Steel sheet.
   2. Expansion anchors.
   3. Power-actuated anchors.
   4. Mechanical fasteners.
   5. Vertical deflection clips.
   6. Horizontal drift deflection clips
   7. Miscellaneous structural clips and accessories.

F. Research/Evaluation Reports: For cold-formed metal framing.

1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.

D. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness.

E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

F. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

G. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
   1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:
   1. Allied Studco.
   2. AllSteel Products, Inc.
   3. California Expanded Metal Products Company.
   4. Clark Steel Framing.
   5. Consolidated Fabricators Corp.; Building Products Division.
   6. Craco Metals Manufacturing, LLC.
   7. Custom Stud, Inc.
   8. Dale/Incor.
   9. Design Shapes in Steel.
   10. Dietrich Metal Framing; a Worthington Industries Company.
   11. Formetal Co. Inc. (The).
   12. Innovative Steel Systems.
   13. MarinoWare; a division of Ware Industries.
   14. Quail Run Building Materials, Inc.
   15. SCAFCO Corporation.
   16. Southeastern Stud & Components, Inc.
   17. Steel Construction Systems.

18. Steeler, Inc.
19. Super Stud Building Products, Inc.
20. United Metal Products, Inc.

2.2 MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
   1. Grade: As required by structural performance.
   2. Coating: G60, A60, AZ50, or GF30.

B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
   1. Grade: As required by structural performance.
   2. Coating: G90.

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: as indicated.
   2. Flange Width: as indicated.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: Matching steel studs.
   2. Flange Width: 1-1/4 inches.

C. Vertical Deflection Clips: Manufacturer's standard bypass clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Dietrich Metal Framing; a Worthington Industries Company.
      b. MarinoWare, a division of Ware Industries.
      c. SCAFCO Corporation
      d. The Steel Network, Inc.
      e.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Minimum Base-Metal Thickness: as indicated.

3. Flange Width: 1 inch plus twice the design gap for other applications.

E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
a. Minimum Base-Metal Thickness: as indicated.
b. Flange Width: 1 inch plus twice the design gap for other applications <**Insert dimension**>.
2. Inner Track: Of web depth indicated, and as follows:
a. Minimum Base-Metal Thickness: as indicated.
b. Flange Width: as indicated

2.4 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers, knee braces, and girts.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.5 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel headless, hooked bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
   1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.6 MISCELLANEOUS MATERIALS

A. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, non-staining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

B. Shims: Load bearing, high-density multi-monomer plastic, non-leaching.

C. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.7 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
   1. Fabricate framing assemblies using jigs or templates.
   2. Cut framing members by sawing or shearing; do not torch cut.
   3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
   4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies' level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
   1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
   2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.
   1. Cut framing members by sawing or shearing; do not torch cut.
   2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
   1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:
   1. Stud Spacing: As indicated.
   2. Stud Spacing: As indicated.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
   1. Install single-leg deflection tracks and anchor to building structure.
   2. Install double deep-leg deflection tracks and anchor outer track to building structure.
   3. Connect vertical deflection clips to infill studs and anchor to building structure.
   4. Connect drift clips to cold formed metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
   1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
      a. Install solid blocking at 96-inch centers.
   2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
   3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.5 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 05500 - METAL FABRICATIONS

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including General and Supplementary (or Special) Conditions and Part 1 Specification Sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 SUMMARY

A. Extent of work is indicated on Drawings.

B. This section includes the following metal fabrications:

(1) Bearing and leveling plates.
(2) Loose steel lintels and edge angles.
(3) Miscellaneous framing and supports.
(4) Rough hardware.
(5) Steel handrails at Interior Ramp and at Mechanical Mezzanine Access Stairs and at locations indicated on Drawings.
(6) Steel pipe bollards
(7) C.I. Downspout boots

C. Gratings and Frames for New Storm Sewer System are specified in Division 2 Sections and on Civil Drawings.

F. Metal Stairs to Mezzanine 200 are specified in Section 05510 "Metal Stairs".

1.03 SUBMITTALS

A. General: Submit the following in accordance with conditions of contract and Division 1 Specification sections.

B. Product Data and Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other section.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that indicated for this project, with sufficient production capacity to produce required units without causing delay in the work.

B. Quality welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code-Steel," D1.3 "Structural Welding Code-Sheet Steel", and D1.2 "Structural Welding Code-Aluminum".

(1) Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.05 PROJECT CONDITIONS

A. Field measurements: Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay in work.

1.06 SYSTEM PERFORMANCE REQUIREMENTS

A. Structural Performance of Handrails and Railing Systems: Design, engineer, fabricate, and install handrails and railing systems to comply with requirements of ASTM E985 for structural performance based on testing performed in accordance with ASTM E894 and E935.

(1) Comply with Railing Load Requirements of 2015 International Building Code.

PART 2 - PRODUCTS

2.01 FERROUS METALS

A. Metal surfaces, general: For metal fabrications exposed to view upon completion of the work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.

B. Steel plates, shapes, and bars: ASTM A 36.

C. Uncoated Structural Steel Sheet: Product type (manufacturing method), quality, and grade as follows:

(1) Cold-Rolled Structural Steel Sheet: ASTM A 611, grade as follows:

(a) Grade A, unless otherwise indicated or required by design loading.

(2) Hot-Rolled Structural Steel Sheet: ASTM A 570, grade as follows:

(a) Grade 30, unless otherwise indicated or required by design loading.

D. Uncoated Steel Sheet: Commercial quality, product type (method of manufacture) as follows:
(1) Cold-Rolled Steel Sheet: ASTM A 366.
(2) Hot-Rolled Steel Sheet: ASTM A 569.

E. Galvanized Steel Sheet: Quality as follows:
(1) Commercial Quality: ASTM A 526, G90 coating designation unless otherwise indicated.

F. Cold-Formed Steel Tubing: ASTM A 500.
(1) For exterior installations, where indicated on Drawings, provide tubing with hot-dip galvanized coating per ASTM A 53.

G. Gray Iron Castings: ASTM A 48, Class 30.

H. Malleable Iron Castings: ASTM A 47, grade 32510.

I. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported items, unless otherwise indicated.

J. Stainless Steel: AISI Type 302/304, complying with ASTM A 167, 2D annealed finish, soft, except where harder temper required for forming or performance; 26 Gage.

K. Concrete Inserts: Threaded or wedge, type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.

L. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded.

2.02 GROUT AND ANCHORING CEMENT

A. Non-shrink Metallic Grout: Premixed, factory-packaged, ferrous aggregate grout complying with CE CRD-C 621, specifically recommended by manufacturer for heavy duty loading applications of type specified in this section.

B. Non-shrink Nonmetallic Grout: Premixed, factory-packaged, non-staining, non-corrosive, nongaseous grout complying with CE CRD-C 621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

C. Erosion-Resistant Anchoring Cement: Factory-prepackaged, non-shrink, non-staining, hydraulic controlled expansion cement formulation for mixing with water at project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without need for protection by a sealer or waterproof coating and is recommended for exterior use by manufacturer.

D. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include but are not limited to the following:

(1) Non-shrink Metallic Grouts:
"Hi Mod Grout"; Euclid Chemical Co.
"Embeco 885 and 636"; Master Builders
"Ferrolith G Redi-Mix and G-NC"; Sonneborn Building Products Div.,

(2) Non-shrink Nonmetallic Grouts:
"Euco N-S Grout"; Euclid Chemical Co.
"Masterflow 713"; Master Builders
"Sonogrout"; Sonneborn Building Products Div.,

(3) Erosion-Resistant Anchoring Cement
"Super Por-Rok"; Minwas Construction Products Division

2.03 FASTENERS AND MISCELLANEOUS MATERIALS:

A. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.

B. Bolts and Nuts: Regular hexagon head type, ASTM A307, Grade A.

C. Lag Bolts: Square head type, FS FF-B-561.

D. Machine Screws: Cadmium plated steel, FS FF-S-92.

E. Wood Screws: Flat head carbon steel, FS FF-S-111.

F. Plain Washers: Round, carbon steel, FS FF-W-92.

G. Drilled-in Expansion Anchors: Expansion anchors complying with FS FF-S-325, Group VIII (anchors, expansion, non-drilling), Type I (internally threaded tubular expansion anchor); and machine bolts complying with FS FF-B-575, Grade 5.

H. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.

I. Lock Washers: Helical spring type carbon steel, FS FF-W-84.

J. Solder: For use with stainless steel, provide 60-40 tin/lead solder (ASTM B 32), with acid-chloride type flux, except use rosin flux over tinned surfaces.

K. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of work, matching or compatible with material being installed, non-corrosive, size and gage required for performance.

2.04 PAINT

A. Shop Primer for Ferrous Metal: Manufacturer's or Fabricator's standard, fast-curing, lead-free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure complying with performance requirements of FS TT-P-645.

B. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers.

C. Zinc Chromate Primer: FS TT-P-645.

2.05 FABRICATION, GENERAL

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

C. Allow for thermal movement resulting from the maximum change (range) in ambient temperature in the design, fabrication and installation of installed metal assemblies to prevent buckling, opening up of joints, and over stressing of welds and fasteners.

D. Shear and punch metals cleanly and accurately. Remove burrs.

E. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Remove sharp or rough areas on exposed traffic surfaces.

G. Weld corners and seams continuously to comply with AWS recommendations and the following:

(1) Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
(2) Obtain fusion without undercut or overlap.
(3) Remove welding flux immediately.
(4) At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

J. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

K. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.

L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.06 ROUGH HARDWARE

A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 sections.

B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.07 BEARING AND LEVELING PLATES

A. Provide bearing and leveling plates (if any) for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required.

2.08 LOOSE STEEL LINTELS and EDGE ANGLES

A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions, at edge of slab at overhead doors and other locations as indicated. Slab edge angles are to be galvanized.

2.09 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports for applications indicated or which are not a part of structural steel framework, as required to complete work.

B. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware, hangers, and similar items.

2.10 STEEL PIPE HANDRAILS

A. General: Fabricate pipe railings and handrails to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of pipe, post spacings, and anchorage, but not less than that required to support structural loads.

B. Interconnect railing and handrail members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.

(1) At tee and cross intersections, notch ends of intersecting members to fit contour of pipe to which end is joined and weld all around.

C. Form changes in direction of railing members as follows:

(1) By radius bends of radius indicated.

(2) By mitering at elbow bends, unless otherwise indicated to have radius bend.

D. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross-section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of pipe.

E. Close exposed ends of pipe by welding 3/16” thick steel plate in place or by use of prefabricated fittings, except where clearance of end of pipe and adjoining wall surface is 1/4 inch or less.

F. Bracket, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnections of pipe and attachment of railings and handrails to other work, as shown on Drawings and as required. Furnish inserts and other anchorage devices for connecting railings and handrails to concrete, masonry or other miscellaneous steel work.

G. Provide wall returns at ends of wall-mounted handrails.

2.11 CAST IRON DOWNSPOUT BOOTS

A. Provide Cast Iron Downspout Boots as manufactured by J.R. Hoe, or equal in 4”x5” inlet size, A-Series x length as required (or Series and length as required to fit specific condition) at locations as indicated on the drawings. See Civil drawings for continuation of storm drainage beyond downspout boot.

2.12 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports for applications indicated or which are not a part of structural steel framework, as required to complete work.

B. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware, hangers, and similar items.

2.13 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish metal fabrications after assembly.

2.14 STEEL AND IRON FINISHES

A. Galvanizing: For those items indicated for galvanizing, apply zinc-coating by the hot-dip process compliance with the following requirements:
(1) ASTM A 153 for galvanizing iron and steel hardware.
(2) ASTM A 123 for galvanizing both fabricated and un-fabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick and heavier.

B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
(1) Exteriors (SSPC Zone 1B): SSPC-SP6 "Commercial Blast Cleaning".
(2) Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning".

C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finish or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirement of SSPC-PA1 "Paint Application Specification No. 1" for shop painting.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instruction, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

B. Set Sleeves, if any, in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

3.02 INSTALLATION, GENERAL

A. Fastening to In-place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, welds at steel substrates, and other connectors as required.

B. Cutting, fitting and placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

E. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used I correcting welding work, and the following:
   (1) Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   (2) Obtain fusion without undercut or overlap.
   (3) Remove welding flux immediately.
   (4) At exposed connections, finish exposed welds and surfaces smooth and blend so that no roughness shows after finishing and contour of welded surface matches those adjacent.

F. Corrosion Protection: Coat concealed surfaces of aluminum or stainless steel that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint or zinc chromate primer.

3.03 SETTING LOOSE PLATES AND ANGLES

A. Clean concrete and masonry bearing surfaces of any bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

B. Set loose leveling and bearing plates and angles on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.
   (1) Use metallic non-shrink grout in concealed locations where not exposed to moisture; use nonmetallic non-shrink grout in exposed locations, unless otherwise indicated.
   (2) Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.04 INSTALLATION OF STEEL PIPE RAILINGS AND HANDRAILS

A. Adjust railings prior to anchoring to ensure matching alignment at abutting joints. Space posts and/or railing wall brackets at spacing indicated, or if not indicated, as required by design loadings. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:

(1) Where indicated, anchor rail ends into concrete masonry with steel round flanges welded to rail ends and anchored into wall construction with lead expansion shields and bolts.

3.05 ADJUSTING AND CLEANING

A. Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal is specified in Division 9 Section "Painting", of these specifications.

B. For galvanized surfaces clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 05500

SECTION 05510 - METAL STAIRS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

(1) Straight run, steel-framed stairs, for interior stairs to Mechanical Mezzanine 200, as indicated on Drawings.

B. Related Sections: The following Sections contain requirements that relate to this Section.

(1) Division 5 Section 05500 "Metal Fabrications" for pipe handrails integral to metal stairs accessing Mechanical Mezzanine.
(2) Division 9 Section 09900 "Painting" for finish painting of metal stairs.

1.03 PERFORMANCE REQUIREMENTS

A. Structural Performance: Engineer, fabricate, and install steel stairs to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each component of steel stairs.

(1) Treads of Steel Stairs: Capable of withstanding a uniform load of 100 lbf per sq. ft. or a concentrated load of 300 lbf on an area of 4 sq. inches located in the center of the tread, whichever produces the greater stress.
(2) Platforms of Steel Stairs: Capable of withstanding a uniform load of 100 lbf per sq. ft.
(3) Stair Framing: Capable of withstanding stresses resulting from loads specified above as well as stresses resulting from railing system loads.

1.04 SUBMITTALS

A. Product data for metal stair components and accessories.

B. Shop drawings detailing fabrication and installation of steel stairs. Include plans, elevations, sections, and details of steel stairs and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other sections.

(1) For installed steel stairs indicated to comply with certain design loadings. include structural analysis data sealed and signed by the qualified professional engineer who was responsible for their preparation.

C. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing steel stairs similar to those indicated for this Project with a record of successful in-service performance and with sufficient production capacity to produce required units without delaying the Work.

B. Installer Qualifications: Arrange for steel stair installation specified in this Section by the same firm that fabricated them.

C. Engineer Qualifications: A professional engineer legally authorized to practice in jurisdiction where Project is located and experienced in providing engineering services of the kind indicated that have resulted in the installation of metal stairs (including handrails and railing systems) similar to this Project in material, design, and extent and that have a record of successful in-service performance.

D. Welding Standards: Comply with applicable provisions of AWS D1.1 “Structural Welding Code-Steel” and AWS D1.3 "Structural Welding Code-Sheet Steel."

(1) Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

PART 2 - PRODUCTS

2.01 FERROUS METALS

A. Metal Surfaces, General: For surfaces exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, roughness, or, for steel sheet, variations in flatness exceeding those permitted by referenced standards for stretcher-leveled sheet.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M, except ASTM 992 (Grade 50) for W shapes.

C. Steel Tubing: Product type (manufacturing method) and as follows:
(1) Cold-formed Steel Tubing; ASTM A 500.
(2) Hot-formed Steel Tubing; ASTM A 501.

D. Steel Pipe: ASTM A 53, standard weight (schedule 40), unless otherwise indicated, or another weight required by structural loads.

E. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

2.02 FASTENERS

A. General: Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head type, ASTM A 325 high strength and nuts, ASTM A 563 (ASTM A 563M), and where required, flat washers.

B. Machine Screws: ANSI B18.6.3 (ANSI B18.6.7M).

D. Lag Bolts: ANSI B18.2.1 (ANSI B18.2.3.8M).

E. Plain Washers: Round, carbon steel, ANSI B18.22.1 (ANSI B18.22M).

F. Lock Washers: Helical, spring type, carbon steel, AUSI B18.21.1.

G. Expansion Anchors: anchor bolt and sleeve assemblies of material indicated below with capacity to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

2.03 PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements of FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

2.04 GROUT

A. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, non-corrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.05 FABRICATION, GENERAL

A. Form steel stairs from materials of size, thickness, and shapes indicate, but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

C. Shear and punch metals cleanly and accurately.

D. Remove sharp or rough areas on exposed surfaces.

E. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Weld corners and seams continuously to comply with the following:
(1) Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
(2) Obtain fusion without undercut or overlap.
(3) Remove welding flux immediately.

(4) At exposed connections, finish exposed welds and surfaces smooth and blended

so that no roughness shows after finishing, and welded surface matches contours of adjoining surfaces.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

H. Shop Assembly: Preassemble in shop to greatest extent possible to minimize field splicing and assembly. Use connections that maintain structural value of joined pieces. Clearly mark units for field assembly and coordinated installation.

2.07 STEEL-FRAMED STAIRS

A. General: Construct stairs to conform to sizes and arrangements indicated. Join pieces together by welding, unless otherwise indicated. Provide complete stair assemblies, including metal framing, hangers, columns, struts, clips, brackets, bearing plates, or other components necessary for the support of stairs and platforms, and as required to anchor and contain the stairs on the supporting structure.
(1) NAAMM Stair Standard: Comply with ARecommended Voluntary Minimum Standards for Fixed metal Stairs@ in NAAMM “Metal Stair Manual” for class of stair designated, except where more stringent requirements are indicated.

B. Stair Framing: Fabricate stringers of structural steel tubes, or a channel-plate combination, as indicated. Provide closures for exposed ends of stringers. Construct platforms of structural steel channel headers and miscellaneous framing members as indicated. bolt or weld headers to stringers; and bolt or weld framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finish surfaces.
(1) Where concrete structure supports steel stairs, provide temporary supporting struts designed for erecting steel stair components as necessary.

C. Bar-Grate Type Metal Treads, and Platforms: As indicated on Drawings. Shape metal treads and platforms to conform to configuration shown. Provide thicknesses of structural steel as required to support total design loading.

(1) Attach treads and platforms to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal treads and platforms to brackets by welding, riveting, or bolting.
(2) Treads to include nosing integral with tread.
(3) Provide sub-platforms in configuration and thicknesses as required to support design loading. Attach sub-platform to platform framing members with welds.

2.08 FINISHES

A. General: Finish metal stairs after assembly.
(1) Comply with NAAMM “Metal Finishes Manual” for recommendations on application and designations of finishes.

B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed units:
(1) Interiors (SSPC Zone 1A: SSPC-SP 3 "Power Tool Cleaning".

C. Apply shop primer to uncoated surfaces, except those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, weld plates, and anchor bolts. Coordinate delivery of such items to Project site.

3.02 INSTALLATION, GENERAL

A. Fastening to In-place Construction: Provide anchorage devices and fasteners where necessary for securing steel stairs to in-place construction; include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors as required.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing steel stairs. Set units accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted field connections.

E. Field Welding: Comply with the following requirements:

(1) Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

(2) Obtain fusion without undercut or overlap.

(3) Remove welding flux immediately.

(4) At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and welded surface matches contours of adjoining surface.

3.03 ADJUSTING AND CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on steel stairs are specified in Division 9 Section APainting@.

END OF SECTION 05510

SECTION 05720 - HANDRAILS AND RAILINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Extent of work is indicated on Drawings and as follows:
   (1) New Exterior Steel Tube Handrails, as indicated on Drawings.

B. Related Sections: The following Sections contain requirements that relate to this Section.
   (1) Division 5 Section 05500 “Metal Fabrications”
   (2) Division 9 Section 09911 “Painting”.

1.03 DEFINITIONS

A. General: In engineering handrail and railing systems to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
   (1) Cold-formed Structural Steel: AISI “Specification for the Design of Cold-formed Steel Structural Members”.

B. Structural Performance of Railing Systems: Engineer, fabricate, and install railing systems to withstand the following structural loads without exceeding the allowable design working stress of the materials for handrails, railing systems, anchors, and connections. Apply each load to produce the maximum stress in each of the respective components comprising handrails and railing systems. Requirements are based on the 1994 Standard Building Code.
   (1) Top Rail of System: Capable of withstanding the following loads applied as indicated:
      (a) Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
      (b) Uniform load of 50 lbf per linear foot (730 N/m) applied horizontally and concurrently with uniform load of 100 lbf per linear foot (1460 N/m) applied vertically downward.
      (c) Concentrated and uniform loads above need not be assumed to act concurrently.

   (2) Handrails not serving as Top Rails: Capable of withstanding the following loads applied as indicated:
      (a) Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
      (b) Uniform load of 50 lbf per linear foot (730 N/m) applied in any direction.
      (c) Concentrated and uniform loads above need not be assumed to act concurrently.

   (3) Infill area of Railing Systems: Capable of withstanding a horizontal concentrated

load of 200 lbf (890 N) applied to 1 sq. ft. (0.09 sq. m) at any point in the system, including panels, intermediate rails, balusters, or other elements composing the infill area.

(a) Above load need not be assumed to act concurrently with loads on top rails of railing systems in determining stress on guard.

(4) Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.04 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specifications Sections.

B. Product data for manufacturer's product lines of handrails and railing systems assembled from standard components. Submit product data for grout, anchoring cement, and paint products.

C. Shop drawings showing fabrication and installation of handrails and railings, including plans, elevations, sections, details of components, and attachments to other units of Work.
(1) For installed handrails and railing systems indicated to comply with certain design loadings, include structural analysis data sealed and signed by the qualified professional engineer who was responsible for their preparation.

D. Samples for initial selection in the form of short sections of railing or flat sheet metal samples showing available mechanical finishes.

E. Samples for verification of each type of exposed finish required. Where finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.

F. Product test reports from a qualified independent testing agency evidencing compliance of handrails and railing systems with requirements based on comprehensive testing of current products.

1.05 QUALITY ASSURANCE

A. Single-source Responsibility: Obtain primary handrails and railing systems of each type and material from a single manufacturer.

1.06 STORAGE

A. Store handrails and railing systems inside a well-ventilated area, away from uncured concrete and masonry and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.

1.07 PROJECT CONDITIONS

A. Field Measurements: Where handrails and protective railings are indicated to fit to other

construction, check actual dimensions of other construction by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.08 SEQUENCING AND SCHEDULING

A. Sequence and coordinate installation of exterior protective railings and handrails as follows:
(1) Mount exterior handrails at steps, protective railings at Patio and ramp handrails only on completed concrete work properly prepared to receive railings. Do not support handrails temporarily by any means not satisfying structural performance requirements. See details and elevations for handrail mounting methods.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering handrails and railing systems that may be incorporated in the Work include, but are not limited to, the following:
(1) Main Entrance Handrails at Steps:
Steel tube, post-mounted railings fabricated in size, lengths and configuration as shown on elevations and sections.

2.02 METALS

A. General: Provide metal free from surface blemishes where exposed to view in the finished unit. Exposed-to-view surfaces exhibiting pitting, seam marks, roller marks, stains, discolorations, or other imperfections on finished units are not acceptable.

B. Steel and Iron: Provide steel and iron in the form indicated complying with the following requirements:
(1) Steel Tubing: Product type (manufacturing method) and other requirements as follows:
(a) Cold-formed Steel Tubing: ASTM A 500, grade as indicated below:
Grade A, unless otherwise indicated or required by structural loads.
(b) Hot-formed Steel Tubing: ASTM A 501.
(2) Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
(3) Gray Iron Castings: ASTM A 48, Class 30.
(4) Malleable Iron Castings: ASTM A 4 47, Grade 32510 (ASTM A 47M, Grade 22010).

C. Brackets, Flanges, and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

2.03 PAINT

A. Powder Coated: See Section 09900 for powder coating of all steel tube handrails in this section.

2.05 FABRICATION

A. General: Fabricate handrails to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of hollow members, post spacing, and anchorage, but not less than that required to support structural loads.

B. Assemble railing systems in shop to the greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping, handling and placement limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Form changes in direction of railing members as follows:
(1) By radius bends of radius indicated.
(2) By mitering at elbow bends.

D. Welded Connections: Fabricate steel railing systems and handrails for connecting members by welding. For connections made during fabrication, weld corners and seams continuously to comply with the following:

(1) Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
(2) Obtain fusion without undercut or overlap.
(3) Remove welding flux immediately.
(4) At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

E. Brackets, Flanges, Fittings, and Anchors: Provide brackets and anchors to connect handrail and railing members to other construction as shown on the drawings.

F. Close exposed ends of handrail and railing members with prefabricated end fittings.

2.06 FINISHES, GENERAL

A. Comply with NAAMM “Metal Finishes Manual” for recommendations relative to applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering prior to shipment.

C. Appearance of finished work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one half of the range of approved samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved samples and they are assembled or installed to minimize contrast.

2.08 IRON AND STEEL FINISHES

A. For non-galvanized steel handrails and railing systems, provide non-galvanized ferrous metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.

B. Preparation for Powder Coating: Prepare uncoated ferrous metal surfaces to comply with minimum powder coating requirements indicated in Section 09900.

(1) Paint all edges, corners, crevices, bolts, welds, and sharp edges at exterior railings.

PART 3 - EXECUTION

3.01 PREPARATION

A. Fit exposed connections accurately together to form tight, hairline joints.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing handrails and railings. Set handrails and railings accurately in location, alignment, and elevation, measured from established lines and levels and free from rack.

(1) Do not weld, cut, or abrade surfaces of handrails and railing components that have been coated or finished after fabrication and are intended for field connection by mechanical or other means without further cutting or fitting.
(2) Set posts plumb within a tolerance of 1/4 inch in 12 feet (2 mm in 1 m).
(3) Align rails so that variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (2 mm in 1 m).

C. Field Welding: Comply with the following requirements:

(1) Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
(2) Obtain fusion without undercut or overlap.
(3) Remove welding flux immediately.
(4) At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

D. Adjust handrails prior to anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated but not less than that required by structural loads.

E. Fastening to In-place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings systems and for properly transferring loads to in-place construction.

3.02 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components by welding. Cope or butt components to provide 100 percent contact, or use fittings designed for this purpose.

3.03 ADJUSTING AND CLEANING

A. Painting: Painting of all steel tube railings is specified in Division 9, Section 09900.

3.04 PROTECTION

A. Protect finishes of railing systems and handrails from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire units, or provide new units.

END OF SECTION 05720

SECTION 06100 –ROUGH AND FINISH CARPENTRY

PART I - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division I Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK

A. Definition: Interior finish carpentry includes carpentry not specified as part of other sections which may be covered by other work. Types of interior finish carpentry included in this section are:

(1) Wood framing and blocking.
(2) Plastic laminate for Casework counters.
(3) Plywood backing panels or backboards
(4) Interior running and standing wood trim, at all locations.
(5) Ornamental Round FRP Column Surrounds.

B. Related Sections:

(1) Section 061000 “Rough Carpentry” for concealed wood blocking, grounds and plywood backing panels.
(2) Section 06402 “Millwork” for cabinets and other millwork to receive wood mouldings specified in this section.
(3) Section 06650 “Solid Polymer Fabrications” for countertops where indicated.

C. Painting and staining of finish carpentry work is specified in Division 9 Section 09900 “Painting”.

1.03 REFERENCES

A. Comply with the applicable provisions of the “Architectural Woodwork Quality Standards, Guide Specifications and Quality Certification Program” (Latest Edition) of the Architectural Woodwork Institute (AWI) except as otherwise specified herein. References to “Premium”, “Custom” and “Economy” Grades herein, shall be as defined in that Standard.

1.04 SUBMITTALS

A. Shop Drawings, including full-size details and wood species for all interior finish carpentry indicated on Drawings.

B. Samples:

(1) Samples for interior finish carpentry items to receive transparent finish: One nominal 12” long sample of typical wood base moulding, to indicate compliance with wood species and quality specified herein.

1.05 MATERIAL HANDLING AND PROTECTION

A. All interior finish carpentry items shall be handled and stacked off the ground so as to protect them against damage. All items shall be protected from the weather while in

transit and after delivery to the site. All other material such as nails, bolts, etc. shall be protected and not allowed to rust. Store materials at temperature and humidity conditions recommended by manufacturers.

1.06 PROJECT CONDITIONS

A. Environmental Requirements: Maintain constant minimum temperature of 60 degrees F and maximum relative humidity of 55 percent in spaces to receive interior finish carpentry work.

PART II - MATERIALS

2.01 GENERAL

A. Lumber: Kiln-dried to eight percent (8%) for interior work.

B. Hardwoods:
(1) Hardwood for interior finish carpentry shall be Stain-grade Poplar, with a transparent finish conforming to AWI Custom Grade. Hardwood species shall not be mixed within the Project.

C. Fasteners:
(1) Nails and Staples shall comply with FS FF-N-101 and shall be cement coated, except use finishing type at finish carpentry items. Size and type to suit application; non-ferrous metal or galvanized steel for interior finish carpentry work in high humidity areas and wood to receive transparent finish.

D. Interior Running and Standing Trim receiving Transparent Finish: Clear stain grade as specified in 2.01B above; smooth surfaced, in profiles and sizes as indicated and scheduled on the Drawings.
(1) Comply with AWI Sections 300, 700, or 900 as applicable, and as otherwise specified herein.
(2) Interior Woodwork to receive transparent finish: AWI Custom Grade.
(3) Cut: Solid Wood; Plain Sawn
(4) Basis of Design: To establish minimum design and quality requirements, moulding profiles indicated on the Drawings are those of the following:
(a) Randall Brothers, Inc., Atlanta, GA
(b) Marshall Lumber & Mill Company, Montgomery, AL
(c) Equal products by other manufacturers will be considered, subject to compliance with Part 1 “Prior Approvals” section of the Project Manual.

E. Plastic laminate horizontal surfaces, vertical facings and all exposed edges over plywood backing where indicated:

(1) Plastic laminate shall be NEMA with satin finish as manufactured by Formica, Wilson-Art, Nevamar, or approved equal, in standard colors and pattern selected by Architect.
(a) General purpose grade: .050" thick, NEMA LD3-1980, type GP-50

F. Lumber which is to become a permanent part of the building shall be No. 2 common dimension Southern Yellow Pine, S4S to standard yard sizes and shall, where necessary, be job or mill ripped to sizes indicated on Drawings. Lumber shall be kiln dried to a moisture content of 19% or less. Lumber required to be treated shall be pressure treated with Wolman salts or approved equal, to a net retention of 0123 lbs. per cu. ft. in accordance with FS TT-W-571. Treated lumber shall be so marked. If lumber is

cut or sawed after treating shall be brush-coated or dipped with same preservative used at plant.

G. All other lumber (stud wall blocking, plates other than pressure treated, etc.) which is to become a permanent part of the building in this category, shall be No. 2 common dimension Spruce, S4S to standard yard sizes and shall, where necessary, be job or mill ripped for sizes indicated on the Drawings.

H. Plywood:

(1) APA Grade “C-D”, exterior glue, conforming to PSI-83, except A-D Grade at interior counters to receive plastic laminate.

I. Bolts, nuts and washers shall be non-corroding type. Types and sizes shall be as indicated on Drawings or as required to complete the Work.

J. Nails shall comply with FS FF-N-101 and shall be cement coated, except use finishing type at finish carpentry items.

K. Plastic laminate top, vertical facings, and edges over plywood backing for counters:

(1) Plastic laminate shall be NEMA with satin finish as manufactured by Formica, Wilson-Art, Nevamar, or approved equal, in standard colors and pattern selected by Architect.
(a) General purpose grade: .050" thick, NEMA LD3-1980, type GP-50.

L. Ornamental Round Endura-Stone FRP Column Surrounds:

(1) Round Tapered Column with true entasis taper and Tuscan Capital and Base.

a. Nominal Size: 14’-0” high x24” outside diameter (Plan Type “R”)
b. Acceptable Manufacturer: Equal to Endura-Craft ES2414ATPSATUTU as distributed by The Architectural Depot @ architecturaldepot.com

2.02 FABRICATION

A. Machine and sand wood surfaces to comply with the requirements of the AWI Quality Grade specified.

B. Mill assemble items to largest sizes practicable, to minimize field cutting and jointing. Allow for cutting and fitting where necessary to fit at the Job Site.

PART III – EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine substrate conditions and surfaces upon which finish carpentry work is to be installed. Do not proceed with finish work until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Condition the Work of this Section to average prevailing humidity conditions in installation areas, prior to installing.

3.03 INSTALLATION:

A. Comply with workmanship and finishing standard requirements of the AWI Quality Grade specified herein.

B. Execute interior finish carpentry in best substantial manner. Secure to wood blocking, grounds, wood frames and millwork items as shown on Drawings. Install the Work plumb, level and free of distortion. Shim where required with concealed shims. Bolts shall be drawn up tight; countersink and fill bolts and nails at exposed locations. Install blocking wherever shown or as required to maintain interior finish carpentry rigid, or provide adequate substrate for trim application.
   (1) Cut wood items to fit unless specified to be shop-fabricated, or shop-cut to exact size. Scribe and cut for accurate fit where work abuts other finish work.
   (2) Distribute defects to the greatest appearance advantage possible.

C. Interior and Exterior Running and Standing Trim shall be installed using full length pieces with minimum number of joints possible. Cope interior corners and miter outside corners to establish tight fitting joints with full surface contact throughout length of joint. Stagger joints in adjacent members. Countersink and conceal all fasteners for complete installation.

   (1) Nailing: Blind nail where possible. Use finishing nails where exposed. Set nail heads for filling.

   (2) Anchoring: Secure interior finish carpentry to anchors or to blocking which is built into or directly attached to substrates.

D. Exposed nail and screw heads shall be set or countersunk before putty is applied.

E. See Division 9 Section 09900, "PAINTING & STAINING" for final finishing of installed finish carpentry.

3.04 INSTALLATION OF PLYWOOD

A. Comply with recommendations of American Plywood Association (APA).

3.05 PROTECTION

A. Protect installed interior finish carpentry work from damage by work of other trades. Maintain temperature and humidity requirements during the construction period at interior installation areas.

END OF SECTION 06100

SECTION 06160 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Glued-laminated wood sheathing (plywood wall sheathing).
2. Fiberglass-mat faced, moisture resistant gypsum sheathing.
3. Plywood
4. Plywood and gypsum sheathing accessories.
5. Plywood decking.

B. Related Sections:

1. Division 5 Section 05400 “Cold Formed Framing” and Division 9 Section 09250 "Gypsum Drywall" for light-gauge steel stud and joist framing to receive plywood or glass mat gypsum sheathing board.
2. Division 6 Section 06100 "Rough Carpentry" for dimension lumber items associated with wood sheathing and gypsum sheathing.
3. Division 7 Section 07240 “Exterior Insulation and Finish System” for installing glass mat gypsum board sheathing integral with exterior insulation and finish system.
4. Division 7 Section 073113 "Asphalt Shingles" for installing plywood decking integral to vented nail-base insulation installed with shingle roofing system.

1.3 DEFINITIONS

A. Plywood grading agencies, and the abbreviations used to reference them, include the following:

1. APA: The Engineered Wood Association.
2. AWPA: American Wood Preservers’ Association.
3. SPIB: The Southern Pine Inspection Bureau.

B. IBC: 2021 International Building Code

1.4 REFERENCES

A. ASTM International (ASTM):

1. ASTM C473 Standard Test Methods for Physical Testing of Gypsum Panel Products.
2. ASTM C518 Standard Test Methods for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

3. ASTM C1002 Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
4. ASTM C1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
5. ASTM C1280 Standard Specification for Application of Gypsum Sheathing.
6. ASTM E72 Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
7. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.

B. Gypsum Association:

1. GA-254 Application of Gypsum Sheathing.

1.5 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Schedule delivery of wood decking and gypsum sheathing to avoid extended on-site storage and to avoid delaying the Work.

B. Store materials under cover and protected from weather and contact with damp or wet surfaces. Provide for air circulation within and around stacks and under temporary coverings. Stack wood decking and gypsum sheathing with surfaces that are to be exposed in the final Work protected from exposure to sunlight.

C. When handing plywood, avoid dropping panels on edges to prevent splintering or chipping.

1.7 JOB CONDITIONS

A. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring strips, nailers, blocking, framing members and similar supports to allow proper attachment other work.

B. Once wood material has been installed, protect by applying temporary covering, siding and roofing as soon as possible.

C. All pressure-preservative-treated lumber shall not to come in direct contact with any metal components, including steel decking. All treated wood blocking, nailers, framing members, curb supports, decking and plywood sheathing must be separated from metals with one

course of elastomeric underlayment unless an alternate method of separation is indicated or specified in other divisions of this Project Manual.

1.8 **WARRANTY**

A. Provide gypsum sheathing products that offer twelve (12) months of coverage against in-place exposure damage (delamination, deterioration and decay).

B. Manufacturer's Warranty:

1. Five (5) years against manufacturing defects.

PART 2 - PRODUCTS

2.1 WOOD DECKING, GENERAL

A. General: Comply with DOC PS 20 and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.

2.2 WOOD-PRESERVATIVE-TREATED

A. Preservative Treatment by Pressure Process: AWPA C2**,** except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX)].

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Plywood, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2.3 GLUED-LAMINATED WOOD SHEATHING

A. Provide engineered wood products that comply with APA standards; The Engineered Wood Construction Guide. Only products bearing the APA trademark will be accepted for use on this project.

1. Laminating Adhesive: Wet-use type complying with ASTM D 2559.
2. Species: Southern pine.
3. Grade: C-D Group 1
4. Exposure Durability Classification: Exterior

5. Decking Nominal Size: 4 x 8.
6. Nominal Thicknesses: ½ inch or ¾ inch, as indicated on drawings.
7. Edge Pattern: Square-edge.

2.4 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: 30 to 40 mils thick minimum, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.
2. Low Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.
3. Products:

a. Carlisle Coatings & Waterproofing, Div. of Carlisle Companies Inc.; Dri-Start "HR" High Performance Roofing Underlayment.
b. Grace, W. R. & Co.; Vycor Ultra.
c. Henry Company; Perma-Seal PE.

2.5 WOOD SHEATHING FASTENERS

A. Provide fastener size, spacing and type complying with recommendations of American Plywood Association, and the following:

1. Where exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153.

2. Nails, Wire, Brads and Staples: FS FF-N-105.

3. Power Driven Fasteners: National Evaluation Report NER-272, for power driven nails, screws or staples used in all types of building construction, issued by ICC-ES to ISANTA.

4. Wood Screws: ANSI B18.6.1.

5. Lag Bolts: ANSI B18.2.1.

2.6 FIBERGLASS-MAT FACED, MOISTURE RESISTANT GYPSUM SHEATHING

A. Available Manufacturers: The following performance specification is intended to meet specific design, maintenance and functional requirements necessary to this project. It is not intended to limit competitive bidding, but rather encourage participation from all qualified manufacturers which have the performance criteria as outlined in Part 2 of this section. Equal products by other manufacturers will be considered subject to ten (10) day prior approval.

B. Available manufacturers: The following manufacturer and product has been accorded preliminary approval:

Georgia-Pacific Gypsum LLC: Fiberglass-Mat Faced Gypsum Sheathing **DENSGLASS GOLD**.

C. Manufacturers wishing to bid must submit the following to the Architect no less than ten (10) days prior to the bid date:

1. Manufacturer's Product Data.
2. Certified test reports showing conformance with requirements as specified.
3. Approval shall be by written addendum only. Verbal approval will not be given.

D. Materials: Fiberglass-Mat Faced Gypsum Sheathing (ASTM C1177):

1. Thickness: 1/2 inch.
2. Width: 4 feet.
3. Length: 8 feet.
4. Weight: 1,900 pounds per M square feet.
5. Edges: Square.
6. Surfacing: Coated fiberglass mat on face, back, and long edges.
7. Racking Strength (Ultimate, not design value) (ASTM E72): Not less than 540 PSF, dry.
8. Flexural Strength, Parallel (ASTM C472): 8o lbf, parallel.
9. Humidified Deflection (ASTM C1177): Not more than 1/4 inch.
10. Permeance (ASTM E96): 23 perms.
11. R-Value (ASTM C518): 0.56.

E. Accessories:

1. Screws: ASTM C1002, corrosion-resistant treated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions / Inspection: Verify that project conditions and substrates are acceptable to the installer, prior to beginning work of this section.

B. Examine walls and support framing in areas to receive wood decking and gypsum sheathing, for compliance with installation tolerances and other conditions affecting performance.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Install additional fasteners as required to comply with project wind uplift requirements.

3.2 INSTALLATION

A. Install laminated wood sheathing as required to comply with the APA "Engineered Wood Construction Guide".

1. Install wood sheathing with long joints in a continuous straight line with end joints staggered between rows a minimum of 24 inches, 48 inches where possible. Provide metal "H" clips at all unsupported edges, creating 1/8 inch spacing at all edge and end joints.

B. Attach all plywood to substrate framing. Anchor with specified fasteners to resist building code wind loading requirements unless a more stringent fastening rate is specified.

1. Fasten plywood at 6” centers into each support.

C. Examine support framing in areas to receive wood sheathing, for compliance with installation tolerances and other conditions affecting performance of wood sheathing.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Provide pressure-preservative-treated plywood of indicated thicknesses.

1. Provide elastomeric underlayment where pressure treated lumber will be in contact with sheet steel components; steel deck, sheet metal flashings, bent angle plates, etc. unless an alternate method of separation is indicated or specified in other specification divisions of this Project Manual.

E. Gypsum Sheathing: Install in strict accordance with ASTM C1280 and with manufacturer’s written recommendations.

1. Install per the current product catalog of Georgia-Pacific Gypsum, or equal.

3.3 ADJUSTING

A. Repair damaged surfaces and finishes after completing erection. Replace damaged decking and sheathing if repairs are not approved by Architect.

3.4 PROTECTION

A. Provide temporary waterproof covering as the Work progresses to protect roof decking and gypsum sheathing until roofing and other covering materials are applied.

B. Coordinate with requirements for underlayment in Division 7 Roofing Sections.

END OF SECTION 06160

SECTION 06402 - MILLWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 DESCRIPTION OF WORK

A. Extent of Millwork is indicated on Drawings, including:

(1) New Council Dais at Council Chambers 117.

B. Related Sections:

(1) Section 06202 “Finish Carpentry” for applied wood mouldings integral with new millwork.
(2) Section 06650 “Solid Polymer Fabrications” at indicated countertops.

C. Painting and staining of finish carpentry and millwork is specified in Division 9 Section 09900 “Painting”.

1.03 SUBMITTALS

A. Product Data: Shop drawings shall be furnished for all fabricated items of millwork and cabinet work. Drawings shall show elevations, sections, joining and shall have noted thereon grades and type of materials.

1.04 FINISHING

A. Finishing shall be accomplished under Division 9, Section 09900 “Painting”.

1.05 MILLWORK SUPPLIER

A. Millwork supplier shall have a minimum of five (5) years of experience in this field.

1.06 MOISTURE CONTENT

A. The moisture content for all items of millwork shall be a maximum of 10 percent. Millwork shall be of materials which have been seasoned and kiln dried.

1.07 QUALITY STANDARDS

A. Quality Standards for millwork shall be Architectural Woodwork Institute (AWI) latest edition.

1.08 STORAGE AND PROTECTION OF MATERIALS

A. Material shall not be delivered to the job until building is closed in, dry and protected from the extreme cold.

B. Materials shall be stored to protect them from damage and shall be stacked straight. Members shall be spaced apart so that air can freely circulate around individual pieces of wood. If pieces are evenly bundled and strapped, the bundle shall be stored to allow circulation.

C. All damaged material shall be removed from the site immediately.

1.09 COOPERATION WITH OTHER TRADES

A. This work includes cutting and framing material for other trades for the completion of their work and then to restore the structural strength and finished appearance to its original state.

B. This work includes the installation of anchors and straps for other trades.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Exposed solid wood: Select Stain Grade Poplar.

B. Exposed plywood: NIST PS 1; graded in accordance with AWI-200, core materials of veneer, type of glue recommended for application: Birch face veneer, plain-sliced cut.

C. Concealed solid wood: B & BTR. Ponderosa pine.

D. Concealed plywood: DFPA Rotary Fir.

(1) Dividers: A-A Grade.
(2) Backing: A-D Grade.

E. Adhesive: CS 35, Type II.

PART 3 - INSTALLATION

3.01 WORKMANSHIP

A. All work shall be constructed and assembled at the mill, to the greatest extent possible, and shipped to the job. Where units have to be shipped to the job broken down for moving into the building, the units shall be constructed to have ample room for cutting, connecting and fitting

B. All cabinet/counter work shall have the corners hot glued and be braced at the corners to conceal shrinkage. (Mortise and Tenon, Dowel or Biscuit Construction at stiles and rails).

C. No end grains shall be allowed to show and all returns and corners shall be mitered.

D. Built-up items shall be clamp glued as well as nailed.

E. All face nailing shall be with finishing nails set to receive putty.

F. Nails shall be spaced to have positive anchorage and avoid splitting.

G. All members shall be long lengths if possible reducing number of joints.

H. Hammer marks on a member on cabinet work shall be reason for rejection.

I. Returns and internal corners shall be coped. External corners shall be mitered.

J. Backs of wide members shall be kerfed.

K. Hand sand finish surfaces to remove machine or tool marks.

3.02 PRIMING

A. All back priming shall be done under Division 9. Any wood coming in contact with masonry or concrete shall be back-primed.

3.03 INSTALLATION OF CABINETS

A. All cabinets/counters and other millwork shall be secured to the floor and/or walls.

3.04 CLEANING

A. Prior to application of transparent stained finish, done under another section, all cabinet work shall be inspected for any marks or blemishes and repairs made. Remove all dust and debris from cabinets and wipe clean.

END OF SECTION 06402

SECTION 06650 - SOLID POLYMER FABRICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and other Part 1 Specifications sections, apply to this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 DESCRIPTION OF WORK

A. Extent of solid polymer fabrications is indicated on Drawings and as follows:

(1) Countertops and Edges at indicated locations. See Interior Elevations and Details.

B. Related Work specified elsewhere:

(1) Division 6 Section “Rough Carpentry” for plywood backing at solid polymer surfaces.
(2) Division 6 Section "Finish Carpentry".
(2) Division 9 Sections “Gypsum Drywall”, “Tile” and “Painting”.
(3) Division 12 Section 12304 "Modular Laminate Casework."

1.03 REFERENCES

A. Applicable Standards: Standards of the following, as referenced herein:

(1) American National Standards Institute (ANSI)
(2) American Society for Testing and Materials (ASTM)
(3) National Electrical Manufacturer's Associations (NEMA)
(4) Federal Specifications (FS)

1.04 SUBMITTALS

A. Shop drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work.

B. Samples: Submit minimum 2"x 2" (50mm x 50mm) samples. Indicate full range of color and pattern variation. Approved samples will be retained as standards for work.

C. Product data: Indicate product description, fabrication information and compliance with specified performance requirements.

D. Maintenance data: Submit manufacturer’s care and maintenance data, including repair and cleaning instructions. Include in project close-out documents.

1.05 QUALITY ASSURANCE

A. Allowable tolerances:
(1) Variation in component size: (3mm).
(2) Location of openings: (3mm) from indicated location.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver no components to project site until areas are ready for installation. Store components indoors prior to installation.

B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.07 **WARRANTY**

A. Provide manufacturer's 10-year warranty against defects in materials. Warranty shall provide material and labor to repair or replace defective materials. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. For purpose of determining minimum performance and quality standards, this specification is based upon **Formica Solid Surfacing**™ solid polymer fabrications as manufactured by Formica Corporation.

B. Equal products by Dupont (Corian), WilsonArt International, Nevamar, Samsung (Staron), will be accepted.

C. Equal products of other manufacturers will be considered, subject to submission in accordance with the “Prior Approval” section of these specifications.

2.02 MATERIALS

A. Homogenous filled acrylic; not coated, laminated or of composite construction; meeting ANSI Z124.3 & 6, Type Six, and Fed. Spec. WW-P-541E/GEN.

(1) Flame Spread: Less than 25
(2) Smoke Developed: Less than 25
(3) Superficial damage to a depth of 0.010" (.25mm) shall be repairable by sanding and polishing.

B. Thickness: ½”, as indicated on Drawings.

C. Pattern and Color: Equal to **Dupont Corian Solid Surfacing, “Terra Collection**”. Pattern and color selection is intended to establish a price range for solid polymer fabrications. The Architect reserves the right to select other standard patterns and colors within the established price range.

2.03 ACCESSORY PRODUCTS

A. Joint adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, non-porous joints, with a chemical bond. (Technical Bulletin: CTDC 102).

B. Sealant: Manufacturer's standard mildew-resistant, FDA/UL recognized silicone sealant in color matching or clear formulations. (Technical Bulletin: 102, 127).

2.04 FABRICATION

A. Fabrication shall be performed by a company certified by the manufacturers.

B. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's requirements.

C. Form joints between components using manufacturer=s standard joint adhesive. Joints shall be inconspicuous in appearance and without voids. Attach 2" (50mm) wide reinforcing strip under each joint.

D. Rout and finish component edges to a smooth, uniform finish as detailed. Rout all cutouts, then sand all edges smooth. Repair or reject defective or inaccurate work.

E. Finish: All surfaces shall have uniform finish.
(1) Matte, with a gloss rating of 5-20.

PART 3 - EXECUTION

3.01 JOB MOCK-UP

A. Prior to final approval of shop drawings, erect one full size mock-up of each component at project site for Architect review. Should mock-up not be approved, rework or remake until approval is secured. Remove rejected units from project site.

B. Approved mock-ups may remain as part of finished work.

3.02 INSTALLATION

A. Install components plumb and level, in accordance with approved shop drawings and product installation details.
(1) Edge Treatment: Ease edges as indicated on Drawings.

B. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.

C. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Components shall be clean on Date of Substantial Completion.

D. Protect surfaces form damage until Date of Substantial Completion. Repair or replace damaged work that cannot be repaired to Architect's satisfaction.

E. Provide manufacturer's care and maintenance recommendations to Architect at project close out. Review same with Owner's maintenance personnel.

END OF SECTION 06650

SECTION 07210 - BUILDING INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part-1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect Work or requirements of this Section is mandatory.

1.02 DESCRIPTION OF WORK

A. Extent of insulation work is shown on drawings and indicated by provisions of this section.

B. Applications of insulation specified in this section include the following:

(1) Unfaced Blanket-type Building Insulation as indicated on Drawings at the following locations:

(a) Exterior metal stud framing at locations shown on Wall Sections.
(c) Attic Insulation at bottom chord of roof trusses as shown on Sections.

C. Weather Barrier Membranes over gypsum sheathing are specified in Division 7 Section 07250 “Weather Barriers.”

D. Rigid Roofing Insulation Board is specified in the Division 7 section in which other roofing products are covered.

E. Rigid Insulation as part of Exterior Insulation and Finish System (E.I.F.S.) is specified in Division 7 Section 07240 “Exterior Insulation & Finish System.”

F. Un-faced Sound Attenuation Blankets are specified in Division 9, Section 09250 “Gypsum Board.”

G. Plumbing and HVAC insulation is specified in Division 15 sections.

1.03 QUALITY ASSURANCE

A. Thermal Resistivity: Where thermal resistivity properties of insulation materials are designated by R-values, they represent the rate of heat flow through a homogenous material exactly 1" thick, measured by test method included in referenced material standard or otherwise indicated. They are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.

B. Fire Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.

(1) Surface Burning Characteristics: ASTM E 84
(2) Fire Resistance Ratings: ASTM E 119

(3) Combustion Characteristics: ASTM E 136
(4) All insulation materials shall be asbestos free.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's product literature and installation instructions for each type of insulation material required.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General Protection: Protect insulations from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following:

(1) Manufacturers of Glass Fiber Insulation:

(a) CertainTeed Corp.
(b) Johns Manville, Inc.
(c) Owens-Corning Fiberglass Corp.

2.02 INSULATING MATERIALS

A. General: Provide insulating materials which comply with requirements indicated for materials, compliance with referenced standards, and other characteristics.

(1) Insulation shall be in thicknesses and R-values as indicated herein or on Drawings.

B. Unfaced Mineral Fiber Blanket/Batt Insulation: Thermal insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with **ASTM C 665** for **Type I** (blankets without membrane facing); and as follows:

(1) Mineral Fiber Type: Fibers manufactured from glass.

(2) Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively, when tested in accordance with ASTM E 84.

(3) **Thermal Resistance (R) 11**; per ASTM C518 for 2-1/2" thick blankets, at exterior wall structural steel beams, as indicated on Drawings.

(4) **Thermal Resistance (R) 19**; per ASTM C518 for nominal six inch (6") thick blankets, at typical exterior 6” steel stud wall framing, as indicated on Drawings.

(5) **Thermal Resistance (R) 30**; per ASTM C528 for 9-1/2” thick blankets, at bottom chord of trusses as indicated on Drawings.

(7) Locations: Where indicated on Drawings.

2.03 AUXILIARY INSULATING MATERIALS

A. Types recommended by insulation manufacturer, including insulation supports, clips, fasteners and other accessories.

B. Attic insulation to be suspended on wire mesh at bottom chord of trusses or wire mesh on hanger wires as indicated on the drawings.

PART 3 - EXECUTION

3.01 INSPECTION AND PREPARATION

A. Require Installer to examine substrates and conditions under which insulation work is to be performed. A satisfactory substrate is one that complies with requirements of the section in which substrate and related work is specified. Obtain Installer's written report listing conditions detrimental to performance of work in this section. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

B. Clean Substrates of substances harmful to insulations.

3.02 INSTALLATION, GENERAL

A. Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.

B. Extend insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.

C. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

3.03 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Do not obstruct ventilation spaces, except for fire-stopping.

C. Stuff loose glass fiber insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40% of normal maximum volume (to a density of approximately 2.5 lbs. per cu. ft.).

3.04 CLEAN-UP

A. Remove and dispose of excess insulation, wrappings and other waste materials.

3.05 PROTECTION

A. General: Protect installed insulation from harmful weather exposures and from possible physical abuses, where possible by non-delayed installation of concealing work or where that is not possible, by temporary covering or enclosure.

END OF SECTION 07210

SECTION 07240 - EXTERIOR INSULATION AND FINISH SYSTEM

PART I - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 SUMMARY

A. Extent of exterior insulation and finish systems (E.I.F.S.) is indicated on drawings.

B. Types of Exterior Insulation and Finish System applications in this section include the following:

(1) Applications over gypsum sheathing at exterior wall metal stud framing at locations as indicated on the drawings
(2) E.I.F.S. Accessories: Continuous PVC Soffit Vent System

C. Metal Stud Framing is specified in Division 5, Section 05400” Cold-Formed Metal Framing.”

D. Gypsum Sheathing is specified in Division 6, Section 06160 “Sheathing”.

E. Sealing joints is specified in Division 7, Section 07920 "Joint Sealants".

1.03 DEFINITIONS

A. Exterior insulation and finish system refers to an exterior assembly composed of an inner layer of thermal insulation board and an outer layer forming the protective finish coating. The assembly is applied to a supporting substrate of construction indicated. Designations below for the class and type of exterior insulation and finish system specified in this section are based on those developed by the Exterior Insulation Manufacturers Association (EIMA).

(1) Class PB Type A designates a polymer-based protective finish coating (Class PB), externally reinforced (Type A).
(2) System shall have mildew-resistant coating.

B. System in this section refers to Class PB Type A exterior insulation and finish systems.

C. System manufacturer refers to the manufacturer of the exterior insulation and finish system.

1.04 SYSTEM DESCRIPTION

A. Provide system complying with the following performance requirements:

(1) Bond Integrity: Free from bond failure within system components or between system and supporting wall construction, resulting from exposure to fire, wind loads, weather, or other in-service conditions.

(2) System shall have been tested at full scale for impact resistance and structural load capacity per ASTM E72 and E330 respectively.

(3) Weather-tightness: Resistant to water penetration from exterior into system and assemblies behind it or through them into interior of building which results in deterioration of thermal-insulating effectiveness or other degradation of system and assemblies behind system including substrates, supporting wall construction, and interior finish.

(a) System shall have been tested for moisture resistance, rain resistance, absorption-freeze, accelerated weathering, mildew resistance, salt spray resistance, chemical resistance, and abrasion resistance.

B. Basis for Design (See Paragraph 2.01A, Page 5): **Dryvit Outsulation Plus MD System** is an Exterior Insulation and Finish System (EIFS), Class PB consisting of a secondary weather resistive barrier (Dryvit Backstop), adhesive (Dryvit Primus, Genesis, or Genesis DM) Dryvit reinforcing mesh, and Dryvit finish.

(1) Design requirements:

(a) Acceptable Substrates shall include:

(1) Silicone treated gypsum core sheathing surfaced with inorganic fiberglass mats meeting ASTM C1177.

(2) Unglazed brick, cement plaster, concrete or concrete masonry.

(b) Deflection of the substrate systems shall not exceed 1/240 times the span.

(c) The substrate shall be flat within 6.4 mm (1/4" in a 1.2 m (4') radius.

(2) Performance requirements:

(a) **The Outsulation Plus MD System** shall have been tested for durability as follows:

(1) Abrasion Resistance: ASTM D968; no deleterious effects after 500 liters (132 gal).

(2) Absorption, Freeze-thaw: 60 cycles, slak at 20 deg. C (68 deg.F) for four days, then -10 deg. C (14 deg. F) for two hours, then 20 deg. C (68 deg. F) for two hours; no checking, cracking, or splitting.

(3) Accelerated Weathering: ASTM G23 (Federal Test Standard 141A Method 6151); 2000 hours. No deterioration.

(4) Mildew Resistance: Mil Standard 810B; passes.

(5) Moisture Resistance: ASTM D2247 (Federal Test Standard 141A Method 6201); no deleterious effects after 14 days.

(6) Salt Spray Resistance: ASTM B117 Federal Test Standard 141A Method 6061; 5% concentration for 300 hours. No deleterious effects.

(7) Air leakage: ASTM E283; less than 0.301 1/min/m^2 (.001 cfm/ft^2) classified as a Type III air barrier as defined by the National Research Council of Canada.

(8) Water Penetration: ASTM E331; no water penetration to the inner most surface of the test specimen.

(9) Drainage: ASTM E331; 97% drainage efficiency.

(10) Water Vapor Transmission: ASTM E96 Procedure B; Standard lamina: 10 g/hr.m^2 (14 gr/hr.ft^2).

(b) **The Outsulation Plus MD System** shall have been tested for structural performance as follows:

(1) Tensile Bond Strength: ASTM C297.

(a) Backstop to exterior grade gypsum sheathing: 62.7 kPa (9.1 psi) sheathing facer failure.
(b) Backstop to Dens-Glass Gold: 199 kPa (28.8 psi) sheathing facer failure.
(c) Backstop to concrete/concrete block: 290 kPa (42.07 psi) substrate failure.
(d) Primus to Backstop: Minimum 86.9 kPa (12.6 psi).
(e) Genesis to Backstop: Minimum 104 kPa (15.1 psi).

(2) Full Scale Structural Tests: ASTM E330; minimum failure load under positive or negative load of 4.3 kPa (90 psf) unless otherwise specified; substrate failure.

(3) Impact Resistance: In accordance with EIMA Standard 101.86. Refer to table below: Panzer mesh used in conjunction with Standard mesh is recommended for areas exposed to high traffic.

Reinforcing Mesh/Weight g/m^2 (oz/yd^2)	EIMA Impact Classification	EIMA Impact Range Joules (In-lbs)		Impact Test Results Joules (In-lbs)	
Standard™ - 146 (4.3)	Level 1	3-6	(25-49)	4	(36)
Standard Plus™ - 203 (6)	Level 2	6-10	(50-89)	6	(56)
Intermediate® - 407 (12)	Level 3	10-17	(90-150)	12	(108)
Panzer® 15* - 509 (15)	Level 4	>17	(>150)	18	(162)
Panzer 20* - 695 (20.5)	Level 4	>17	(>150)	40	(352)
Detail® Short Rolls - 146 (4.3)	n/a	n/a	n/a	n/a	n/a
Corner Mesh - 244 (7.2)	n/a	n/a	n/a	n/a	n/a

*Shall be used in conjunction with Standard Mesh

(c) **The Outsulation Plus MD System** shall have been tested for fire performance as follows:

(1) Surface burning Characteristics: ASTM E84:
(a) The EPS insulation board shall have a Flame Spread index not exceeding 25 and a Smoke Developed index not exceeding 450.
(b) The adhesives and coatings shall have a Flame Spread index not exceeding 20 and a Smoke Developed index not exceeding 10.

(2) ASTM E108 (Modified) Full Scale Fire Test; passed.

(3) UBC 26-9 Intermediate Scale Multi-Story Test (ISMA); passed.

(4) Ignitability Characteristics: BOCA National Building Code Radiant Heat Exposure Test of Exterior Wall Assemblies; passed.

1.05 SUBMITTALS

A. Product Data: Manufacturer's technical data for each component of exterior insulation and finish system.

B. Samples for Initial Selection Purposes: Manufacturer=s standard color charts, trim accessory samples, and small scale samples indicating textural choices available.

(1) Submit sealant manufacturer's standard bead samples consisting of strips of actual products showing full range of colors available.

(2) Color and Texture of new exterior insulation and finish system shall be selected from the manufacturer's standard palette of colors and textures.

(3) Samples for Verification Purposes: Samples, 2' square, for each finish, color and texture indicated; prepare samples using same tools and techniques intended for actual work.

(4) Obtain Architect's acceptance of samples before start of final work.

(5) Incorporate within each sample a typical control joint filled with sealant of color indicated or selected.

(6) Retain samples during construction for judging completed work.

C. Installer certificates signed by manufacturer certifying that Installers comply with specified requirements.

D. Test reports for system from a qualified independent testing laboratory certifying and interpreting test results relative to system=s compliance with requirements for fire performance characteristics, bond integrity and material properties.

E. Sealant compatibility and test report from sealant manufacturer certifying that materials forming joint substrates of system have been tested for compatibility and adhesion with joint sealant; include sealant manufacturer=s interpretation of results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.

F. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction which evidence system=s compliance with building code in effect for project.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm regularly engaged in manufacturing products for system indicated and with at least 5 years successful experience in applications similar to that required for this Project.

B. Installer Qualifications: Engage an Installer that is certified in writing by system manufacturer as qualified for installation of systems indicated.

C. Single Source Responsibility: Obtain materials for system from either a single manufacturer or from manufacturers approved by the system manufacturer as compatible with other system components.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver products in original, unopened packages with manufacturer's labels identifying products legible and intact.

B. Store materials inside and under cover; keep them dry, protected from the weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, damage from construction traffic and other causes.

C. Stack insulation board flat and off the ground.

1.08 PROJECT CONDITIONS

A. Environmental Conditions: Do not install system when ambient outdoor temperatures are 40EF and falling unless temporary protection and heat is provided to maintain ambient temperature above 40E during installation of wet materials and for 24 hours after installation or longer to allow them to become thoroughly dry and weather resistant.

1.09 SEQUENCING AND SCHEDULING

A. Sequence installation of system with related work specified in other sections to ensure that wall assemblies, including flashing, trim and joint sealers, are protect against damage from weather, aging, corrosion, or other causes.

1.10 **WARRANTY**

A. **Provide a five (5) years minimum limited warranty for materials and workmanship.**

PART 2 - MATERIALS

2.01 MANUFACTURERS

A. The following performance specification is intended to meet specific design, maintenance and functional requirements necessary to this project. It is not intended to limit competitive bidding but rather encourage participation from all qualified manufacturers which have the performance criteria as outlined in Part 2 of this section. Equal products by other manufacturers will be considered subject to submission in accordance with the Prior Approval section of these specifications.

DRYVIT Systems, Inc. - **Outsulation Plus MD** System (Basis of Design)

B. Other pre-approved system and manufacturer:

Finestone Pebbletex Class PB (Type A) Wall System manufactured by Siks.

2.02 MATERIALS

A. Compatibility: Provide adhesive, mechanical fasteners, board insulation, reinforcing fabrics, base and finish coat materials, and trim accessories which are compatible with one another and approved for use by system manufacturer.

B. Provide colors and texture of protective coating to comply with following requirements:

(1) Provide selection made by Architect from manufacturer's full range of standard colors and textures available for type of finish coat indicated.

C. Surface-Sealer: System manufacturer's standard adhesion intermediary designed to improve bond between substrate of type indicated and adhesive for application of insulation.

D. Molded Polystyrene Board Insulation: Rigid, cellular thermal insulation formed by the expansion of polystyrene resin beads or granules in a closed mold to comply with F.S. HH-1-524C ASTM C578 for Type I; nominal 1.0 PCF density; aged in block form prior to cutting and shipping by air drying for not less than 6 weeks or by another method approved by system manufacturer and producing equivalent results; 2' x 4' x thicknesses indicated on Drawings, but not less than the minimum thickness allowed by system manufacturer for corner squareness and other dimensional tolerances.

E. Reinforcing Fabric: Balanced, alkali-resistant open weave glass fiber fabric treated for compatibility with other system materials; made from continuous multi-end strands with tensile strength of not less than 120 lbs and 140 lbs. in warp and fill directions, respectively, per ASTM D1682 and complying with ASTM D578 and the following requirements:

(1) Weight of Standard Reinforcing Fabric: Not less than 3.75 oz. per sq. yd.

F. Air/Weather Barrier: Shall provide an air and secondary weather barrier for the substrates listed in Section 1.02B (1), and include the following components:

(1) Dryvit Backstop: A 100% acrylic product, which is field mixed with Portland cement in a 1:1 ratio by weight.
(2) Dryvit Grid Tape™: An open weave fiberglass mesh tape with pressure sensitive adhesive.
(3) Dryvit Flashing Tape™: A high density, polyethylene backed, tape with a rubberized asphalt adhesive.
(4) Dryvit Flashing Tape Surface Conditioner™: A water-based surface conditioner and adhesion promoter for the Dryvit Flashing Tape.

G. Dryvit AP Adhesive: A moisture cure urethane- based adhesive used to adhere the Dryvit Drainage Strip.

H. Starter Trac (ST) and Starter Trac with Drip Edge (STDE): UV treated PVC "J" channels with weep holes manufactured by Plastic Components, Inc.

I. Dryvit Drainage Strip: A corrugated plastic sheet material, which provides drainage.

J. Adhesives/Base Coats: Use to adhere the insulation board to the air/weather barrier and to embed the reinforcing mesh on the face of the insulation board, shall be one of the following:
(1) Genesis: A fiber-reinforced, acrylic modified product, which is field mixed with Portland cement in a 1:1 ratio by weight.
(2) Genesis DM: A dry mix, polymer-based, fiber-reinforced product, which is field mixed with water.
(3) Primus: An acrylic polymer-based product, which is field mixed with Portland cement in a 1:1 ratio by weight.
(4) Dryvlex: A high percentage polymer-blend material which is field mixed with Portland cement in a 1:1 ratio by weight.

K. Dryvit Finish: Shall be the type, color and texture as selected by the Architect, and shall be the following:

(1) Medallion Series PMR: (Proven Mildew Resistance) Finishes: Water-based, acrylic finishes with integral color and texture:
(2) Coatings, Primers and Sealers:
(a) As recommended by Manufacturer.

L. Water: Clean and potable.

M. Weep Tubes: Manufacturer's standard.

N. Accessories: Rigid Vinyl (Un-plasticized Polyvinyl Chloride – PVC); where recommended by the manufacturer; formulated for exterior use.

2.03 MIXING

A. General: Comply with system manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials except as approved by system manufacturer. Mix materials in clean containers. Use materials within time period specified by system manufacturer or discard.

2.04 E.I.F.S. ACCESSORIES - CONTINUOUS PVC SOFFIT VENT SYSTEM

A. ACCEPTABLE MANUFACTURER

(1) For purpose of determining minimum performance and quality standards, this specification is based upon the soffit vent system products as manufactured by the following: **Vinyl Corp™, Miami, FL 33166 (1-800-648-4695).**

(2) Equal products by other manufacturers will be considered, subject to 10 day prior approval, in accordance with Part 1 Section "Prior Approval".

B. Continuous One-Piece Soffit Vent: **PB Vented Shadow Reveal No. RS/CBS150-300V**, conforming to ASTM D1784 and ASTM D4216 Cell Classification 13244C.

(1) Vent Reveal Width: 3"
(2) Ground: 1-1/2" (for 1-1/2" thick E.I.F.S. soffit board)
(3) Overall Width: 5"
(4) Overall Length of Vent Section: 10'-0"
(5) Vertical Leg Height: 1"
(6) Perforated Flange
(7) Vent Area: 12 square inches per linear foot.
(8) Color: White.

C. Soffit Vent Connector Clips:

(1) For Joining Straight Vent Sections:
Vinyl Corp. Product No. **VC300 Straight Connector Clips**.

(2) For Joining Vent Sections at Inside and Outside Corners
Vinyl Corp. Product No. **VC300C Mitered Connector Clips**.

D. Fasteners: As recommended by vent manufacturer for fastening to gypsum sheathing.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates to determine if they are in satisfactory condition for installation of system. Do not proceed with installation of system until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protect contiguous work from moisture deterioration and soiling resulting from application of systems. Provide temporary covering and other protection needed to prevent spattering of exterior finish coatings on other work.

B. Protect system, substrates, and wall construction behind them from inclement weather during installation. Prevent infiltration of moisture behind system and deterioration of substrates.

C. Substrate Preparation: Prepare and clean substrates to comply with system manufacturer's requirements to obtain optimum bond between substrate and adhesive for insulation.
   (1) Apply surface sealer over substrates, if required by system manufacturer for improving adhesion.

3.03 INSTALLATION

A. General: Comply with system manufacturer=s current published instructions for installation of system as applicable to each type of substrate indicated.

B. Adhesively or mechanically attach insulation to comply with the following requirements:

   (1) Allow attached insulation to remain undisturbed for period prescribed by system manufacturer but not less than 24 hours, prior to beginning rasping and sanding insulation or application of base coat and reinforcing fabric.

C. Interlock ends at internal and external corners.

D. Abut boards tightly at joints within and between each course to product flush, continuously even surfaces without gaps or raised edges between insulation boards. If gaps occur, fill with insulation cut to fit gaps exactly; insert without use of adhesive.

E. Rasp or sand flush any irregularities project more than 1/32" from surface of insulation; do not create depressions deeper than 1/16".

F. Cut insulation to fit openings, corners, and projections precisely and to produce edges and shapes conforming to details indicated.

G. Interrupt insulation where expansion joints are indicated in substrates behind exterior insulation and finish systems.

   (1) Provide "aesthetic" joints at E.I.F.S. walls and soffits, as shown and indicated on Drawings.

H. Form joints for sealant application by leaving gaps of width needed between adjoining insulation edges as well as between insulation edges and dissimilar adjoining surfaces

projecting through insulation that produce joint widths indicated after encapsulation of joint substrates with base coat, reinforcing fabric, and finish coat.

(1) Treat exposed edges of insulation board, including those forming substrates of sealed joints within system or between system and other work, by encapsulating with base coat, reinforcing fabric, and finish coat.
(2) Coordinate flashing installation with installation of insulation to produce a wall system which does not allow water to penetrate behind protective coating.

I. Apply base coat to exposed surfaces of insulation in minimum thickness specified by system manufacturer.

J. Fully embed reinforcing fabric of weight indicated below in wet base coat to produce wrinkle-free installation with fabric continuous at corners and lapped or otherwise treated at joints to comply with system manufacturer=s requirements.

K. Apply finish coat over dry base coat in thickness required by system manufacturer to produce a uniform finish of texture and color matching approved sample.

3.04 INSTALLATION OF JOINT SEALANTS

A. Prepare joints to receive sealants, at locations indicated, to comply with applicable requirements of Division 7 section "Joint Sealants".

3.05 CLEANING AND PROTECTION

A. Remove temporary covering and protection of other work. Promptly remove protective coatings from window and door frames, and any other surfaces outside areas indicated to receive protective coating.

B. Provide final protection and maintain conditions, in a manner acceptable to Installer and system manufacturer, which ensures system being without damage of deterioration at time of substantial completion.

END OF SECTION 07240

SECTION 07250 – WEATHER BARRIERS

PART 1 – GENERAL

1.1 GENERAL

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.2 SECTION INCLUDES

A. Weather barrier membrane
B. Seam Tape
C. Flashing
D. Fasteners

1.3 REFERENCES

A. ASTM International
   1. ASTM C920; Standard Specification for Elastomeric Joint Sealants
   2. ASTM C1193; Standard Guide for Use of Joint Sealants
   3. ASTM D882; Test Method for Tensile Properties of Thin Plastic Sheeting
   4. ASTM D1117; Standard Guide for Evaluating Non-woven Fabrics
   5. ASTM E84; Test Method for Surface Burning Characteristics of Building Materials
   6. ASTM E96; Test Method for Water Vapor Transmission of Materials
   7. ASTM E1677; Specification for Air Retarder Material or System for Framed Building Walls
   8. ASTM E2178; Test Method for Air Permeance of Building Materials

B. AATCC – American Association of Textile Chemists and Colorists
   1. Test Method 127 Water Resistance: Hydrostatic Pressure Test

C. TAPPI
   1. Test Method T-410; Grams of Paper and Paperboard (Weight per Unit Area)
   2. Test Method T-460; Air Resistance (Gurley Hill Method)

1.4 SUBMITTALS

A. Refer to Section 01300 Submittals.
B. Product Data: Submit manufacturer current technical literature for each component.
C. Samples: Weather Barrier membrane, minimum 8-1/2 inches by 11 inch.
D. Quality Assurance Submittals

   1. Manufacturer Instructions: Provide manufacturer’s written installation instructions.

E. Closeout Submittals: Refer to Division 1 Section “Project Closeout”.

1.5 QUALITY ASSURANCE

A. Qualifications
1. Installation shall be in accordance with manufacturer’s installation guidelines and recommendations.
2. Source: Provide weather barrier & accessory materials produced by single manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver weather barrier materials and components in manufacturer’s original, unopened, undamaged containers with identification labels intact.

B. Store weather barrier materials as recommended by system manufacturer.

1.7 SCHEDULING

A. Review requirements for sequencing of installation of weather barrier assembly with installation of windows, doors, louvers and flashings to provide a weather-tight barrier assembly.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. The following performance specification is intended to meet specific design, maintenance and functional requirements necessary to this project. It is not intended to limit competitive bidding, but rather encourage participation from all qualified which have the performance criteria as outlined in Part 2 of this section. Equal products by other manufacturers will be considered subject to ten (10) day prior approval.

B. Available manufacturers: The following manufacturer and product has been accorded preliminary approval

(1) DuPont Building Innovations; 4417 Lancaster Pike, Chestnut Run Plaza 721, Wilmington, DE19805; 1-800-44-TYVEK (8-9835); http://construction.TYVEK.com.

(2) DuPont™ Tyvek® HomeWrap

C. Manufacturers wishing to bid must submit the following to the Architect in accordance with the Prior Approval section of these specifications.

(1) Manufacturer’s Product Data.

(2) Certified test reports prepared by an independent testing laboratory, showing conformance with the weather barrier requirements as specified.

(3) Stated differences between the proposed window and units specified and shown on the Drawings.

(4) Approval of submittals shall be by written addendum only. Verbal approval will not be given.

2.2 MATERIALS

A. Basis of Design: spunbonded polyolefin, non-woven, non-perforated, weather barrier equal to DuPont™ Tyvek® HomeWrap® and related assembly components.

B. Performance Characteristics:

1. Air Penetration: 0.007 cfm/ft^2 at 75 Pa, when tested in accordance with ASTM E2178, Type I per ASTM E1677.
2. Water Vapor Transmission: 58 perms, when tested in accordance with ASTM E96, Method B.
3. Water Penetration Resistance: 210 cm when tested in accordance with AATCC Test Method 127.
4. Basis Weight: 1.8 oz/yd^2, when tested in accordance with TAPPI Test Method T-410.
5. Air Resistance: 300 seconds, when tested in accordance with TAPPI Test Method T-460.
6. Tensile Strength: 30/30 lbs/in., when tested in accordance with ASTM D882, Method A.
7. Tear Resistance: 6/6 lbs, when tested in accordance with ASTM D1117.
8. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84. Flame Spread: 5, Smoke Developed: 20

2.3 ACCESSORIES

A. Seam Tape: 2 inch wide, DuPont™ Tyvek® Tape as manufactured by DuPont Building Innovations.

B. Fasteners:

1. DuPont™ Tyvek® Wrap Caps, as manufactured by DuPont Building Innovations: #4 nails with large 1-inch plastic cap fasteners.
2. Masonry tap-con fasteners with DuPont™ Tyvek® Wrap Caps as manufactured by DuPont Building Innovations: 2-inch diameter plastic cap fastener.

C. Sealants

1. Provide sealants that comply with ASTM C 920, elastomeric polymer sealant to maintain watertight conditions.
2. Products: Sealants recommended by the weather barrier manufacturer.

D. Adhesive:

1. Provide adhesive recommended by weather barrier manufacturer.

E. Primer:

1. Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing.

F. Flashing

1. DuPont™ StraightFlash™, as manufactured by DuPont Building Innovations: straight flashing membrane materials for flashing sealing penetrations, at wall openings & penetrations, masonry ties, etc.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories.

3.2 INSTALLATION – WEATHER BARRIER

A. Install weather barrier over exterior face of all exterior wall sheathing substrates behind face brick, as shown on Drawings, in accordance with manufacturer recommendations.

B. Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner to overlap.

C. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface. Maintain weather barrier plumb and level.

D. Extend bottom roll edge over masonry interface 2” to 3” minimum. Seal weather barrier with sealant or tape. Shingle weather barrier over back edge of thru-wall flashings and seal weather barrier with sealant or tape. Ensure weeps are not blocked.

E. Subsequent layers shall overlap lower layers a minimum of 6 inches horizontally in a shingling manner.

F. Wall Openings: Extend weather barrier completely over openings.

G. Weather Barrier Attachment:

1. Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommended fasteners, spaced 12 -18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.

H. Apply 4 inch by 7-inch piece of DuPont™ StraightFlash™ to weather barrier membrane prior to the installation of cladding anchors.

3.3 SEAMING

A. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.

B. Seal any tears or cuts as recommended by weather barrier manufacturer.

3.4 PROTECTION

A. Protect installed weather barrier from damage.

END OF SECTION 07250

SECTION 07920 – JOINT SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification Sections, apply to this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 SUMMARY

A. Extent of joint sealer (denoted “sealant” or “caulking” on Drawings) is indicated on Drawings.

B. This Section includes joint sealers for the following locations:

(1) Wall control joints “W.C.J.”
(2) Exterior and interior perimeters of all door frames, windows, louvers and other openings in interior and exterior walls.
(3) Top edge of roof counter flashings.
(4) Perimeter of all wall-hung plumbing fixtures.
(5) Below all exterior door thresholds.
(6) Around bottom of all exterior and interior hollow metal frames, at finish flooring termination against frame.
(7) All other locations as indicated or as required for providing watertight or aesthetic joints.

D. Sealing joints related to Cast Stone is specified in a Division 4 Section 04720 “Architectural Cast Stone.” Cast Stone joint sealing shall be performed by Cast Stone Installer, using products and methods as specified in this section.

E. Sealing joints at fire-rated construction is specified in Division 7 Section 07270 “Fire-stopping.”

F. Sealing joints related to Roofing is specified in another Division 7 Section.

G. Sealing joints related to Exterior Insulation and Finish System (E.I.F.S.) is specified in another Division 7 Section.

H. Sealants for Glazing Purposes are specified in a Division 8 Section.

I. Materials shall be delivered to the job site in new unbroken containers clearly labeled as to contents. Materials are to be stored at normal room temperature.

J. Color cards of current available colors shall be submitted to Architect for selection of color.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Sealant shall be equal to Sonneborn “NP-1", 1-part polyurethane, U.S. Government Spec. TT-S-00230, Type II, Class A. (Exterior locations).

B. Interior Non-Fire-Rated Locations: Sealant shall be equal to Tremco Acrylic Latex 834 or equal/Dow "Performance Plus" Silicone Sealant.

2.02 Joint backing shall be as recommended by sealant manufacturer.

PART 3 – EXECUTION

3.01 APPLICATION

A. Examine all joints to determine their acceptability for caulking and report discrepancies to the General Contractor.

B. Clean all joints of foreign matter or loose particles; use compressed air as necessary. Insure that surfaces are dry.

C. Joints up to 2“wide shall be 1/4"-3/8" deep. Joints over 2“wide shall have depth required. Force in sealant to fill entire joint and tool smooth. Use solvent as recommended by the sealant manufacturer for tooling.

D. At completion of joint sealers, clean off all excess material from adjoining surfaces. Correct any damage caused by this work and leave work in watertight and neat condition.

END OF SECTION 07920

SECTION 073113 - ASPHALT SHINGLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Asphalt shingles.
2. Underlayment.
3. Nail Over Ridge & Hip Vents.
4. Attic Intake and Exhaust Vent (Smart Vent)

B. Related Sections:

1. Division 07 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, counter-flashings and flashings.

1.3 DEFINITION

A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of asphalt shingle, ridge and hip cap shingles, ridge and eave vent indicated.

1. Include similar color charts of trim and accessories involving color selection.

C. Samples for Verification: For the following products, of sizes indicated, to verify color selected:

1. Asphalt Shingle: Full size.
2. Ridge and Hip Cap Shingles: Full size.
3. Ridge Vent: 12-inch- (300-mm-) long Sample.
4. Attic intake vent: 12-inch- (300-mm-) long Sample.
5. Self-Adhering Underlayment: 12 inches (300 mm) square.
6. Synthetic Underlayment: 12 inches (300 mm) square.

D. Qualification Data: For qualified Installer.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for asphalt shingles.

F. Research/Evaluation Reports: For each type of asphalt shingle required, from the ICC.

G. Maintenance Data: For each type of asphalt shingle to include in maintenance manuals.

H. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. A single installer (Contractor) shall perform the roofing work of this project; and shall be a firm with not less than five (5) years experience in installation of Roofing System similar to that required for this project and which is acceptable to or licensed by manufacturer of primary roofing materials. Contractor/installer/sub-contractor is to have been in business under the same name and organization for the past five (5) consecutive years with a successful experience record.
2. Installer's Field Supervision: Installer to maintain a full-time supervisor/foreman on the job site during times that roofing work is in progress. Any roofing installed during times when the supervisor/foreman is not on site is subject to rejection.

a. Provide Field Supervisor's resume.
b. Field Supervisor must be experienced in installation of roofing systems similar to type and scope required for this project.

B. Manufacturer: Company specializing in Asphalt Roofing Products with fifteen (15) years minimum experience. Being listed as pre-qualified manufacturer does not release manufacturer from providing complete, current and acceptable test data for each performance, thermal, and wind load requirement specified.

1. Shingle Roofing Standard: Comply with instruction and recommendations of shingle manufacturer, but not less than those recommended by ARMA's "Residential Asphalt Roofing Manual" and NRCA's "Steep Roofing Manual".

C. Source Limitations: Obtain ridge and hip cap shingles ridge vents, felt underlayment and self-adhering sheet underlayment from single source from single manufacturer.

D. Fire-Resistance Characteristics: Where indicated, provide asphalt shingles and related roofing materials identical to those of assemblies tested for fire resistance per test method below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

1. Exterior Fire-Test Exposure: Class A; ASTM E 108 or UL 790, for application and roof slopes indicated.

E. Wind-Resistance Test Characteristics: Provide products identical to those tested according to ASTM D 3161 or UL 997 and passed. Identify each bundle of asphalt shingles with appropriate markings of applicable testing and inspecting agency.

F. FM Listing: Provide shingle roofing system and component materials which have been evaluated by Factory Mutual System for fire spread, wind-uplift, and hail damage and are listed in "Factory Mutual Approval Guide" for Class 1 construction.

G. Pre-installation Roofing Conference: Prior to project start-up, a Pre-Roofing Conference will be held at the project site. Required attendees include the Owner, Architect/Consultant, Owner's insurer (if applicable), testing and inspection representative, roofing installer, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing including installer of roof accessories and equipment. ATTENDANCE OF THE CONTRACTOR'S JOB SUPERINTENDENT IS MANDATORY. Review methods and procedures related to roofing system including but not limited to the following:

1. Review methods and procedures related to asphalt shingle roof installation, including manufacturer's written instructions.
2. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Examine deck substrate conditions for compliance with requirements, including flatness and attachment to structural members.
4. Review structural loading limitations of deck during and after roofing.
5. Review flashings, special roof details, roof drainage, roof penetrations, exhaust fans, venting requirements and condition of other construction that will affect roofing system.
6. Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.
7. Review temporary protection requirements for shingle assembly during and after installation.
8. Review roof observation and repair procedures after roofing installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store roofing materials in a dry, well-ventilated, weather-tight location according to asphalt shingle manufacturer's written instructions. Store underlayment rolls on end on pallets or other raised surfaces. Do not double stack rolls.

1. Handle, store, and place roofing materials in a manner to avoid significant or permanent damage to roof deck or structural supporting members.

B. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

C. Provide traps or other means of protection from weather. Manufacturer's plastic wrapping is provided for protection during shipping only.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install asphalt shingles until spaces are enclosed and weather-tight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended by manufacturer.

C. Weather Conditions: Proceed with installation of shingles only with weather conditions are in compliance with manufacturer's recommendations and when substrate is dry.

1.8 WARRANTY

A. The Warranties specified in this section shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Warranty: Manufacturer's roof warranty for the replacement of asphalt shingles that fail in materials or workmanship within specified period.

1. Failures include, but are not limited to, the following:

a. Manufacturing defects.
b. Structural failures including failure of asphalt shingles to self-seal after a reasonable time.

2. Material Warranty Period:
a. Architectural Shingles: Thirty (30) years from date of Substantial Completion, prorated, with first five years non-prorated. Manufacturer's Ten (10) Year 110 mph wind warranty. Algae-Discoloration Warranty Period: Asphalt shingles will not discolor Ten (10) **y**ears from date of Substantial Completion.

C. Special Warranty Language: <u>State of Alabama Building Commission roofing systems manufacturer's warranty special requirements:</u> Standard manufacturer's roofing guarantees which contain language regarding the governing of the guarantee by any state other than the State of Alabama, must be amended to exclude such language, and substituting the requirement that the Laws of the State of Alabama shall govern all such guarantees.

D. **Special Project Warranty:** General Contractor's State of Alabama Five (5) Year Roofing Guarantee covering the work of this Section. The Contractor is responsible for maintaining the roof in a water-tight condition, if leaks occur as a result of deterioration of materials or improper workmanship, for the following warranty period:

1. Warranty Period: Five (5) years from date of Substantial Completion.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Asphalt Shingles: 200 sq. ft of each type, in unbroken bundles.

PART 2 - PRODUCTS

2.1 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

A. Architectural Asphalt Shingles: ASTM D 3462, glass-fiber reinforced, mineral-granule surfaced, and self-sealing. UL Certification of ASTM D3462; Conforms to ASTM D3018 Type I – Self-Sealing; ASTM D3161-03b, Class "F" Wind Resistance (110-mph): ASTM D3161-99a, (110-mph) Wind Resistance; UL997 Wind Resistance, UL 2390/ASTM D6381 Class "H" and ASTM D7158 Class "H" Wind Resistance, and UL Class A Fire Resistance; heavy-duty glass fiber mat base; ceramically colored/UV resistant mineral surface granules across entire face of shingle; four-tab type, algae-resistant.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed Corporation – Landmark AR. (XT 30IR).
b. Owens Corning – TruDefinition Duration Storm. (Supreme Shingles).
c. GAF Materials Corporation – Timberline HD.

2. Butt Edge Straight cut.
3. Strip Size: Manufacturer's standard.
4. Algae Resistance: Granules treated to resist algae discoloration.
5. Color and Blends: As selected by Architect/Consultant from manufacturer's full range.

2.2 UNDERLAYMENT MATERIALS

A. Self-Adhering Sheet Underlayment, Granular Surfaced: ASTM D 1970, minimum of 55-mil-(1.4-mm-) thick sheet; glass-fiber-mat-reinforced, SBS-modified asphalt; mineral-granule surfaced; with release paper backing; cold applied. This product shall be applied at all valleys, roof eave and rakes, hips and ridges.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed Corporation – WinterGuard.
b. Owens Corning – WeatherLock Mat.
c. GAF Materials Corporation – StormGuard

B. Synthetic Underlayment: Polyolefin based high strength reinforced roofing underlayment. ASTM D4869; Inorganic shingle underlayment standard ASTM D 6757. Fire resistance ASTM D 108, UL 790 Fire Resistant. UL classified as a Prepared Roofing Accessory. This product shall be applied over all plywood deck surfaces.

1. Manufacturers:
a. Certainteed – DiamondDeck.
b. Owens Corning – Deck Defense.
c. GAF Materials Corporation – DeckArmor.

2.3 SHINGLE-OVER RIDGE/HIP VENTS

A. Rigid Ridge/Hip Vent: Manufacturer's standard, rigid section high-density polypropylene or other UV-stabilized plastic ridge vent with nonwoven geotextile filter strips and external deflector baffles; for use under ridge shingles.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Owens Corning – VentSure Rigid Roll Ridge Vent.
   b. GAF Materials Corporation – Cobra Rigid Vent 2.
   c. DCI Products, Smart Ridge II.

2. Minimum Net Free Area: **18NFVA, per lineal foot.**
3. Width: 11-inch Minimum.
4. Thickness: 1-inch.

B. Attic Intake Ventilation: Intake vent shall be SmartVent Attic Intake (SV-TAP) as manufactured by DCI Products, 425 South Penn Street, Clifton Heights, PA 19018. www.dciproducts.com or approved equal.

C. Attic Off-peak and Roof-to-wall Exhaust Ventilation: Exhaust vent shall be SmartVent Attic Exhaust Vent (SV-TAP) as manufactured by DCI Products, 425 South Penn Street, Clifton Heights, PA 19018. www.dciproducts.com or approved equal.

2.4 MISCELLANEOUS MATERIALS

2.5 ACCESSORIES

A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free of consistency required by roofing system manufacturer for application.

B. Roofing Nails: Double hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch- (3-mm-) diameter, **ring-shank**, sharp-pointed, with a minimum ⅜-inch- (9.5-mm-) diameter flat head and of sufficient length to penetrate ¾-inch (19 mm) into solid wood decking or extend at least ⅛-inch (3 mm) through plywood sheathing.

1. Nails equal to the following:
   a. Maze # R103A, 1.5-inches, 11guage, ⅜-inch head

2. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

C. Underlayment Nails: Hot-dip galvanized-steel wire with low-profile capped heads or disc caps, 1-inch (25-mm) minimum diameter.

D. Hip and Ridge Shingles: Pre-cut manufacturer's ridge and hip shingles applicable for wind warranty rating required under this Specification Section.

E. Starter Shingles: Shall be located at the eaves and rakes or any other location where shingle roof begins. These shall be starter shingles as provided by the shingle manufacturer.

2.6 METAL FLASHING AND TRIM

A. General: Comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim."

B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item.

1. Apron Flashings: Fabricate with lower flange a minimum of 5 inches (125 mm) over and 4-inches (100 mm) beyond each side of down-slope asphalt shingles and 12 inches (300 mm) up the vertical surface.
2. Step Flashings: Fabricate with a head-lap of 2 inches (50 mm) and a minimum extension of 4 inches (100 mm) over the underlying asphalt shingle and up the vertical surface.
3. Cricket Backer Flashings: Fabricate with concealed flange extending a minimum of 24-inches (600 mm) beneath upslope asphalt shingles and 6 inches (150 mm) above the roof plane.
4. Drip Edges: Fabricate in lengths not exceeding 10 feet (3 m) with 4-inch (50-mm) roof-deck flange and 1½-inch (38-mm) fascia flange with ⅜-inch (9.6-mm) hemmed drip at lower edge.

C. Vent Pipe Flashings: ASTM B 749, Type L51121, at least 1/16-inch (1.6 mm) thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof, and extending at least 6-inches (150 mm) from pipe onto roof.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions under which shingle work is to be performed and notify Architect/Consultant in writing of unsatisfactory conditions.

B. Do not proceed with shingle work until unsatisfactory conditions have been corrected.

3.2 PREPARATION OF SUBSTRATE

A. Clean substrate of any projections and substances detrimental to shingle work. Cover knotholes or other minor voids in substrate with sheet metal flashing secured with non-corrosive roofing nails.

1. Remove and replace any damaged or deteriorated wood blocking, nailers, or fascia boards as drawings indicate.

B. Verify that roof penetrations and plumbing stacks are in place and are securely fastened against movement.

C. Verify roof openings are correctly framed prior to installing work of this Section.

D. Verify deck surfaces are dry, free of ridges, warps, or voids.

E. Review General and Specific Instructions noted on the Drawings.

3.3 UNDERLAYMENT INSTALLATION

A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

B. Single-Layer Synthetic Underlayment: Install on roof deck parallel with and starting at the eaves. Lap sides a minimum of 2-inches (50 mm) over underlying course. Lap ends a minimum of 4-inches (100 mm). Stagger end laps between succeeding courses at least 72-inches (1830 mm). Fasten with capped roofing nails.

1. Install synthetic underlayment on roof deck not covered by self-adhering sheet underlayment. Lap sides of synthetic over self-adhering sheet underlayment not less than 3-inches (75 mm) in direction to shed water. Lap ends of felt not less than 6-inches (150 mm) over self-adhering sheet underlayment.
2. Install fasteners at no more than 36-inch (900 mm) oc.

C. Self-Adhering Sheet Underlayment: Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install at locations indicated below and on Drawings, lapped in direction to shed water. Lap sides not less than 3-½inches (89 mm). Lap ends not less than 6-inches (150 mm) staggered 24-inches (600 mm) between courses. Roll laps with roller. Cover underlayment within seven days.

1. Eaves: Extend from edges of eaves 12-inches (300 mm) beyond interior face of exterior wall.
2. Rakes: Extend from edges of rake 12-inches (300 mm) beyond interior face of exterior wall.
3. Valleys: Extend from lowest to highest point 18-inches (450 mm) on each side.
4. Hips: Extend 18-inches (450 mm) on each side.
5. Ridges: Extend 36-inches (914 mm) each side without obstructing continuous ridge vent slot.

3.4 METAL FLASHING INSTALLATION

A. General: Install metal flashings and other sheet metal to comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim" and shingle manufacturer’s written instruction.

1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

B. Apron Flashings: Extend lower flange over and beyond each side of down-slope asphalt shingles and up the vertical surface.

C. Step Flashings: Install with a head-lap of 2-inches (50 mm) and extend over the underlying asphalt shingle and up the vertical surface. Fasten to roof deck only.

1. First course minimum 5-inches by 12-inches applied with the lowermost edge of the first shingle.
2. Succeeding courses must consist of pieces that are a minimum 5-inches by 10-inches. Place each piece of flashing 2-inches up the roof from where the lowermost edge of the next (overlapping) shingle will be applied. Each succeeding course of flashing must "overlap" the flashing course below it a minimum of 2-inches.

D. Cricket Flashings: Install against the roof-penetrating element extending concealed flange beneath upslope asphalt shingles and beyond each side.

E. Closed-Valley Installation: Install valley shingle using closed-valley method; install in strict compliance with shingle roof system manufacturer's written specification guidelines.

F. Rake Drip Edges: Install rake drip edge flashings **over** underlayment and fasten to roof deck.

G. Eave Drip Edges: Install eave drip edge flashings **below** underlayment and fasten to roof sheathing.

H. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

I. Fabricate Pipe or Post Flashing: Assemble on-site as required with soldered seams and flange. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.5 ASPHALT SHINGLE INSTALLATION

A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

1. **Shingles must be applied with exposure specified by the shingle manufacturer, this is a requirement. Changing exposure will harm the appearance of the installed roof and reduce the ability to resist wind up-lift.**
2. **Extend asphalt shingles ¾-inch (19 mm) over fascia at eaves and rakes**.
3. **Install manufacturer's starter strip along all eave and rake conditions.**
4. **Install manufacturer's per-cut hip and ridge shingles at all hip and ridge conditions.**

B. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.

C. Fasten asphalt shingle strips with a minimum of **Six roofing nails** located according to manufacturer's written instructions. **Hand nailing only, pneumatically driven fasteners will not be allowed.**

D. Closed-Cut Valleys: Extend asphalt shingle strips from one side of valley 12-inches (300 mm) beyond center of valley. Use one-piece shingle strips without joints in valley. Fasten with extra nail in upper end of shingle. Install asphalt shingle courses from other side of valley and cut back to a straight line 2-inches (50 mm) short of valley centerline. Trim upper concealed corners of cut-back shingle strips.

1. Do not nail asphalt shingles within 6-inches (150 mm) of valley center.
2. Set trimmed, concealed-corner asphalt shingles in a 3-inch- (75-mm-) wide bed of asphalt roofing cement.

E. Ridge Vents: Install continuous ridge and hip vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.

F. Off-peak and Roof-to-wall Vents: Install off-peak and roof-to-wall exhaust vents over and/or integrated with asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.

G. Ridge and Hip Cap Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.

1. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

3.7 CLEANING AND PROTECTION

A. Protect in-place roofing and installed products from foot traffic until completion of project.

B. Any roof areas that are not completed by the end of the workday are to be protected from moisture and contaminants.

C. Upon completion, remove any remaining debris from the roof and project site. Restore any damage to existing building surfaces and site caused by new work.

END OF SECTION 073113

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Formed roof-drainage sheet metal fabrications.
2. Formed steep-slope roof sheet metal fabrications.
3. Formed roof penetration flashings.
4. Formed metal fascia fabrications
5. Prefinished metal soffit and trim at locations as indicated on the drawings.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leak-proof, secure, and noncorrosive installation.

1.4 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination".
1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
3. Review requirements for insurance and certificates if applicable.
4. Review sheet metal flashing observation and repair procedures after flashing installation.
5. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
6. Document proceeding, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counter-flashings as applicable.
10. Include details of special conditions.
11. Include details of connections to adjoining work.
12. Detail formed flashing and trim at scale of not less than 1½-inches per 12-inches.

C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.

D. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing: 12-inches (300-mm) long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12-inches (300-mm) long and in required profile. Include fasteners and other exposed accessories.
3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: Employ skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.

B. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

C. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.10 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 659-74.
c. Cracking, checking, peeling, or failure of paint to adhere to the bare substrate.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. FM Approvals Listing: Manufacture and install copings and roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with name of fabricator and design approved by FM Approvals.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum-Zinc alloy-coated steel sheet (Galvalume); produced according to ASTM Specification A792/A792M-97a "Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by Hot-Dip Process." Structural quality, AZ50 or 0.50 oz/sq. ft. (150 g/sq. m.) architectural Galvalume. Colors shall consist of 70% PVDF Kynar/Hylar. Manufacturer shall offer colors that provide reflectivity and emissivity standards, in accordance with Energy Star Ratings, DOE and LEED criteria. Colors shall provide for an SRI rating of minimum 29 @ slopes of 2:12 or greater. All colors shall be identified as LEED qualified and "COOL" colors to meet Energy Star compliance, 24 gauge.

1. Color: As selected by Architect/Consultant from manufacturer's full range.

C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed; with smooth, flat surface, 0.015-inch thickness or as indicated.

1. Finish: 2D dull, cold rolled**.**

2.3 SELF-ADHERING UNDERLAYMENT SHEET

A. General: A self-adhering underlayment sheet consisting of a white engineered polyolefin composite film with factory-applied anti-skid coating surface and rubberized asphalt membrane with split-release film.

1. Material: WIP 300HT High-Temperature Protection Self-Adhering Roofing Underlayment by Carlisle.

2.4 POLYVINYL CHLORIDE UNDERLAYMENT SHEET

A. A 20-mil polyvinyl chloride sheet meeting ASTM D-822.ELASTOMERIC UNDERLAYMENT/SEPARATION SHEET

2.5 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners**,** solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.

b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
3. Fasteners for Zinc-Coated (Galvanized) Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless.
4. Fasteners for attachment of wood nailers and blocking: Series 300 Stainless steel screws.

C. Solder:

1. For Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape ½-inch (13-mm) wide and ⅛-inch (3 mm) thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

2.6 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of ¼-inch in 20-feet (6-mm in 6-m) on slope and location lines indicated on Drawings and within ⅛-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Use lapped expansion joint unless otherwise shown.

2. Form expansion joints of intermeshing hooked flanges, not less than 1-inch (25-mm) deep, filled with butyl sealant concealed within joints as indicated on the drawings.

D. Sealant Joints: Where movable, non-expansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

E. Fabricate cleats and attachment devices from galvanized steel as indicated minimum 20-gauge.

F. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use, rivet joints where necessary for strength.

G. Do not use graphite pencils to mark metal surfaces.

2.7 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch (2400-mm) long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from 16 gauge galvanized steel. Fabricate expansion joints, expansion-joint covers and gutter accessories from same metal as gutters.

1. Gutter Style: SMACNA designation for profile as shown on the drawings.
2. Expansion Joints: Butt type with cover plate.
3. Fabricate from the following materials:
   a. Pre-Finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge thick.

B. Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.

1. Fabricated Hanger Style: SMACNA figure designation as "32B".
2. Fabricate from the following materials:
   a. Pre-Finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge thick.

2.8 ROOF SHEET METAL FABRICATIONS

A. General: Any clarifications will be in accordance with National Roofing Contractors Association (NRCA) standards.

B. Roof Edge Flashing: Fabricate in minimum 96-inch (2400mm) long, but not exceeding 12-foot (3.6-m) long sections.

1. Joint style: Overlapped, 4-inches (100mm) wide.
2. Fabricate from the following materials:

   a. Pre-Finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge.

C. Counter-flashing: Fabricate from the following materials:

1. Pre-finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge thick.

D. Expansion Joints: Fabricate from the following materials:

1. Pre-finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge thick.

E. Rake Trim: Fabricate from the following materials:

1. Pre-finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge thick.

F. Apron flashing: Fabricate from the following materials:

1. Pre-finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge thick.

G. Step-flashing: Fabricate from the following materials:

1. Pre-finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge thick.

H. Fascia/Frieze Cladding: Fabricate from the following materials:

1. Pre-finished Aluminum-Zinc Alloy-Coated Steel: 24 gauge thick.

2.9 PRE-FINISHED METAL SOFFIT SYSTEM

A. 12" Full Ventilating Panel: Equal to Petersen, Pac-Clad, Pac-750 Soffit Panel; .032" thick aluminum; 1/2" panel depth, 6" o.c. "V" grooves.

B. Trim Accessories: Pac-Clad Matching J-Channel Trim

C. Finish: Kynar

D. Color: As selected by Architect from manufacturer's full range of 36 stocked standard colors.

E. Warranty: 30 yr. non-prorated finish warranty.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ELASTOMERIC UNDERLAYMENT/SEPARATION SHEET INSTALLATION

A. Install underlayment as indicated on the drawings.

B. Elastomeric Sheet Underlayment: Install underlayment, under sheet metal flashings and trim. Apply in shingle fashion to shed water, with lapped and taped joints of not less than 2-inches.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners**,** solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Install continuous cleats spaced not more than 1-inch apart. Anchor each cleat with fasteners through the vertical leg face at 12-inches on center.
4. Install exposed sheet metal flashing and trim without excessive oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.
6. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet of polyvinyl chloride (PVC) underlayment.
2. Bed flanges in approved sealant where required for waterproof performance.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10-feet with no joints allowed within 24-inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges not less than 1-inch deep, filled with elastomeric sealant concealed within the joints.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1¼-inches for wood screws

1. Galvanized or Aluminum-Zinc Alloy-coated steel: Use stainless-steel fasteners
2. Stainless Steel: Use stainless steel fasteners.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1-inch (25-mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70° F (4 and 21° C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4° C).
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1½-inches (38 mm); however, reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder metallic-coated steel and aluminum sheet.
2. Do not pre-tin zinc-tin alloy-coated stainless steel
3. Do not use torches for soldering.
4. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
5. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements**,** NRCA's "Roofing and Waterproofing Manual" and "SMACNA's Manual.". Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Counter-flashing: Coordinate installation of counter-flashing with installation of base flashing. Insert counter-flashing in reglets or receivers and fit tightly to base flashing. Extend counter-flashing 4-inches (100-mm) over base flashing. Lap counter-flashing joints minimum of 4-inches (100-mm). Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant; interlocking folded seam or blind rivets and sealant as indicated.

3.5 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Hanging Gutters: Join sections with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored straps spaced not more than 36 inches (900 mm) apart. Provide end closures and seal watertight with sealant. Slope to downspouts.

1. Loosely lock straps to front gutter bead and anchor to roof deck.

C. Downspouts: Join sections with 1½-inch (38-mm) telescoping joints.

1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60-inches (1500 mm) o.c.

2. Provide elbows at base of downspout to direct water away from building.

3. Connect downspouts to underground drainage system as indicated.

3.6 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited SMACNA sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.7 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of ¼-inch in 20-feet (6-mm in 6-m) on slope and location lines indicated on Drawings and within ⅛-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.8 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturers written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 08110 – HOLLOW METAL DOORS & FRAMES

PART 1 - GENERAL

1.01 WORK under this section comprises of furnishing and installing hollow metal frames for doors, windows and hollow metal doors and panels.

1.02 RELATED DOCUMENTS, drawings and general provisions of contract, General and Supplementary Conditions and Division 1 specifications sections apply to this section.

1.03 RELATED WORK, specified elsewhere that should be examined for its effect upon this section.

A. Section 08 7100 Finish Hardware

B. Section 09910 Painting

C. Section 09250 Gypsum Drywall

D. Section 08210 Flush Wood Doors

E. Section 06100 R&F Carpentry

1.04 REFERENCES SPECIFIED in this section subject to compliance as directed:

A. ASTM-A366-95A - Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality.

B. ASTM-A568-95 -Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled.

C. ASTM-A 569-91A - Specification for Steel, Carbon, (0.15 Maximum Percent), Hot-Rolled Sheet and Strip Commercial Quality.

D. ASTM-A924-95 - General Requirements for Steel Sheet, Metallic coated by the Hot-Dip Process.

E. ASTM-A620- Specifications for Steel, Sheet, Carbon, Drawing Quality, Special Killed, Cold Rolled (for embossed panels).

F. ANSI A250.8-1998/SDI100 - Recommended specifications for standard steel doors and frames.

G. SDI-105-92 - Recommended Erection Instructions for Steel Frames.

H. ANSI/SDI A250.6 - 1997 - Hardware on Steel Doors (reinforcement-application).

I. ANSI-A250.4-1994 Test Procedure and acceptance criteria for physical endurance, steel doors and frames.

J. ANSI-A224.1-1990 Test Procedure and acceptance criteria for prime painted steel surfaces for steel doors and frames.

K. ADA, The Americans with Disabilities Act - Title III - Public Accommodations

L. ANSI-A117.1-1992 American National Standards Institute - Accessible and Usable Buildings and Facilities

M. U.L. - 1784-90 Air leakage test of door assemblies.

N. ASTM E283-91 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

O. IBC- 2021

1.05 SUBMITTALS

A. Shop Drawings: Indicate door and frame elevations and sections, materials, gages and finishes,fabrication and erection details, locations of finish hardware by dimension and locations/details of all openings and louvers. Do not proceed with any fabrication until all details are approved.

B. Certification of Compliance: Submit any information necessary to indicate compliance to these specifications.

C. Submit samples as necessary.

1.06 QUALITY ASSURANCE

A. Hollow metal supplier shall be a qualified direct distributor of products to be furnished. In addition the distributor shall have in their regular employment an A.H.C./C.D.C. or person of equivalent experience who will be available at reasonable times to consult with the Architect/Contractor and/or Owner regarding any matters affecting the total door and frame openings.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver doors and frames cardboard wrapped, crated, palletized or otherwise protected during transit and site storage.

B. Inspect doors and frames upon delivery for damage.Minor damages may be repaired provided refinished items are equal in all respects to new work and accepted by the Architect. Otherwise remove and replace damaged items.

C. Store doors and frames at the building site in a dry, secure place.

1. Place units on minimum 4 inches (101.6) high wood blocking.
2. Avoid use of non-vented plastic or canvas shelters which could create a humidity chamber.
3. If cardboard wrapper/packaging on door becomes wet, remove packaging materials immediately.
4. Provide 1/4 inch (6.3) spaces between stacked doors to promote air circulation.

1.08 SEQUENCING AND SCHEDULING

A. Deliver all doors and frames to the jobsite in a timely manner so not to delay progress of other trades.

B. Issue purchase orders to frame, door and other hardware suppliers early so not to interfere with normal quoted delivery of materials.

1.09 **WARRANTY**

A. Hollow metal doors and frames shall be supplied with a one (1) year warranty against defects in materials and workmanship.

B. Warranty to commence with Architect's determination of substantial completion of the job.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS (providing the products supplied comply with this specification)

A. STEELCRAFT
B. CURRIES Co.
C. CECO
D. WINDSOR REPUBLIC

2.02 MATERIALS

A. Steel requirements, all doors and frames to be manufactured of commercial quality, stretcher leveled flatness, cold rolled steel per ASTM-A-366 and A-568 general requirements or galvanealed to 'A-60' minimum coating weight standard per ASTM-A924. Internal reinforcing may be manufactured of hot rolled pickled and oiled steel per ASTM-A569.

B. Coating Materials, primer, Use manufacturer's standard rust inhibiting primer conforming to ANSI-A-224.1-1990.

C. Core Materials:

1. Non-labeled doors or labeled doors, polystyrene foam core, self-extinguishing, non-toxic in case of fire.
2. Fire labeled doors with temperature rise rating to have a mineral fiber core sufficient to obtain a 250 degree F (121 C) temperature rating.

2.03 FABRICATION

A. General

1. Fabricate all doors and frames in accordance with ANSI A250.8-1998/SDI-100 except where more stringent requirements are specified.
2. Prepare doors to receive finish hardware per approved schedule. Include all thru-bolting holes as required per hardware template. not include unnecessary cutouts in door faces not required hardware template.
3. Supply only doors and frames manufactured by one (1) of the acceptable manufacturers listed in this specification.

B. Doors

1. Classification: SDI Level 3 – Model 1.

2. Face Sheets: Minimum 16 ga. (0.053 inch) (1.3mm).
   a. Cold or hot-rolled at interior locations.
   b. Galvannealed A-60 at exterior locations.
3. All galvanealed doors at exterior locations to have galvannealed hardware reinforcements and channels.
4. Seams allowed only on edges of doors.
5. All vertical lock and hinge edges to be beveled 1/8 inch (3.2mm) in 2 inches (50.8mm). Non-beveled doors are not acceptable.
6. Doors to have continuous vertical mechanical interlocking joints at both lock and hinge edges with seams sealed internally by epoxy.
7. Top and bottom channels
   a. Not less than 14 ga. (0.067 inch) (1.6mm) – inverted.
   b. Weld channels securely to both face sheets. Gluing of face sheets to supporting door channels is not acceptable.
   c. Close tops of outswinging exterior doors flush by the addition of steel top caps or channel fillers.
   d. Bottom channel must be inverted. Provide weep holes in bottom channel to allow for escape of entrapped condensation moisture.
8. Closer reinforcements required in all doors scheduled for closers.
   a. Reinforcements to be minimum 14 ga. (0.067 inch) (1.6mm).
   b. Minimum of 20 inches (508mm) long.
   c. Welded into door.
   d. Galvannealed A-60 where door faces are specified as galvannealed.
9. Astragals: Where called for to be flat security type or “Z” as called for in drawings, specifications or by listing requirements.
10. All doors conform to ANSI-A250.4-1994 Level “A” criteria and be Tested to 1,000,000 operating cycles and 23 twist tests. Certification of Level “A” doors is to be submitted with approval drawings by the distributor. Do not bid or supply any type or gage door not having been tested and passed this criteria.

C. Frames

1. Construction: 16 ga. (0.053 inch) (1.3mm) hot or cold-rolled steel at interior locations, 14 ga. (0.067 inch) (1.6mm) galvannealed A-60 at exterior locations.
2. All galvannealed frames to have galvannealed hardware reinforcements only.
3. All exterior door frames are to be face welded, ground smooth, and shop or factory reprimed at the welded area. All interior door frames are to be face welded, ground smooth, and shop or factory reprimed at the welded area. KD type may be used where necessary to match existing and may be assembled at the jobsite. Fill all anchor point holes flush with adjacent surface, sand smooth and paint as specified.
4. Provide temporary shipping bars to help protect from damage during transmit and handling.
5. Temporary shipping bars to be removed before setting frames.
6. All welds on frames, transoms and sidelites to be flush with neatly mitered or butted material cutts.

D. Anchors

1. Wall anchors for attachment to masonry construction or drywall partitions
   a. Use masonry, steel or wood stud anchors sized to accomodate frame jamb depth and face dimension on all welded frames.
2. All frame jamb anchors to be provided; one each jamb per 30 inches (762mm) of frame height or fraction thereof.
3. Floor anchors: Vertically adjustable

a. Floor anchors to be screw adjustable prior to permanent installation so as to provide the ability to plumb frame without the use of shims under jambs.
b. Fabricate anchors to receive 2 fasteners per jamb.

4. Head struts: For frames not anchored to masonry or concrete construction provide ceiling struts spot welded to jambs each side extending to building structure.

E. Preparation For Hardware

1. Reinforcement: Reinforce components for hardware installation in accordance with SDI-107.

a. All lock and closer reinforcements in doors to be "box" or "channel" type.
b. All hinge reinforcements in doors to be 7 ga.
c. All hinge reinforcements in frames to be 7 ga. (0.167 inch) (4.2mm) securely welded to the frame rabbet.

2. Punch single leaf frames to receive three (3) silencers. Double leaf frames to receive one silencer per leaf at head. Factory install silencers prior to shipment to job site.
3. Factory prepared hardware locations to be in accordance with "Recommended locations for Builders' Hardware for Standard Steel Doors and Frames", as adopted by The Steel Door Institute.

PART 3 - EXECUTION

3.01 SETTING FRAMES

A Set all frames in accordance with SDI 105-92.

B. Set welded frames in position prior to beginning partition work. Brace frames until permanent anchors are set.

C. Set anchors for frames as work progresses. Install anchors at hinge and strike levels.

D. Use temporary setting spreaders at all locations. Use intermediate spreaders to assure proper door clearances and header braces for grouted frames.

E. Install all fire rated frames in accordance with requirements of NFPA-80-1999.

F. Remove factory spreader bars used for shipping from frames before setting.

3.02 DOOR INSTALLATION

A. Install hollow metal doors in frames using hardware specified in Section 08710 Finish Hardware.
B. Clearances at edge of doors

1. Between door and frame at head and jambs: 1/8 inch (3.2).

2. At meeting edges pairs of doors and at mullions: 1/8 inch (3.2).

3. At transom panels, without transom bars: 1/8 inch (3.2).

4. At sills without thresholds: 5/8 inch (15.9) maximum above finish floor.

5. At sills with thresholds: 1/8 inch (3.2) above threshold.

3.03 ADJUSTMENT AND CLEANING

A. Remove dirt and excess sealants, mortar or glazing compounds from exposed surfaces.

B. Adjust moving parts for smooth operation. Use shims if necessary to allow for proper closing.

C. Fill all dents, holes, etc. with metal filler and sand smooth and flush with adjacent surfaces - Reprime/paint to match finish.

END OF SECTION 08110

SECTION 08210 - WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pre-fit and pre-machine pre-finished wood doors with flush faces.

B. Related Sections:

1. Section 08110 - Hollow Metal Frames.
2. Section 08710 – Door Hardware.
3. Section 08800 - Glass and Glazing.

1.2 REFERENCES

A. WDMA - Window and Door Manufacturers Association: IS 1-A 1997 Industry Standard for Architectural Flush Wood Doors.

B. NFPA-80 Standards for Fire Doors 1999 Edition.

C. 2016 International Building Code or UL10c, Positive Pressure Fire Door Test Method.

D. NFPA-105 Recommended Practice for Installation of Smoke-Control Door Assemblies, latest edition

1.3 SUBMITTALS

A. Shop Drawings and Product Data:

1. Submit in accordance with Section 01300.

2. Indicate general construction, jointing methods, hardware and louver locations, and locations of cut-outs for glass. Indicate thickness of veneers.

B. Samples:

1. Submit samples of wood veneer and factory finishing in accordance with WDMA Quality Standards I.S. 1-A 1997, sections G-18 and Guide Specifications 1.03 C.

C. Certification:

1. Submit certification that doors and frames comply with IBC 2009 or UL10c, Positive Pressure Fire Door Test Method.

1.4 QUALITY ASSURANCE

A. Fire-Rated Wood Doors: Provide wood doors which are identical in materials and construction to units tested in door and frame assemblies in accordance with IBC 2009 or UL10c, Positive Pressure Fire Door Test Method and which are labeled and listed for ratings indicated by ITS -

Warnock Hersey, UL or other testing and inspection agency acceptable to authorities having jurisdiction.

1. Doors: Comply with IBC-2016 or UL10c Category A.

B. WDMA I.S. 1-A 1997 Quality Standard: Window and Door Manufacturers Association Quality Standards for grade of door, core, construction, finish, and other requirements.

1.5 PRODUCT HANDLING

A. Plastic wrap and protect wood doors during transit, storage and handling to prevent damage, soiling or deterioration. Doors to be stored flat, off the floor with bottom door being supported every 24 inches in clean, dry surroundings. Protect from dirt, water and abuse.

B. Doors shall not be exposed to excessive moisture, heat, dryness, direct sunlight or where heating or air conditioning ducts will blow directly on them. Relative humidity should not be less than 30 % or greater than 60 %. Doors to be handled with clean or gloved hands so not to soil doors. Always keep doors in poly bag until they are ready to hang.

1.6 **GUARANTEE/WARRANTY**

A. **Guarantee**: Provide manufacturer's guarantee for all wood doors. Guarantee period: Lifetime of original installation. Doors exhibiting defects in materials or workmanship within guarantee period shall be replaced (including hanging and finishing) with new doors. These terms shall be part of the manufacturer's standard warranty.

PART 2 - PRODUCTS

2.0 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

OSHKOSH
EGGERS Industries
ALGOMA Hardwoods

2.1 MATERIALS

A. Door Construction:

1. Non-Fire Rated Doors: Thickness: 1-3/4 inches, interior flush wood, bonded, solid core conforming to WDMA I.S. 1-A 1997 and the following;

   a. Core: bonded particle core (PC) conforming to WDMA I.S. 1-A 1997.
   b. Door construction shall conform to WDMA I.S. 1-A 1997 Premium Grade requirements.
   c. Stiles: Hardwood to match face veneer over structural composite lumber (SCL), glued to core.
   d. Rails: Mill option hardwood or SCL. Top and bottom: 2 inches before trim or factory fit.
   e. Facing: Wood veneer cut and specie as specified shall conform to WDMA I.S. 1-A 1997 "A" grade for Premium Grade Door Construction requirements.

2. Fire Rated Doors: Thickness: 1-3/4 inches, interior flush wood, bonded, solid core conforming to WDMA I.S. 1-A 1997 and the following;

   a. Core: bonded mineral core (FD) conforming to WDMA I.S. 1-A 1997.
   b. Door construction shall conform to WDMA I.S. 1-A 1997 Premium Grade requirements.
   c. Stiles: Hardwood to match face veneer over mineral composite, glued to core.
   d. Rails: Mineral composite as required by fire door authorities. Top and bottom: as required by manufacturer's fire door authorities.
   e. Facing: Wood veneer cut and specie as specified shall conform to WDMA I.S. 1-A 1997 "A" grade for Premium Grade Door Construction requirements.

B. WOOD VENEER

1. Door face veneers shall meet quality standards conforming to WDMA I.S. 1-A 1997 "A" grade for transparent or semi-transparent finish. Minimum face veneer thickness shall be 1/50" at 12% moisture content after finish sanding
2. Species: White Birch
3. Face Cut: Rotary Cut
4. Face Assembly: Book Match
5. Face Symmetry: Running Match

C. ADHESIVES

1. Adhesives: Face to core adhesives shall be Type I or Type II as appropriate for location in building. Adhesives must be classified Type I or Type II per WDMA TM-6 "Adhesive Bond Test Method." Type I adhesives shall be used for doors in exterior applications, Type II adhesives shall be used for doors in interior applications.

D. CORE

1. Non-rated doors: Solid particleboard.
2. Fire-rated doors: Non-combustible mineral core containing no asbestos.

2.2 FACTORY FINISHING

1. Comply with referenced WDMA Section G-15, "Factory Finishing" for Premium Grade factory finish systems.

2. Pre-finish wood doors at factory.

3. Architect shall select color from manufacturer's standard colors.

4. Transparent Finish: Match finish indicated in WDMA Section G-17: WDMA System #6.

5. Doors shall be poly-bagged.

2.3 ACCESSORIES

A. Vision Frames:

1. Non-rated doors: Prefinished wood vision frames to match door veneer and finish.
2. Fire-rated doors: Metal vision frames.
3. Glass: Refer to Glazing Section for glass types.

2.4 FABRICATION

A. Fabricate wood doors in accordance with requirements of WDMA I.S. 1-A 1997 Quality Standards.

B. Fabricate fire rated doors in accordance with requirements of ITS - Warnock Hersey or Underwriters' Laboratories, with metal label on each door including IBC 2009 or UL-10c.

C. Fabricate doors with WDMA Quality Standards hardware blocking options as follows:

1. Provide HB-1 - head and HB-2 - sill rails and HB-4 – lock block on all doors.
2. Provide HB-6 only when exit devices are specified for door.

D. Provide doors with minimum ¼ inch thick edge strips, of wood species to match face veneers except as required for fire rating.

E. Make cut-outs and provide stops for glass and louvers. Seal cut-outs prior to installation of moldings.

F. Bevel lock and hinge edges of single acting doors 3 degrees or 1/8 inch in 2 inches.

G. Prepare doors to receive hardware. Refer to Section 08710 - Hardware, NFPA 80 Latest Edition and UL10c Positive Pressure Fire Door Test Method for hardware requirements.

1. Pre-fit and bevel to net opening size less approximately 1/4 inch in width on single swing doors. Provide 1/4-inch clearance above finished floor, unless otherwise indicated on drawings. Provide 1/8-inch clearance at top of door.
2. Slightly ease vertical edges.

PART 3 - EXECUTION

3.0 EXAMINATION

A. Examine installed door frames before hanging doors.

B. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.1 INSTALLATION

A. Handle doors in accordance with recommendations of WDMA I.S. 1-A, “Care and Installation at Job Site.”

B. Condition doors to average temperature and humidity in area of installation for not less than 48 hours prior to installation. Store doors per recommendations of WDMA I.S. 1-A, “Care and Installation at Job Site.”

C. Install in neat and skillful manner, free from hammer or tool marks, open joints or slivers.

D. Set plumb, level, square and true. Install work after building humidity is at acceptable level.

E. Remove and replace all doors found to be warped, twisted, bowed, or otherwise damaged. Do not install doors which cannot be properly fitted to frames.

F. Adjust prefinished doors and hardware and other moving or operating parts to function smoothly and correctly.

G. Ensure that smoke gaskets are in-place before prefinished door installation at fire-rated doors.

3.2 CLEANING / PROTECTION

A. Clean prefinished doors and hardware.

END OF SECTION 08210

SECTION 08332 - INTERIOR COILING COUNTER DOORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and other Part 1 Specification sections, apply to this Section.

1.02 SUMMARY

A. This Section includes interior coiling metal doors.

B. Types of interior coiling doors and grilles include the following:

(1) Overhead Rolling Counter Door #132A.

C. Operation of Interior coiling doors shall include the following:

(1) Manual operation.

D. Provide complete operating door assemblies including door curtains, guides, counterbalance mechanism, hardware, operators, and installation accessories.

E. Related Sections: See Section 04810" for concrete block partition construction at rolling counter door.

F. Work by Others: Base cabinet and solid polymer countertop at rolling counter door are not included in this Contract. These items shall be furnished and installed separately by others – as selected by the Owner. Coordinate installation of coiling counter door with installers of cabinet and countertop.

1.03 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data, roughing-in diagrams, and installation instructions for each type and size of interior coiling doors.

(1) Provide operating instructions and maintenance information.

C. Shop drawings for special components and installations that are not dimensioned or detailed in manufacturer's data sheets.

1.04 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Furnish each coiling door as a complete unit produced by one manufacturer, including hardware, accessories, mounting and installation components.

(1) Furnish coiling door units by one manufacturer for entire Project.

B. Insert and Anchorages: Provide setting drawings, templates, instructions, and directions to install anchorage devices. Coordinate delivery with other work to avoid delay.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

Ceco/Windsor Door-Div. Of the Ceco Corp.
The Cookson Co.
Cornell Iron Works Inc. (Models named herein as Basis for Design)
Overhead Door Corp.

2.02 COUNTER DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Non-Fire Rated Counter Door equal to Cornell Model ESC10, as follows:

(1) Face of wall mounting.

B. Door Curtain: Fabricate overhead coiling door curtain of interlocking slats, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of material gage recommended by door manufacturer for size and type of door required, and as follows:

(1) Aluminum Door Curtain Slats: Furnish with Clear anodized Finish.

(a) Furnish manufacturer's standard "flat-face" slats; Cornell #1F or equal at counter doors.

C. Equip doors for locking by master- keyed cylinder, at bottom bar, operable from coil side.

D. Bottom Bar shall be extruded aluminum, with continuous lift handles; clear anodized finish.

(1) Provide a replaceable gasket of flexible vinyl as a cushion bumper for manually operated doors.

E. Curtain Jamb Guides: Fabricate curtain jamb guides of 2-piece extruded aluminum sections or Polypropylene pile runners with sufficient depth and strength to retain curtain loading. Clear anodized Aluminum Finish.

F. Hood: 0.04" thick clear anodized aluminum, with intermediate supports as required to prevent sagging.

2.03 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of adjustable steel helical torsion spring, mounted around a steel shaft and in a spring barrel, and connected to door curtain with required barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of hot-formed structural-quality carbon steel, welded or seamless pipe, of sufficient diameter and wall thickness to support roll-up of curtain without distortion of slats and to limit barrel deflection to not more than 0.03 inch per foot of span under full load.

C. Provide spring balance of one or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Provide cast steel barrel plugs to secure ends of springs to barrel and shaft.

D. Brackets: Provide mounting brackets of manufacturer=s standard design.

2.04 MANUAL COUNTER DOOR OPERATORS

A. Manual Counter Door Push-Up Operation: Design counterbalance mechanism so that required lift or pull for door operation does not exceed 15 lb. Provide pole with hook.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Install door, grille and operating equipment complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports according to final shop drawings, manufacturer=s instructions, and as specified.

B. After completing installation, including work by other trades, lubricate, test, and adjust doors to operate easily, free from warp, twist, or distortion.

C. Train Owner=s maintenance personnel on procedures and schedules related to door operation as follows: Servicing and preventive maintenance.

END OF SECTION 08332

SECTION 08411 - ALUMINUM STORE FRONT AND ENTRANCES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification Sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 SUMMARY

A. Extent of aluminum entrances and storefronts complete with reinforcing, fasteners, anchors and attachment devices as indicated on drawings.

B. Aluminum storefront entrances and frame types required for this project include:
   (1) All exterior entrance doors and storefront frames and windows.
   (2) Accessories necessary to complete work, including matching prefinished formed aluminum sub-sills and sill flashings with concealed clip anchors, where indicated on drawings.

C. Glazing: Refer to “Glass and Glazing” section of Division 8 for glazing requirements for aluminum entrances and windows.

D. Door Hardware is specified under Division 8 – Door Hardware and installed by Store Front supplier or manufacturer for doors in this section.

E. Related Sections:
   (1) Section 01400 - Quality Control
   (2) Section 05500 – Metal Fabrication
   (3) Section 06100 - Rough Carpentry
   (4) Section 07920 - Joint Sealants
   (5) Section 08710 – Door Hardware
   (6) Section 08800 - Glass and Glazing

1.03 REFERENCES

A. Aluminum Association (AA):
   (1) DAF-45 Designation System for Aluminum Finishes.

B. American Architectural Manufacturers Association (AAMA):
   (1) 503.1 Test Method for Condensation Resistance of Windows, Doors and Glazed Wall Systems.
   (2) 605.2-92 Voluntary Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.
   (3) 607.1 Specifications and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum.
   (4) 608.1 Specification and Inspection Methods for Electrolytically Deposited Color Anodic Finishes for Architectural Aluminum.
   (5) 701.2 Specifications for Pile Weatherstripping.
   (6) SFM-1 Aluminum Storefront and Entrance Manual.

C. American National Standards Institute (ANSI):
   (1) A117.1 Safety Standards for the Handicapped.

D. American Society for Testing and Materials (ASTM):
(1) A36 Structural Steel.
(2) B209 Aluminum and Aluminum-Alloy Sheet and Plate.
(3) B221 Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.
(4) B308 Aluminum-Alloy 6061-T6 Standard Structural Shapes, Rolled or Extruded.
(5) C509 Cellular Elastomeric Pre-formed Gasket and Sealing Material
(6) C864 Dense Elastomeric Compression Seal Gaskets, Setting Blocks and Spacers.
(7) E283 Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors.
(8) E330 Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
(9) E331 Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

E. Federal Specifications (FS):
(1) TT-P-645A Primer, Paint, Zinc Chromate, Alkyd Type.

F. Steel Structures Painting Council (SSPC):
(1) Paint 12 Cold-applied Asphalt Mastic (Extra Thick Film).

1.04 SYSTEM REQUIREMENTS

A. Design Requirements:
(1) Drawings are diagrammatic and do not purport to identify nor solve problems of thermal or structural movement, glazing, anchorage or moisture disposal.
(2) Requirements shown by details are intended to establish basic dimension of units, sight lines and profiles of members.
(3) Provide concealed fastening.
(4) Provide entrance and storefront systems, including necessary modifications, to meet specified requirements and maintaining visual design concepts.
(5) Attachment considerations are to take into account site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening or fracturing connection between units and building structure or between units themselves.
(6) Anchors, fasteners and braces shall be structurally stressed not more than 50% of allowable stress when maximum loads are applied.
(7) Provide for expansion and contraction without detriment to appearance or performance.
(8) Assemblies shall be free from rattles, wind whistles and noise due to thermal and structural movement and wind pressure.
(9) Not Permitted: Vibration harmonics, wind whistles, noises caused by thermal movement, thermal movement transmitted to other building elements, loosening, weakening, or fracturing of attachments or components of system.

B. Performance Requirements (Exterior Frames):
(1) Air infiltration: Air leakage through fixed light areas of storefront shall not exceed 0.06 cfm per square foot (0.0003 m3/sm2) of surface area when tested in accordance with ASTM E283 at differential static pressure of 6.24 psf (300 Pa).
(2) Water infiltration: No uncontrolled water penetration when tested in accordance with ASTM E331 at test pressure of 10.0 psf (480 Pa.).

C. Thermal Requirements:
   (1) Framing systems shall accommodate expansion and contraction movement due to surface temperature differentials of 180 deg. F. (82 deg. Celsius) without causing buckling, stress on glass, failure of joint seals, excessive stress on structural elements, reduction of performance, or other detrimental effects.
   (2) Ensure doors function normally within limits of specified temperature range.

D. Structural Requirements as measured in accordance with ANSI/ASTM E330:
   (1) Wind loads for exterior assemblies:
      (a) Basic loading:
         (1) 35 psf acting inward
         (2) 30 psf acting outward.
   (2) Deflection: Maximum calculated deflection of any framing member in direction normal to plane of wall when subjected to specified design pressures shall not exceed 1/240 of its clear span.

E. Testing Requirements: Provide components that have been previously tested by an independent testing laboratory.

1.05 SUBMITTALS

A. General: Submit in accordance with Section 01300.

B. Product Data:
   (1) Submit manufacturer=s descriptive literature and product specifications.
   (2) Include information for factory finishes, hardware, accessories and other required components.
   (3) Include color charts for finish indicating manufacturer=s standard colors available for selection.

C. Shop Drawings:
   (1) Submit shop drawings covering fabrication, installation and finish of specified systems.
   (2) Include the following:
      (a) Fully dimensioned plans and elevations with detail coordination keys.
      (b) Locations of exposed fasteners and joints.
   (3) Provide detailed drawings of:
      (a) Composite members.
      (b) Joint connections for framing systems and for entrance doors.
      (c) Anchorage.
      (d) System reinforcements.
      (e) Expansion and contraction provisions.
      (f) Glazing methods and accessories.
      (g) Internal sealant requirements as recommended by sealant manufacturer.
   (4) Schedule of finishes.

D. Samples:
   (1) Submit samples indicating quality of finish, in required colors, on alloys used for work, in sizes as standard with manufacturer.
   (2) Where normal texture or color variations are expected, include additional samples illustrating range of variation.

E. Test Reports:
(1) Standard Systems: Submit certified copies of previous test reports substantiating performance of system in lieu of re-testing. Include other supportive data as necessary.

F. Certificates:
(1) Submit manufacturer=s certification stating that systems are in compliance with specified requirements.

G. Qualification Data:
(1) Submit installer qualifications verifying years of experience.
(2) Include list of projects having similar scope of work identified by name, location, date, reference name and phone number.

H. Manufacturer=s Instructions: Submit manufacturer=s printed installation instructions.

1.06 QUALITY ASSURANCE

A. Single Source Responsibility:
(1) To ensure quality of appearance and performance, obtain materials for each system from either a single manufacturer or from manufacturer approved by each system manufacturer.

B. Installer Qualifications: Certified in writing by Contractor as qualified for installation of specified systems.

C. Perform work in accordance with AAMA SFM-1 and manufacturer=s written instructions.

D. Conform to requirements of ANSI A117.1 and local amendments.

1.07 DELIVERY, STORAGE AND HANDLING

A. Protect finished surfaces as necessary to prevent damage.

B. Do not use adhesive papers or sprayed coatings which become firmly bonded when exposed to sun.

C. Do not leave coating residue on any surfaces.

D. Replace damaged units.

1.08 **WARRANTY**

A. Provide written manufacturer=s warranty, executed by company official, **warranting against defects in materials and products for 2 years from date of Substantial Completion. Warrant door corner construction for the life of the project.**

B. Provide written installer=s warranty, **warranting work to be watertight, free from defective materials, defective workmanship, glass breakage due to defective design, and agreeing to replace components which fail within 2 years from date of Substantial Completion.**
(1) Warranty shall cover following:
(a) Complete watertight and airtight system installation within specified

tolerances.

(b) Completed installation will remain free from rattles, wind whistles and noise due to thermal and structural movement and wind pressure.

(c) System is structurally sound and free from distortion.

(d) Glass and glazing gaskets will not break or Apop@ from frames due to design wind, expansion or contraction movement.

(e) Glazing sealants and gaskets will remain free from abnormal deterioration or dislocation due to sunlight, weather or oxidation.

C. **Provide written warranty stating organic coating finish will be free from fading more than 10%, chalking, yellowing, peeling, cracking, pitting, corroding or non-uniformity of color, or gloss deterioration beyond manufacturer=s descriptive standards for 5 years from date of Substantial Completion and agreeing to promptly correct defects.**

PART 2 - PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

A. The following specification is intended to meet specific design, maintenance and functional requirements necessary to this project. It is not intended to limit competitive bidding but rather encourage participation from all qualified manufacturers which have the performance criteria as outlined in Part 2 of this section. Equal products by Kawneer, U.S. Aluminum and other manufacturers will be considered subject to ten (10) day prior approval.

B. BASIS OF DESIGN – APPROVED MANUFACTURER AND SYSTEMS. Subject to compliance with requirements indicated, provide products of the following:

(1) Coral Aluminum Products, 3010 Rice Mine Road, Tuscaloosa, AL 35406.

C. Substitutions:

(1) General: Refer to Division 1 Section “Prior Approvals” for procedures and submission requirements.

(2) Pre-Contract (Bidding Period) Substitutions: Submit written requests no later than ten (10) days prior to bid date.

(3) Substitution Documentation:

(a) Product Literature and Drawings: Submit product literature and drawings modified to suit specific project requirements and job conditions.

(b) Test Reports: Submit test reports verifying compliance with each test requirement for each aluminum storefront and entrance product required by the project.

(c) Product Sample and Finish: Submit product sample, representative of storefront for the project, with specified finish and color.

(4) Substitution Acceptance: Acceptance will be by written addendum only.

D. Acceptable Entrance Doors:

(1) Door Types A, B, C and D:

(a) Equal to Coral Architectural Products, Series 500 Wide Stile Swing Doors, as indicated on drawings, with Type “DG101” stops for 1” thick insulating glass.

E. Acceptable Storefront Framing System:

(1) Interior Reception Pass Window Frame Type F:

(a) Equal to Coral Architectural Products Storefront System FL 200; 1¾”x4½”, as indicated on Drawings.

(2) Exterior Door Frame Type 1, 2, 3 and 4 (with transom and/or sidelight) and Exterior Window Types A, B, C, D and E:
(a) Equal to Coral Architectural Products Thermal Storefront System FL300T; 2"x4½", for 1" thick glazing infill, as indicated on Drawings.

2.02 FRAMING MATERIALS AND ACCESSORIES

A. Aluminum:
(1) ASTM B221, alloy 6063-T5 for extrusions; ASTM B209, alloy 5005-H34 for sheets; or other alloys and temper recommended by manufacturer appropriate for specified finish.

B. Interior Reinforcing:
(1) ASTM A36 for carbon steel; or ASTM B308 for structural aluminum.
(2) Shapes and sizes to suit installation.
(3) Shop coat steel components after fabrication with alkyd type zinc chromate primer complying with FS TT-P-645.

C. Anchorage Devices:
(1) Manufacturer's standard formed or fabricated steel or aluminum assemblies of shapes, plates, bars or tubes.

D. Fasteners:
(1) Aluminum, non-magnetic stainless steel or other materials warranted by manufacturer to be non-corrosive and compatible with components being fastened.
(2) Do not use exposed fasteners, except where unavoidable for application of hardware.
(3) For exposed locations, provide countersunk Phillips head screws with finish matching items fastened.
(4) For concealed locations, provide manufacturer=s standard fasteners.
(5) Provide nuts or washers of design having means to prevent disengagement; deforming of fastener threads is unacceptable.

E. Expansion Anchor Devices: Lead-shield or toothed-steel, drilled-in, expansion bolt anchors.

F. Protective Coatings: Cold-applied asphalt mastic complying with SSPC-Paint 12, compounded for 30 mil (0.77 mm) thickness for each coat; or alkyd type zinc chromate primer complying with FS TT-P-645.

G. Glazing Gaskets:
(1) Compression type design, replaceable, molded or extruded, of neoprene, or ethylene propylene diene monomer (EPDM).
(2) Conform to ASTM C509 or C864.
(3) Profile and hardness as required to maintain uniform pressure for watertight seal.
(4) Provide in manufacturer=s standard black color.

H. Weatherstripping:
(1) Wool pile conforming to AAMA 701.2; or extruded EPDM elastomeric conforming to ASTM C509 or C864.
(2) Provide EPDM or vinyl-blade gasket weatherstripping in bottom door rail, adjustable for contact with threshold.

I. Internal Sealants: Types recommended by sealant manufacturer.

J. "Anti-Walk" Edge Blocking: AW@ shaped EPDM blocks for use in keeping glazing material stationary under vibration or seismic loading.

K. Baffles (at weep holes): Type as recommended by system manufacturer and shown in published installation instructions.

L. Thermal Barrier at Thermal Storefront System FL300T locations:
(1) Thermal Break consisting of ¼" interrupted separation filled with a two-part chemically curing, high-density polyurethane. Structural integrity is maintained by leaving a measured amount of the aluminum web creating a small integral structural Tab-Link™ and polyurethane adhesive bond.
(2) Thermal Break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.

M. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.
(1) Surface: Smooth, Flat.
(2) Exposed Coil-Coated Finish:
(a) Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent (70%) PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
(b) Color: As selected by Architect from manufacturer's full range; to match aluminum storefront framing.
(3) Locations: Formed aluminum sill flashings and sub-sills, as indicated on Drawings at storefront frame sills.

2.03 GLASS AND GLAZING ACCESSORIES

A. Refer to Division 8.

2.04 FABRICATION

A. Coordination of Fabrication:
(1) Check actual frame or door openings required in construction work by accurate field measurements before fabrication.
(2) Fabricate units to withstand loads which will be applied when system is in place.

B. General:
(1) Conceal fasteners wherever possible.
(2) Reinforce work as necessary for performance requirements and for support to structure.
(3) Separate dissimilar metals and aluminum in contact with concrete utilizing protective coating or pre-formed separators which will prevent contact and corrosion.
(4) Comply with Section 08800 for Glazing requirements.

C. Aluminum Framing:
(1) Provide members of size, shape and profile indicated, designed to provide for glazing from interior.
(2) Fabricate frame assemblies with joints straight and tight fitting.

(3) Reinforce internally with structural members as necessary to support design loads.
(4) Maintain accurate relation of planes and angles, with hairline fit of contacting members.
(5) Seal horizontals and direct moisture accumulation to exterior.
(6) Provide flashings and other materials used internally or externally that are corrosive resistant, non-staining, non-bleeding and compatible with adjoining materials.
(7) Provide manufacturer=s extrusions and accessories to accommodate expansion and contraction due to temperature changes without being detrimental to appearance or performance.
(8) Make provisions in framing for minimum edge clearance, nominal edge cover and nominal pocket width for thickness and type of glazing or infill used in accordance with recommendations of manufacturer and FGMA Glazing Manual.
(9) Provide tight fitting, injection molded, plastic water deflectors at all intermediate horizontals.

D. Entrance Doors:
(1) Fabricate with mechanical joints using internal reinforcing plates and shear blocks attached with fasteners and by welding.
(2) Provide extruded aluminum glazing stops of beveled and mitered design, with EPDM glazing gaskets, permanently anchored on security side and removable on opposite side.
(3) Hardware:
(a) Receive hardware supplied in accordance with Section 087100 and install in accordance with requirements of this Section.
(b) Cut, reinforce, drill and tap frames and doors as required to receive hardware.
(c) Comply with hardware manufacturer=s templates and instructions.
(d) Use concealed fasteners wherever possible.

F. Welding:
(1) Comply with recommendations of the American Welding Society.
(2) Use recommended electrodes and methods to avoid distortion and discoloration.
(3) Grind exposed welds smooth and flush with adjacent surfaces; restore mechanical finish.

G. Flashings: Form from sheet aluminum with same finish as extruded sections. Apply finish after fabrication. Material thickness as required to suit condition without deflection or Aoil-canning@.

2.05 FINISH

A. Exterior and Interior Storefront and Entrance Frames:
(1) Organic Coating (high performance fluoropolymer):
(a) Comply with requirements of AAMA 2605.
(b) Surfaces cleaned and given conversion coating pre-treatment prior to application of 0.3 mil dry film thickness of epoxy or acrylic primer following recommendations of finish coat manufacturer.
(c) Finish coat of 70 percent minimum fluoropolymer resin fused to primed surfaces at temperature recommended by manufacturer, 1.0 mil (0.25 mm) minimum dry film thickness.
(d) Acceptable coating manufacturer’s: PPG Industries Inc., and The

Valspar Corporation.

(e) Provide in either 2, 3, or 4 coat system as required for color selected.

(f) Manufacturer's standard colors as selected by Architect.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions and proceed with work in accordance with Section 01400.

B. Verify dimensions, tolerances and method of attachment with other Work.

3.02 INSTALLATION

A. Erection Tolerances:

(1) Limit variations from plumb and level:

(a) 1/8 inch (3 mm) in 10 feet (3 M) vertically.

(b) 1/8 inch (3 mm) in 20 feet (6 M) horizontally.

(2) Limit variations from theoretical locations: 1/4-inch 6 mm) for any member at any location.

(3) Limit offsets in theoretical end-to-end and edge-to-edge alignment: 1/16 inch (2 mm) from flush surfaces not more than 2 inches (51 mm) apart or out-of-flush by more than 1/4 inch (6 mm).

B. Install doors and hardware in accordance with manufacturer=s printed instructions.

C. Set units plumb, level and true to line, without warp or rack of frame.

D. Anchor securely in place, allowing for required movement, including expansion and contraction.

E. Separate dissimilar materials at contact points, including metal in contact with masonry or concrete surfaces, with bituminous paint or pre-formed separators to prevent contact and corrosion.

F. Seal perimeter members as shown on manufacturer=s installation instructions or as required for unique job conditions. Set other members with internal sealants and baffles as called for in manufacturer=s installation instructions. Use sealants as recommended by sealant manufacturer.

G. Coordinate installation of perimeter sealant and backing materials between assemblies and adjacent construction in accordance with requirements of Section 08800.

H. Glazing: Refer to requirements of Section 08800. Utilize Aanti-walk@ edge blocking on all vertical edges of glazing.

3.03 ADJUSTING

A. Test door operating functions. Adjust closing and latching speeds and other hardware in accordance with manufacturer=s instructions to ensure smooth operation.

3.04 CLEANING

A. Clean surfaces in compliance with manufacturer=s recommendations; remove excess mastic, mastic smears, foreign materials and other unsightly marks.

B. Clean metal surfaces exercising care to avoid damage.

END OF SECTION 08411

SECTION 087100

DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood, aluminum, and hollow metal doors.
B. Hardware for fire-rated doors.
C. Electrically operated and controlled hardware.
D. Lock cylinders for doors with balance of hardware specified in other sections.
E. Thresholds.
F. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

A. Section 062000 - Finish Carpentry: Wood door frames.
B. Section 079200 - Joint Sealants: Sealants for setting exterior door thresholds.
C. Section 080671 - Door Hardware Schedule: Schedule of door hardware sets.
D. Section 081113 - Hollow Metal Doors and Frames.
E. Section 081116 - Aluminum Doors and Frames.
F. Section 081213 - Hollow Metal Frames.
G. Section 081416 - Flush Wood Doors.
H. Section 081433 - Stile and Rail Wood Doors.
I. Section 084313 - Aluminum-Framed Storefronts: Door hardware, except as noted in section.
J. Section 281000 - Access Control: Electronic access control devices.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.
B. BHMA A156.1 - Standard for Butts and Hinges 2021.
C. BHMA A156.2 - Bored and Preassembled Locks and Latches 2022.
D. BHMA A156.3 - Exit Devices 2020.
E. BHMA A156.4 - Door Controls - Closers 2019.
F. BHMA A156.5 - Cylinders and Input Devices for Locks 2020.
G. BHMA A156.6 - Standard for Architectural Door Trim 2021.
H. BHMA A156.7 - Template Hinge Dimensions 2016.
I. BHMA A156.13 - Mortise Locks & Latches Series 1000 2022.
J. BHMA A156.21 - Thresholds 2019.
K. BHMA A156.22 - Standard for Gasketing 2021.
L. BHMA A156.26 - Standard for Continuous Hinges 2021.
M. BHMA A156.28 - Standard for Recommended Practices for Mechanical Keying Systems 2018.
N. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames 2016.
O. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames 2006.
P. DHI (H&S) - Sequence and Format for the Hardware Schedule 2019.
Q. DHI (KSN) - Keying Systems and Nomenclature 2019.

R. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames 2004.

S. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors 1993; also in WDHS-1/WDHS-5 Series, 1996.

T. ICC (IBC) - International Building Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

U. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

V. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

W. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2022.

X. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

Y. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives 2022.

Z. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2022.

AA. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

B. Sequence installation to ensure facility services connections are achieved in an orderly and expeditious manner.

C. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by affected installers and the following:
   1. Architect.
   2. Installer's Architectural Hardware Consultant (AHC).
   3. Hardware Installer.
   4. Owner's Security Consultant.

D. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

E. Keying Requirements Meeting:
   1. Attendance Required:
      a. Owner.
      b. Owner's Security Consultant.
   2. Agenda:
      a. Establish keying requirements.
      b. Verify locksets and locking hardware are functionally correct for project requirements.
      c. Verify that keying and programming complies with project requirements.
      d. Establish keying submittal schedule and update requirements.
   3. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
   4. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
   5. Deliver established keying requirements to manufacturers.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

C. Shop Drawings - Door Hardware Schedule: A detailed listing that includes each item of hardware to be installed on each door.
   1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
   2. Comply with DHI (H&S) using door numbering scheme and hardware set numbers as indicated in Contract Documents.
      a. Submit in vertical format.
   3. Include complete description for each door listed.

D. Shop Drawings - Electrified Door Hardware: Include diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
   1. Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).
   2. Elevations: Include front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
   3. Diagrams: Include point-to-point wiring diagrams that show each device in door opening system with related colored wire connections to each device.

E. Samples for Verification:
   1. Submit minimum size of 2 by 4 inch (51 by 102 mm) for sheet samples, and minimum length of 4 inch (102 mm) for other products.
   2. Submit one (1) sample of hinge, latchset, lockset, and closer illustrating style, color, and finish.
   3. Include product description with samples.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

G. Manufacturer's qualification statement.

H. Installer's qualification statement.

I. Supplier's qualification statement.

J. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

K. Keying Schedule:
   1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

L. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

M. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.

N. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

D. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC) to assist in work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.
   1. Closers: Five years, minimum.
   2. Exit Devices: Three years, minimum.
   3. Locksets and Cylinders: Three years, minimum.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Locks: Provide a lock for each door, unless it's indicated that lock is not required.
   1. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's Series. As indicated in hardware sets.
   2. Trim: Provide lever handle or pull trim on outside of each lock, unless otherwise indicated.
   3. Strikes:
      a. Finish: To match lock or latch.
      b. Curved-Lip Strikes: Provide as standard, with extended lip to protect frame, unless otherwise indicated.
      c. Center Strike At Pairs of Doors: 7/8 inch (22.2 mm) lip.

D. Closers:
   1. Provide door closer on each exterior door, unless otherwise indicated.
   2. Provide door closer on each fire-rated and smoke-rated door.
   3. Spring hinges are not an acceptable self-closing device, unless otherwise indicated.

E. Thresholds:
   1. Exterior Applications: Provide at each exterior door, unless otherwise indicated.

F. Weatherstripping and Gasketing:
   1. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated.
   2. Provide door bottom sweep on each exterior door, unless otherwise indicated.

G. Electrically Operated and/or Controlled Hardware: Provide necessary power supplies, power transfer hinges, relays, and interfaces as required for proper operation; provide wiring between hardware and control components and to building power connection in compliance with NFPA 70.

H. See Section 281000 for additional access control system requirements.

I. Fasteners:
   1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
      a. Aluminum fasteners are not permitted.
      b. Provide Phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
   2. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
      a. Self-drilling (Tek) type screws are not permitted.

3. Provide stainless steel machine screws and lead expansion shields for concrete and masonry substrates.
4. Provide wall grip inserts for hollow wall construction.
5. Fire-Resistance-Rated Applications: Comply with NFPA 80.
    a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
    b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.

2.02 PERFORMANCE REQUIREMENTS

A. Provide door hardware products that comply with the following requirements:
1. Applicable provisions of federal, state, and local codes.
    a. IBC.
    b. NFPA 101.
2. Accessibility: ADA Standards and ICC A117.1.
3. Fire-Resistance-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
4. Hardware on Fire-Resistance-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for application indicated.
5. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
6. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
7. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.

2.03 HINGES

A. Manufacturers: Conventional butt hinges.
1. BEST; dormakaba Group: www.bestaccess.com/#sle.
2. Ives.
3. Hager.

B. Properties:
1. Butt Hinges: As applicable to each item specified.
    a. Standard Weight Hinges: Minimum of two (2) permanently lubricated non-detachable bearings.
    b. Heavy Weight Hinges: Minimum of four (4) permanently lubricated bearings on heavy weight hinges.
    c. Template screw hole locations.
    d. Bearing assembly installed after plating.
    e. Bearings: Concealed fully hardened bearings.
    f. Bearing Shells: Shapes consistent with barrels.
    g. Pins: Easily seated, non-rising pins.
        1) Fully plate hinge pins.
        2) Non-Removable Pins: Slotted stainless steel screws.
    h. UL 10C listed for fire-resistance-rated doors.
2. Continuous Hinges: As applicable to each item specified.
    a. Geared Continuous Hinges: As applicable to each item specified.
        1) Non-handed.
        2) Anti-spinning through-fastener.
        3) UL 10C listed for fire-resistance-rated doors.
            (a) Metal Door Installation: Rated up to 90 minutes.
            (b) Wood Door Installation: Rated up to 60 minutes.
        4) Sufficient size to permit door to swing 180 degrees

C. Sizes: See Door Hardware Schedule.
   1. Hinge Widths: As required to clear surrounding trim.
   2. Sufficient size to allow 180 degree swing of door.

D. Finishes: See Door Hardware Schedule.
   1. Fully polish hinges; front, back, and barrel.

E. Grades:
   1. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
   2. Continuous Hinges: Comply with BHMA A156.26, Grade 1.

F. Material: Base metal as indicated for each item by BHMA material and finish designation.

G. Types:
   1. Butt Hinges: Include full mortise hinges.
   2. Continuous Hinges: Include geared hinges.

H. Options: As applicable to each item specified.
   1. Provide electric power transfer (EPT) as listed in hardware sets.

I. Quantities:
   1. Butt Hinges: Three (3) hinges per leaves up to 90 inches (2286 mm) in height. Add one (1) for each additional 30 inches (762 mm) in height or fraction thereof.
      a. Hinge weight and size unless otherwise indicated in hardware sets:
         1) For doors up to 36 inches (914 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.134 inch (3.4 mm) and a minimum of 4-1/2 inches (114 mm) in height.
         2) For doors from 36 inches (914 mm) wide up to 42 inches (1067 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.145 inch (3.7 mm) and a minimum of 4-1/2 inches (114 mm) in height.
         3) For doors from 42 inches (1067 mm) wide up to 48 inches (1219 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.180 inch (4.6 mm) and a minimum of 5 inches (127 mm) in height.
         4) For doors greater than 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.180 inch (4.6 mm) and a minimum of 5 inches (127 mm) in height.
   2. Continuous Hinges: One per door leaf.

J. Applications: At swinging doors.
   1. Provide non-removable pins at out-swinging doors with locking hardware and all exterior doors.

K. Products:
   1. Butt Hinges:
      a. Concealed bearing, five (5) knuckle.
   2. Continuous Hinges:
      a. Aluminum geared hinges.

2.04 EXIT DEVICES

A. Manufacturers:
   1. BEST, dormakaba Group: www.bestaccess.com/#sle.
   2. Von Duprin.

B. Properties:
   1. Actuation: Full-length touchpad.
   2. Touchpads: 'T" style metal touchpads and rail assemblies with matching chassis covers end caps.
   3. Latch Bolts: Stainless steel deadlocking with 3/4 inch (19 mm) projection using latch bolt.
   4. Lever Design: Match project standard lockset trims.
   5. Cylinder: Include where cylinder dogging or locking trim is indicated.

6. Strike as recommended by manufacturer for application indicated.
7. Sound dampening on touch bar.
8. Dogging:
    a. Non-Fire-Resistance-Rated Devices: Cylinder 1/4 inch (6 mm) hex key dogging.
    b. Fire-Resistance-Rated Devices: Manual dogging not permitted.
9. Touch bar assembly on wide style exit devices to have a 1/4 inch (6.3 mm) clearance to allow for vision frames.
10. All exposed exit device components to be of architectural metals and “true” architectural finishes.
11. Handing: Field-reversible.
12. Fasteners on Back Side of Device Channel: Concealed - exposed fasteners not allowed.
13. Vertical Latch Assemblies' Operation: Gravity, without use of springs.

C. Grades: Complying with BHMA A156.3, Grade 1.
1. Provide exit devices tested and certified by UL or by a recognized independent laboratory for mechanical operational testing to 10 million cycles minimum with inspection confirming Grade 1 Loaded Forces have been maintained.

D. Options:

E. Products:
1. 2000.

2.05 LOCK CYLINDERS

A. Manufacturers:
1. BEST, dormakaba Group: www.bestaccess.com/#sle.
2. Substitutions: Not permitted.

B. Properties:
1. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
    a. Provide cylinders from same manufacturer as locking device.
    b. Provide cams and/or tailpieces as required for locking devices.
    c. Provide cylinders with appropriate format interchangeable cores where indicated.

C. Grades:
1. Standard Security Cylinders: Comply with BHMA A156.5.

D. Material:

E. Types: As applicable to each item specified.

F. Products:
1. Rim/mortise.

2.06 MORTISE LOCKS

A. Manufacturers:
1. BEST, dormakaba Group: www.bestaccess.com/#sle.
2. Sargent.

B. Properties:
1. Mechanical Locks: Manufacturer's standard.
    a. Fitting modified ANSI A115.1 door preparation.
    b. Door Thickness Coordination Fitting 1-3/4 inch (44 mm) to 2-1/4 inch (57 mm) thick doors.
    c. Latch: Solid, one-piece, anti-friction, self-lubricating stainless steel.
        1) Latchbolt Throw: 3/4 inch (19 mm), minimum.
    d. Auxiliary Deadlatch: One piece stainless steel, permanently lubricated.
    e. Backset: 2-3/4 inch (70 mm).
    f. Lever Trim:

1) Functionality: Allow the lever handle to move up to 45 degrees from horizontal position prior to engaging the latchbolt assembly.
2) Strength: Locksets outside locked lever designed to withstand minimum 1,400 inch-lbs. (158.2 Nm) of torque. In excess of that, a replaceable part will shear. Key from outside and/or inside lever will still operate lockset.
3) Spindle: Designed to prevent forced entry from attacking of lever.
4) Independent spring mechanism for each lever.
   (a) Trim to be self-aligning and thru-bolted.
5) Handles: Made of forged or cast brass, bronze, or stainless steel construction. Levers that contain a hollow cavity are not acceptable.
6) Levers to operate a roller bearing spindle hub mechanism.

2. Electrified Locks: Same properties as standard locks, and as follows:
   a. Voltage: 24 VAC.
   b. Function: Electrically locked (Fail Safe) or unlocked (Fail Secure), as indicated for each lock in Door Hardware Schedule.

C. Finishes: See Door Hardware Schedule.
   1. Core Faces: Match finish of lockset.

D. Grades:
   1. Comply with BHMA A156.13, Grade 1, Grade 1.
      a. Durability: Passing cycles tests verified by third party testing agency.

E. Options:
   1. Provide locksets made in a manufacturing facility to compliant with ISO 9001-Quality Management and ISO 14001-Environmental Management.

F. Products: Mortise locks, including standard and electrified types.
   1. 40H.

2.07 CYLINDRICAL LOCKS

A. Manufacturers:
   1. BEST, dormakaba Group: www.bestaccess.com/#sle.
   2. Corbin Russwin.

B. Properties:
   1. Mechanical Locks:
      a. Fitting modified ANSI A115.2 door preparation.
      b. Door Thickness Fit: 1-3/4 inches (35 mm) to 2-1/4 inches (57 mm) thick doors.
      c. Construction: Hub, side plate, shrouded rose, locking pin to be a one-piece casting with a shrouded locking lug.
         1) Through-bolted anti-rotational studs.
      d. Cast stainless steel latch retractor with roller bearings for exceptionally smooth operation and superior strength and durability.
      e. Bored Hole: 2-1/8 inch (54 mm) diameter.
      f. Backset: 2-3/4 inches (70 mm) unless otherwise indicated.
      g. Latch: Single piece tail-piece construction.
         1) Latchbolt Throw: 9/16 inch (14.3 mm), minimum.
      h. Cylinders:
         1) Cylinder Core Types: Locks capable of supporting manufacturers' cores, as applicable.
            (a) Small format interchangeable.
      i. Lever Trim:
         1) Style: See Door Hardware Schedule.
         2) Functionality: Allow the lever handle to move up to 45 degrees from horizontal position prior to engaging the latchbolt assembly.

3) Strength: Locksets outside locked lever designed to withstand minimum1,400 inch-lbs. (158.2 Nm) of torque. In excess of that, a replaceable part will shear. Key from outside and/or inside lever will still operate lockset.
4) Independent spring mechanism for each lever.
   (a) Contain lever springs in the main lock hub.
5) Outside Lever Sleeve: Seamless one-piece construction.
6) Keyed Levers: Removable only after core is removed by authorized control key.

C. Finishes: See Door Hardware Schedule.
1. Core Faces: Match finish of lockset.

D. Grades: Comply with BHMA A156.2, Grade 1, Series 4000, Operational Grade 1, Extra Heavy Duty.
1. Durability: Passing 50 Million cycle tests verified by third party testing agency.

E. Material: Manufacturer's standard for specified lock.
1. Critical Latch and Chassis Components: Brass or corrosion-resistance treated steel.
2. Outside Lever Sleeve: Hardened steel alloy.

F. Options:

G. Products: Cylindrical locks, including mechanical and electrified types.
1. 9K (Grade 1).

2.08 DOOR PULLS AND PUSH PLATES

A. Manufacturers:
1. Trimco: www.trimcohardware.com/#sle.
2. DonJo.
3. Ives.

B. Properties:
1. Pull Type: Straight, unless otherwise indicated.
2. Push Plate Type: Flat, with square corners, unless otherwise indicated.
   a. Edges: Beveled, unless otherwise indicated.

C. Grades: Comply with BHMA A156.6.

D. Material: Stainless steel, unless otherwise indicated.

E. Products:

2.09 CLOSERS

A. Manufacturers:
1. dormakaba; dormakaba Group: www.dormakaba.com/us-en/#sle.
2. LCN.

B. Properties:
1. Surface Mounted Closers: Manufacturer's standard.
   a. Construction: R14 high silicon aluminum alloy.
   b. Mechanism: Separate tamper-resistant adjusting valves for closing and latching speeds.
   c. Hydraulic Fluid: All-weather type.
   d. Arm Assembly: Standard for product specified.
      1) Include hold-open, integral stop, or spring-loaded stop feature, as specified in Door Hardware Schedule.
      2) Parallel arm to be a heavy-duty rigid arm.
      3) Where “IS” or “S-IS” arms are specified in hardware sets, if manufacturer does not offer this arm provide a regular arm mount closer in conjunction with a heavy-duty overhead stop equal to a dormakaba 900 Series.
   e. Covers:
      1) Type: Standard for product selected.

(a) Full.
2) Material: Plastic.
3) Finish: Painted.

C. Grades:
1. Closers: Comply with BHMA A156.4, Grade 1.
a. Underwriters Laboratories Compliance:
1) Product Listing: UL (DIR) and ULC for use on fire-resistance-rated doors.
(a) UL 228 - Door Closers-Holders, With or Without Integral Smoke Detectors.

D. Code Compliance: As required by authorities having jurisdiction in the State in which the Project is located.
1. Devices listed with California Department of Forestry and Fire Protection, Office of the State Fire Marshal.

E. Types:
1. Rack-and-pinion, surface-mounted. 1-1/2 inches (38 mm) minimum bore.

F. Options:
1. Advanced backcheck.

G. Installation:
1. Mounting: Includes surface mounted installations.
2. Mount closers on non-public side of door and stair side of stair doors unless otherwise noted in hardware sets.
3. At out swinging exterior doors, mount closer on interior side of door.
4. Provide adapter plates, shim spacers, and blade stop spacers as required by frame and door conditions.
5. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order.

H. Products:
1. Surface Mounted:
a. 8900.

2.10 PROTECTION PLATES

A. Manufacturers:
1. Trimco: www.trimcohardware.com/#sle.
2. DonJo.
3. Ives.

B. Properties:
1. Plates:
a. Kick Plates: Provide along bottom edge of push side of every wood door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.

C. Grades: Comply with BHMA A156.6.

D. Material: As indicated for each item by BHMA material and finish designation.
1. Metal Properties: Stainless steel.

E. Installation:
1. Fasteners: Countersunk screw fasteners

F. Products:
1. K0050.

2.11 STOPS AND HOLDERS

A. Manufacturers:
1. Trimco: www.trimcohardware.com/#sle.

B. General: Provide overhead stop/holder when wall or floor stop is not feasible.

C. Properties:
   1. Wall Bumpers: Wrought Stainless Steel.

D. Grades:
   1. Door Holders, Wall Bumpers, and Floor Stops: Comply with BHMA A156.16 and Resilient Material Retention Test as described in this standard.

E. Material: Base metal as indicated for each item by BHMA material and finish designation.

F. Types:
   1. Wall Bumpers: Bumper, concave, wall stop.

G. Installation:
   1. Non-Masonry Walls: Confirm adequate wall reinforcement has been installed to allow lasting installation of wall bumpers.

H. Products:
   1. Wall Bumpers: 1270WV.

2.12 THRESHOLDS

A. Manufacturers:
   1. National Guard Products, Inc: www.ngpinc.com/#sle.
   2. Reese.
   3. Pemko.

B. Properties:
   1. Threshold Surface: Fluted horizontal grooves across full width.

C. Grades: Thresholds: Comply with BHMA A156.21.

D. Types: As applicable to project conditions. Provide barrier-free type at every location where specified.

E. Products:
   1. 425.

2.13 WEATHERSTRIPPING AND GASKETING

A. Manufacturers:
   1. National Guard Products, Inc: www.ngpinc.com/#sle.
   2. Zero.
   3. Reese.

B. Properties:
   1. Adhesive-Backed Perimeter Gasketing: Silicone gasket material applied to frame with self- adhesive.

C. Grades: Comply with BHMA A156.22.

D. Products:
   1. Weatherstripping: See Door Hardware Schedule.
   2. Door Bottom Seals:
      a. Door Sweeps: See Door Hardware Schedule.

2.14 MISCELLANEOUS ITEMS

A. Manufacturers:
   1. Trimco: www.trimcohardware.com/#sle.
   2. DonJo.

B. Properties:
   1. Coat Hooks: Provide on room side of door, screw fastened.
      a. Material: Stainless steel.
   2. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.

a. Single Door: Provide three on strike jamb of frame.
b. Pair of Doors: Provide two on head of frame, one for each door at latch side.
c. Material: Rubber, gray color.

C. Products:
1. Coat Hooks.
a. 3072.
2. Silencers.
a. 1229A.

2.15 ELECTRIFIED HARDWARE

A. Manufacturers:
1. BEST, dormakaba Group: www.bestaccess.com/#sle.

B. Properties:
1. Door Position Switches: Recessed devices with balanced magnetic contacts.
a. Power Requirement: 50mA Max, 100 VDC.
b. SPDT configuration.
2. Power Supply Units: Manufacturer's standard.
a. Enclosures: NEMA Type 1, with hinged cover and knockouts.
b. Power: 24 VAC, 10 Amp; field-selectable.
c. Emergency Release Terminals: Designed to release devices upon activation of fire alarm system.
d. Auxiliary contacts for remote signaling.
e. User-selectable time delay from 0 to 4 minutes.
f. Fire Alarm System Interface: Standard.
g. Output Distribution Board with indicator LEDs.
h. On/Off LED power indicator.
3. Power Transfers: Manufacturer's standard.
a. Mortised Type with Wires & Connectors:
1) Listed by UL and ULC.
2) Stainless steel housing and spring conduit.
3) Wire Harness: Pre-installed, twelve wire, equipped with ten (10) 24 gauge wires and two 18 gauge wires.
4) Accommodate 180 degree door swing.
5) Quick-Connect Plugs: Pre-installed.
4. Wire Harnesses: Of sufficient length, with quick connectors.
a. Wire Harness End Connection to Power Supply or Junction Box: One end with bare leads.
5. Push Button Switches: Interior and weather-resistant, exterior devices to initiate door opening.
a. Action: Push/Release.

C. Products:
1. Power Transfers:
a. EPT-12C.
2. Wire Harnesses:
a. BEST wire harnesses.

2.16 KEYS AND CORES

A. Manufacturers:
1. BEST, dormakaba Group: www.bestaccess.com/#sle.
2. Substitutions: Not permitted.

B. Properties: Complying with guidelines of BHMA A156.28.
1. Provide small format interchangeable core.
2. Provide Patented CORMAX keys and cores.

3. Provide keying information in compliance with DHI (KSN) standards.
4. Keying Schedule: Arrange for a keying meeting, with Architect, Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying complies with project requirements.
5. Keying: Master keyed.
6. Include construction keying and control keying with removable core cylinders.
7. Supply keys in following quantities:
   a. Master Keys: 4 each.
   b. Construction Master Keys: 6 each.
   c. Construction Keys: 15 each.
   d. Construction Control Keys: 2 each.
   e. Control Keys if New System: 2 each.
8. Provide key collection envelopes, receipt cards, and index cards in quantity suitable to manage number of keys.
9. Deliver keys with identifying tags to Owner by security shipment direct from manufacturer.
10. Permanent Keys and Cores: Stamped with applicable key marking for identification. Do not include actual key cuts within visual key control marks or codes. Stamp permanent keys "Do Not Duplicate."
11. Include installation of permanent cores and return construction cores to hardware supplier. Construction cores and keys to remain property of hardware supplier.

C. Products:
   1. Patented:
      a. CORMAX.

2.17 FINISHES

A. Finishes: Identified in Hardware Sets.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

B. Correct all defects prior to proceeding with installation.

C. Verify that electric power is available to power operated devices and of correct characteristics.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Install hardware using the manufacturer’s fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use “Riv-Nuts” or similar products.

C. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

D. Install hardware for smoke and draft control doors in accordance with NFPA 105.

E. Use templates provided by hardware item manufacturer.

F. Do not install surface mounted items until application of finishes to substrate are fully completed.

G. Wash down masonry walls and complete painting or staining of doors and frames.

H. Complete finish flooring prior to installation of thresholds.

I. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
   1. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.
   2. For Steel Doors and Frames: See Section 6549.

3. For Steel Door Frames: See Section 081213.
4. For Aluminum-Framed Storefront Doors and Frames: See Section 084313.
5. For Wood Doors: Install in compliance with DHI WDHS.3 recommendations.
6. Flush Wood Doors: See Section 081416.
7. Stile and Rail Wood Doors: See Section 081433.
8. Mounting heights in compliance with ADA Standards:
   a. Locksets: 40-5/16 inch (1024 mm).
   b. Push Plates/Pull Bars: 42 inch (1067 mm).
   c. Deadlocks (Deadbolts): 48 inch (1219 mm).
   d. Exit Devices: 40-5/16 inch (1024 mm).
   e. Door Viewer: 43 inch (1092 mm); standard height 60 inch (1524 mm).

J. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

K. Include in installation for existing doors and frames any necessary field modification and field preparation of doors and frames for new hardware. Provide necessary fillers, reinforcements, and fasteners for mounting new hardware and to cover existing door and frame preparations.

3.03 CLEANING

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

B. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.04 PROTECTION

A. Protect finished Work under provisions of Section 017000 - Execution and Closeout Requirements.

B. Do not permit adjacent work to damage hardware or finish.

3.05 HARDWARE SETS

Manufacturer List

Code	Name
BE	Best Access Systems
BY	By Related Section
DM	Dorma Door Controls
NA	National Guard
PR	BEST Precision Exit Devices
ST	BEST Hinges and Sliding
TR	Trimco

Option List

Code	Description
24VAC	24 Volt AC
36"	36" Door Width
3RO	Prefix option for 2000 Apex Series
8'0"	8'0" HIGH
B4E-HEAVY-KP	BEVELED 4 EDGES - KICK PLATES
BSHD	Blade Stop Spacer - Heavy Duty Arms
C	QUICK CONNECT WIRING OPTION

C	Quick Connect Wiring System
C4	CAM-STANDARD CAM
CA-03	Cylinder Attachment Kit (Rim/SVR Device)
CD	CYLINDER DOGGING
CSK	COUNTER SINKING OF KICK and MOP PLATES
EPT-Prep	EPT Prep
LAR	Length as Required
LD	Less Dogging
LDS	LATCHBOLT MONITORING DOUBLE SWITCH
MLR	MOTORIZED LATCH RETRACTION
NFHD	Narrow Frame Bracket - Heavy Duty Arms
RQE	Request to Exit
TDS	TOUCHBAR MONITORING DOUBLE SWITCH
TRANSF	TRANSFORMER - 120VAC TO 24VAC
VIB	Double Visual Indictor Option

Finish List

Code	Description
26D	Satin Chrome
626	Satin Chromium Plated
630	Satin Stainless Steel
689	Aluminum Painted
AL	Aluminum
GREY	Grey

Hardware Sets

Set #01

Doors: 100, 118

2	Continuous Hinge	HD100A x LAR		NA
1	CVR Exit Device - Storeroom	3RO 2803 X C03 36" 8'0" CD	630	PR
1	CVR Exit Device - Exit Only	3RO 2801 36" 8'0" CD	630	PR
1	Rim Cylinder - Exit Trim	12E-72 PATD	626	BE
1	Mortise Cylinder - Cyl Dogging	1E-74 PATD C4	626	BE
2	Offset Door Pull	1191-4	630	TR
2	Closer w/ Spring Stop	8916 S-DS BSHD NFHD	689	DM
1	Perimeter Gasketing	By Aluminum Door Provider		BY
2	Door Sweep	C627 A x LAR		NA
1	Saddle Threshold	425 x LAR	AL	NA

Set #02

Doors: 131A, 138

1	Continuous Hinge	HD100A x LAR		NA
1	Rim Exit Device - Storeroom	3RO 2103 36" CA-03 CD	630	PR
1	Rim Cylinder - Exit Trim	12E-72 PATD	626	BE
1	Mortise Cylinder - Cyl Dogging	1E-74 PATD C4	626	BE
1	Offset Door Pull	1191-4	630	TR

1	Closer w/ Spring Stop	8916 S-DS BSHD NFHD	689	DM
1	Perimeter Gasketing	By Aluminum Door Provider		BY
1	Door Sweep	C627 A x LAR		NA
1	Saddle Threshold	425 x LAR	AL	NA

Set #03

Doors: 111

1	Cont. Hinge w/ EPT Prep	HD1100A 83" EPT-Prep		NA
1	Power Transfer	EPT-12C	630	PR
1	Elec Rim Device - Storeroom	3RO C LDS MLR TDS 2103 36" CA-03	630	PR
1	Rim Cylinder - Exit Trim	12E-72 PATD	626	BE
1	Offset Door Pull	1191-4	630	TR
1	Closer w/ Spring Stop	8916 S-DS BSHD NFHD	689	DM
1	Perimeter Gasketing	By Aluminum Door Provider		BY
1	Door Sweep	C627 A x LAR		NA
1	Saddle Threshold	425 x LAR	AL	NA
1	Wiring Harness	WH-6E		ST
1	Wiring Harness	WH-26P		ST
1	Wiring Harness	WH-192P		ST
1	Power Supply	By Access Control Provider		BY
1	Door Position Switch	By Access Control Provider		BY
1	Reader	By Access Control Provider		BY

Set #04

Doors: 114

1	Continuous Hinge	HD100A x LAR		NA
1	Rim Exit Device - Storeroom	3RO 2103 X 4903A 36" CD	630	PR
1	Rim Cylinder - Exit Trim	12E-72 PATD	626	BE
1	Mortise Cylinder - Cyl Dogging	1E-74 PATD C4	626	BE
1	Offset Door Pull	1191-4	630	TR
1	Closer w/ Spring Stop	8916 S-DS BSHD NFHD	689	DM
1	Perimeter Gasketing	By Aluminum Door Provider		BY
1	Door Sweep	C627 A x LAR		NA
1	Saddle Threshold	425 x LAR	AL	NA

Set #05

Doors: 118A

6	Butt Hinge	CB168 4.5" x 4.5"	26D	ST
2	Push Plate	1001-9	630	TR
2	Pull Plate	1014-3	630	TR
2	Closer w/ Spring Stop	8916 S-DS BSHD NFHD	689	DM
2	Kick Plate	K0050 10" x 1" LDW x B4E x CSK	630	TR
2	Silencer	1229A	GREY	TR

Set #06

Doors: 117

3	Butt Hinge	CB168 4.5" x 4.5"	26D	ST
1	Rim Exit Device - Exit Only	3RO 2101 36" LD	630	PR

1	Closer w/ Tri-Pack Arms	8916-AFP NOTE: mount on pull side of door	689	DM
1	Kick Plate	K0050 10" x 1" LDW x B4E x CSK	630	TR
3	Silencer	1229A	GREY	TR

Set #07

Doors: 101, 123

3	Butt Hinge	CB179 4.5" x 4.5" NRP	26D	ST
1	Lockset - Storeroom	9K3-7D15D PATD	626	BE
1	Closer w/ Friction Hold Open	8916 FHP	689	DM
1	Kick Plate	K0050 x10" x 2" LDW x B4E x CSK	630	TR
3	Silencer	1229A	GREY	TR

Set #08

Doors: 135

3	Butt Hinge	CB179 4.5" x 4.5" NRP	26D	ST
1	Lockset - Storeroom	9K3-7D15D PATD	626	BE
1	Closer w/ Tri-Pack Arms	8916-AFP NOTE: mount on pull side of door	689	DM
1	Kick Plate	K0050 x10" x 2" LDW x B4E x CSK	630	TR
1	Wall Bumper	1270WV	630	TR
3	Silencer	1229A	GREY	TR

Set #09

Doors: 110

3	Butt Hinge	CB179 4.5" x 4.5" NRP	26D	ST
1	Lockset - Storeroom	9K3-7D15D PATD	626	BE
1	Closer w/ Tri-Pack Arms	8916-AFP NOTE: mount on pull side of door	689	DM
1	Kick Plate	K0050 x10" x 2" LDW x B4E x CSK	630	TR
1	Wall Bumper	1270WV	630	TR
1	Perimeter Gasketing	5050C x LAR		NA
3	Silencer	1229A	GREY	TR

Set #10

Doors: 102, 103

3	Butt Hinge	CB179 4.5" x 4.5" NRP	26D	ST
1	Privacy Set - w/ Indicators	45H-0L15S VIB	626	BE
1	Closer w/ Tri-Pack Arms	8916-AFP NOTE: mount on pull side of door	689	DM
1	Kick Plate	K0050 x10" x 2" LDW x B4E x CSK	630	TR
1	Wall Bumper	1270WV	630	TR
1	Coat Hook	3072	630	TR
3	Silencer	1229A	GREY	TR

Set #11

Doors: 109

3	Butt Hinge	CB179 4.5" x 4.5" NRP	26D	ST
1	Privacy Set	9K3-0L15D	626	BE
1	Wall Bumper	1270WV	630	TR
1	Coat Hook	3072	630	TR
3	Silencer	1229A	GREY	TR

Set #12

Doors: 119, 120

3	Butt Hinge	CB179 4.5" x 4.5" NRP	26D	ST
1	Push Plate	1001-9	630	TR
1	Pull Plate	1014-3	630	TR
1	Closer w/ Tri-Pack Arms	8916-AFP NOTE: mount on pull side of door	689	DM
1	Kick Plate	K0050 x10" x 2" LDW x B4E x CSK	630	TR
1	Wall Bumper	1270WV	630	TR
3	Silencer	1229A	GREY	TR

Set #13

Doors: 104, 128, 131

2	Butt Hinge	CB168 4.5" x 4.5" NRP	26D	ST
1	Electric Butt Hinge	CECB168-12C 4.5" x 4.5"	26D	ST
1	Electric Lock - Storeroom	9KW3-7DEU15D PATD C RQE	626	BE
1	Closer w/ stop	8916 DS	689	DM
1	Kick Plate	K0050 x10" x 2" LDW x B4E x CSK	630	TR
1	Power Supply	By Access Control Provider		BY
1	Buzzer	By Access Control Provider NOTE: Buzzer to be located at Reception 126		BY
3	Silencer	1229A	GREY	TR

Set #14

Doors: 106, 107, 112, 113, 126, 127, 129, 130, 132, 134, 136, 137

3	Butt Hinge	CB179 4.5" x 4.5"	26D	ST
1	Lockset - Office	9K3-7AB15D PATD	626	BE
1	Wall Bumper	1270WV	630	TR
3	Silencer	1229A	GREY	TR

Set #15

Doors: 108

3	Butt Hinge	CB179 4.5" x 4.5"	26D	ST
1	Lockset - Office	9K3-7AB15D PATD	626	BE
1	Electromagnetic Closer	8916 EMF/T 24VAC TRANSF	689	DM
1	Wall Bumper	1270WV	630	TR
1	Manual Push Button	By Access Control Provider		BY
3	Silencer	1229A	GREY	TR

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Set #16

Doors: 115

3	Butt Hinge	CB179 4.5" x 4.5"	26D	ST
1	Lockset - Office	9K3-7AB15D PATD	626	BE
1	Closer w/ Tri-Pack Arms	8916-AFP NOTE: mount on pull side of door	689	DM
1	Kick Plate	K0050 x10" x 2" LDW x B4E x CSK	630	TR
1	Wall Bumper	1270WV	630	TR
3	Silencer	1229A	GREY	TR

Set #17

Doors: 133

3	Butt Hinge	CB179 4.5" x 4.5" NRP	26D	ST
1	Lockset - Classroom	9K3-7R15D PATD	626	BE
1	Wall Bumper	1270WV	630	TR
3	Silencer	1229A	GREY	TR

Set #18

Doors: 122

3	Butt Hinge	CB179 4.5" x 4.5" NRP	26D	ST
1	Lockset - Classroom	9K3-7R15D PATD	626	BE
1	Closer w/ Tri-Pack Arms	8916-AFP NOTE: mount on pull side of door	689	DM
1	Wall Bumper	1270WV	630	TR
3	Silencer	1229A	GREY	TR

Set #19

Doors: 104A, 128A

3	Butt Hinge	CB168 4.5" x 4.5"	26D	ST
1	Lockset - Classroom	9K3-7R15D PATD	626	BE
1	Closer w/ stop	8916 DS	689	DM
1	Wall Bumper	1270WV	630	TR
3	Silencer	1229A	GREY	TR

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Opening List

Opening	Hdw Set
100	01
101	07
102	10
103	10
104	13
104A	19
106	14
107	14
108	15
109	11
110	09
111	03
112	14
113	14
114	04
115	16
117	06
118	01
118A	05
119	12
120	12
122	18
123	07
126	14
127	14
128	13
128A	19
129	14
130	14
131	13
131A	02
132	14
133	17
134	14
135	08
136	14
137	14
138	02

END OF SECTION

SECTION 08800 - GLASS AND GLAZING

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 SUMMARY

A. Extent of glass and glazing work is indicated on Drawings and Schedules.

B. Types of work in this section include glass and glazing for:

(1) Glazing for Exterior Aluminum Storefront Window Systems, including internal Muntin Grids sealed between insulating glass, where shown and scheduled on Drawings.
(3) Glazing for Exterior Aluminum Entrance Doors and Transoms, including internal Muntin Grids sealed between insulating glass, where shown and scheduled on Drawings.

C. Related Sections:

(1) Exterior Aluminum Storefront Window Systems, Entrance Doors and Transoms are specified in Section 08411.
(2) Mirrors are specified in Division 8 Section 08830 “Mirrors & Accessories “.

1.03 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide glass and glazing that has been produced, fabricated and installed to withstand normal thermal movement, wind loading and impact loading (where applicable), without failure including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing materials and other defects in construction.

1.04 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data for each glass product and glazing material indicated.

C. Samples for verification purposes of 12-inch-square samples of each type of glass indicated, and 12-inch-long samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative in color of the adjoining framing system.

D. Product certificates signed by glazing materials manufacturers certifying that their products comply with specified requirements.

(1) Separate certifications are not required for glazing materials bearing manufacturer’s permanent labels designating type and thickness of glass,

provided labels represent a quality control program of a recognized certification agency or independent testing agency acceptable to authorities having jurisdiction.

1.05 QUALITY ASSURANCE

A. Glazing Standards: Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
   (1) FGMA Publications**:** FGMA Glazing Manual
   (2) SIGMA Publications: TM-3000 Vertical Glazing Guidelines

B. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.
   (1) Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SCGG) or other certification agency acceptable to authorities having jurisdiction.

C. Glazier Qualifications: Engage an experienced glazier who has completed glazing similar in material, design, and extent to that indicated for Project with a record of successful in-service performance.

D. Single-Source Responsibility for Glass: Obtain glass from one source for each project indicated below:
   (1) Primary glass of each (ASTM C 1036) type and class indicated.
   (2) Heat -treated glass of each (ASTM C 1048) condition indicated.
   (3) Insulating glass of each construction indicated.

E. Single-Source Responsibility for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials to comply with manufacturer=s directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

   (1) Where insulating glass units will be exposed to substantial altitude changes, comply with insulating glass fabricator=s recommendations for venting and sealing to avoid hermetic seal ruptures.

1.07 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing materials manufacturer or when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1.08 **WARRANTY**

A. Manufacturer's Warranty on Insulating Glass: Submit written warranty signed by manufacturers of insulating glass agreeing to furnish replacements for insulating glass units that deteriorate within specified warranty period indicated below. Warranty covers

only deterioration due to normal conditions of use and not to handling, installing, protecting, and maintaining practices contrary to glass manufacturer=s published instructions.

(1) **Warranty Period**: **Manufacturer's standard but not less than 10 years after date of Substantial Completion.**

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the products specified in Product Data Sheets at end of this Section.

2.02 HEAT-TREATED FLOAT GLASS PRODUCTS, GENERAL

A. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.

B. HEAT-TREATED FLOAT GLASS

(1) Uncoated, Clear, Heat-Treated Float Glass: ASTM C 1048, Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Quality z3 (glazing select), kind as indicated below.

(a) Kind FT (fully tempered) where indicated.

(2) Available Manufacturers: Subject to compliance with requirements, manufacturers offering heat-treated glass products that may be incorporated in the Work include, but are not limited to, the following companies.

AFG Industries, Inc.
Cardinal IG.
Saint-Gobain
Guardian Industries Corp.
HGP Industries
PPG Industries, Inc.
Viracon, Inc.

2.03 INSULATING GLASS PRODUCTS

A. Sealed Insulating Glass Units: Preassembled units consisting of organically sealed lites of glass separated by dehydrated air spaces complying with ASTM E 774 and with other requirements indicated, including those in Insulating Glass Product Data Sheet at the end of this Section.

(1) Available Manufacturers: Subject to compliance with requirements, manufacturers offering insulating glass products that may be incorporated in the Work include, but are not limited to, the following companies.

AFG Industries, Inc.
Cardinal IG.
Saint-Gobain
Guardian Industries Corp.

HGP Industries
PPG Industries, Inc.
Viracon, Inc.

(2) For properties of individual glass lites making up units, refer to requirements specified elsewhere in this Section applicable to types, classes, kinds, and conditions of glass products comprising lites of insulating glass units.

(3) Provide heat-treated, clear float glass of kind indicated or, if not otherwise indicated, Kind FT (fully tempered) where safety glass is designated or required.

(4) Interior Muntin (Grids): Where indicated and scheduled on the Drawings, provide interior "between the glass" muntin grids sealed between insulating glass lites, as follows:

(a) Interior aluminum roll-formed flat muntin grids, fabricated in patterns (number of lites) as shown on Drawings at each window, door or transom type.
(b) Grid Size: Nominal 5/8" wide x 1/8" thick. Note: Grid thickness shall be set as required to prevent grids from contacting any interior glass surfaces with "Low-E" coating.
(c) Grid Color: Match color and finish of aluminum frames or doors where grids are indicated.

2.04 CERAMIC-COATED SPANDREL GLASS PRODUCTS (ALUMINUM STOREFRONT WINDOW TYPE "C")

A. Ceramic-Coated Spandrel Glass: ASTM C 1048, Condition B (spandrel glass, one - surface ceramic coated), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), and complying with requirements specified including those in Ceramic-Coated Spandrel Glass Product Data at the end of this Section.

B. Fallout Resistance: Provide spandrel units identical to those passing fallout resistant test for spandrel glass specified in ASTM C 1048.

2.05 ELASTOMERIC GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

(1) Compatibility: Select glazing sealants and tapes of proven compatibility with other materials they will contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
(2) Suitability: Comply with sealant and glass manufacturer=s recommendations for selecting glazing sealants and tapes that are suitable for applications indicated and conditions existing at time of installation.
(3) Colors: Provide color of exposed joint sealants to comply with the following:

a. Provide selections made by Architect from manufacturer=s full range of standard of colors for products of type indicated.

B. Elastomeric Glazing Sealant Standard: Provide manufacturer=s standard chemically curing, elastomeric sealants of base polymer indicated that comply with ASTM C 920 requirements indicated on each Elastomeric Glazing Sealant Product Data Sheet at the

end of this Section, including those referencing ASTM classifications for Type, Grade, Class and Uses.

(1) Additional Movement Capability: Where additional movement capability is specified in Elastomeric Glazing Sealant Product Data Sheet, provide products, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, with the capability to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for uses indicated.

2.06 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent, non-staining and nonmigrating in contact with nonporous surfaces, with or without spacer rod as recommended by tape and glass manufacturers for application indicated, packaged on rolls with a release paper backing, and complying with AAMA 800 for products indicated below:

(1) AAMA 804.1.
(2) AAMA 806.1.

B. Expanded Cellular Glazing Tape: Closed-cell, polyvinyl chloride foam tape, factory coated with adhesive on both surfaces, packaged on rolls with release liner protecting adhesive, and complying with AAMA 800 for product 810.5.

C. Available Products: Subject to compliance with requirements, glazing tape that may be incorporated in the Work include, but is not limited to, the following:

(1) Back-Bedding Mastic Glazing Tape Without Spacer Rod:
   a. PTI 393 Glazing Tape (shimless), Protective Treatments, Inc.
   b. S-M 5700 Poly-Glaze Tape Sealant, Schnee-Morehead, Inc.
   c. Tremco 440 Tape, Tremco Inc.
   d. Dyna-Seal, Pecora Corp.
   e. PTI 626 Architectural Sealant Tape, Protective Treatments, Inc.
   f. S-M 5710 H.P Poly-Glaze Tape Sealant, Schnee-Morehead, Inc.
   g. SST-800 Tape, Tremco, Inc.
(2) Back-Bedding Mastic Glazing Tape With Spacer Rod:
   a. PTI 303 Glazing Tape (with shim). Protective Treatments, Inc.
   b. Pre-shimmed Tremco 440 Tape, Tremco. Inc.
   c. PTI 606 Architectural Sealant Tape, Protective Treatments, Inc.
(3) Expanded Cellular Glazing Tape:
   a. Norseal V-980 Closed-Cell Glazing Tape, Norton Company.

2.07 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:

(1) Neoprene, ASTM C 864.
(2) EPDM. ASTM C 864.
(3) Silicone, ASTM C 1115.
(4) Thermoplastic polyolefin rubber, ASTM C 1115.

B. Soft Compression Gaskets: Extruded or molded closed-cell, integral-skinned gaskets of material indicated below, complying with ASTM C 509, Type II, black, and of profile and hardness required to maintain watertight seal:
(1) Neoprene
(2) EPDM
(3) Silicone
(4) Thermoplastic polyolefin rubber.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following companies.

(1) Preformed Gaskets:
Advanced Elastomer Systems, L.P.
Schnee-Morehead, Inc.
Tremco, Inc.

2.08 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials involved for glazing application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85 plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side-walking).

F. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonextruding, non-outgassing, strips of closed-cell plastic foam of density, size, and shape to control sealant depth and otherwise contribute to produce optimum sealant performance.

2.09 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine glass framing, with glazier present, for compliance with the following:

(1) Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.

(2) Presence and functioning of weep system.
(3) Minimum required face or edge clearances.
(4) Effective sealing between joints of glass-framing members.

B. Do not proceed with glazing until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.03 GLAZING, GENERAL

A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions as indicated on Drawings provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass from edge damage during handling and installation as follows:

(1) Use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass lites with flares or bevels on bottom horizontal edges so edges are located at top of opening, unless otherwise indicated by manufacturer=s label.
(2) Remove damaged glass from Project site and legally dispose of off site. Damaged glass is glass with edge damage or other imperfections that, when installed, weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install elastomeric settings blocks in sill rabbets, sized and located to comply with referenced glazing standard, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass sizes larger than 50 united inches (length plus height) as follows:

(1) Locate spacers inside, outside, and directly opposite each other. Install correct size and spacing to preserve required face clearances, except where gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and comply with system performance requirements.
(2) Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking to comply with requirements of referenced glazing publications, unless otherwise required by glass manufacturer.

I. Set glass lites in each series with uniform pattern, draw, bow and similar characteristics.

3.04 TAPE GLAZING

A. Position tapes on fixed stops so that when compressed by glass their exposed edges are flush with or protrude slightly above sight line of stops.

B. Install tapes continuously but not in one continuous length. Do not stretch tapes to make them fit opening.

C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by manufacturer.

E. Do not remove release paper from tape until just before each lite is installed.

F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

G. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.05 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit opening s exactly, with stretch allowance during installation.

B. Secure compression gaskets in place with joints located at corners to compress gaskets producing a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

C. Install gaskets so they protrude past face of glazing stops.

3.06 SEALANT GLAZING (WET)

A. Install continuous spacers between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel weep systems until sealants cure. Secure spacers in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposes surfaces of sealants to provide a substantial wash away from glass. Install pressurized gaskets to protrude slightly out of channel to eliminate dirt and moisture pockets.

3.07 PROTECTION AND CLEANING

A. Protect exterior glass from breakage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkali deposits, or stains, and remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.

E. Wash glass on both faces in each area of Project not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

3.08 PRODUCT DATA

A. Primary (Clear) Float Glass Product Data

(1) Primary (Clear)Float Glass Designation: See “Schedule of Glazing Types”
(2) Class: (Class 1 (clear) float glass.}

B. Type “B” Insulating Glass Product Data

(1) Insulating Glass Unit Designation: See “Schedule of Glazing Types”.
(2) Classification of Units: Class CBA per ASTM E 774.
(3) Air Space Width: Nominal 2 inch measured perpendicularly from surfaces of glass lites at unit’s edge.

(4) Sealing System: Dual seal, primary and secondary sealants: (manufacturer=s standard sealants).

(5) Spacer Specifications: Manufacturer’s standard metal.

a. Dessicant: Either molecular sieve or silica gel or blend of both.
b. Corner Construction: Manufacturer=s standard corner construction.

(6) Glass Specifications: Comply with the following requirements.

a. Thickness of Each Lite: 6.0 mm (0.23 inch)
b. Uncoated Indoor Lite: Class 1 (clear) float glass. Kind FT (fully tempered), where scheduled. Condition A (uncoated), Class 1 (clear) float glass.
c. Outdoor Lite: TI-AC40 Low-E Coating: Where scheduled - Kind FT (fully tempered).

C. Type "C" Insulating Glass Product Data

(1) Insulating Glass Unit Designation: Low-E Ultra Clear Insulating Glass; Clear, low-reflective outdoor appearance.
(2) Product: Equal to "Solarban®" 72(2) "Starphire®" + Starphire by PPG Industries, Inc. Kind FT (fully tempered).
(3) Insulating Unit Construction: 1/4-inch (6mm) "Starphire" Glass, "Solarban" 72 Solar Control (Sputtered) on second surface (2) + 1/2-inch (13mm) air space + 1/4-inch (6mm) "Starphire" (ultra-clear) Glass.
(4) Performance Values:
(a) Visible Light Transmission: 71 percent
(b) SHGC: 0.30
(c) Shading Coefficient: 0.34
(d) Outdoor Visible Light Reflectance: 12 percent
(e) Heat Transfer Coefficient:
Winter U-Value: 0.29
Summer U-Value: 0.27
(f) Ceramic-Coated Indoor Lite (3rd surface): Comply with requirements specified for ceramic-coated spandrel glass products.

D. Elastomeric Glazing Sealant Product Data

(1) Base Polymer: Urethane.
(2) Type: S (single component).
(3) Grade: NS (non-sag).
(4) Uses Related to Exposure: T (traffic) and NT (nontraffic).

END OF SECTION 08800

3.08 PRODUCT DATA

A. Primary (Clear) Float Glass Product Data

(1) Primary (Clear)Float Glass Designation: See "Schedule of Glazing Types"
(2) Class: (Class 1 (clear) float glass.}

C. Patterned Glass Product Data

(1) (Tempered) Patterned Glass Designation: See "Schedule of Glazing Types".
(2) Pattern: Random pattern p3.
(3) (Available) Products are as indicated below:

Aquatex, AFG Industries, Inc.
Flax, AFG Industries, Inc.
Florex, AFG, Industries, Inc.
Hammered, AFG Industries, Inc.
Industrex, AFGk Industries, Inc.
Leaf, AFG Industries, Inc.
Pattern 62, AFG Industries, Inc.
Velvex, AFG Industries, Inc.
Smooth Rub, Guardian Industries Corp.
Spraylite, Guardian Industries Corp.

D. Insulating Glass Product Data

(1) Insulating Glass Unit Designation: See "Schedule of Glazing Types".
(2) Classification of Units: Class CBA per ASTM E 774.

(3) Air Space Width: Nominal ½ inch measured perpendicularly from surfaces of glass lites at unit's edge.
Sealing System: Dual seal, primary and secondary sealants: (manufacturer's standard sealants).

(4) Spacer Specifications: Manufacturer's standard metal.

a. Dessicant: Either molecular sieve or silica gel or blend of both.
b. Corner Construction: Manufacturer's standard corner construction.

(5) Glass Specifications: Comply with the following requirements.

a. Thickness of Each Lite: 6.0 mm (0.23 inch)
b. Uncoated Indoor Lite: Class 1 (clear) float glass. Kind FT (fully tempered), Condition A (uncoated), Class 1 (clear) float glass.
c. Ceramic-Coated Indoor Lite: Comply with requirements specified for ceramic-coated spandrel glass products.
d. Patterned Glass Indoor Lite: Comply with requirements specified for patterned glass products.

E. Tinted Insulating Glass Product Data

(1) Insulating Glass Unit Designation: See "Schedule of Glazing Types".
(2) Classification of Units: Class CBA per ASTM E 774.
(3) Air Space Width: Nominal ½ inch measured perpendicularly from surfaces of glass lites at unit's edge.
Sealing System: Dual seal, primary and secondary sealants: (manufacturer's standard sealants).
(4) Spacer Specifications: Manufacturer's standard metal.
a. Dessicant: Either molecular sieve or silica gel or blend of both.
b. Corner Construction: Manufacturer's standard corner construction.
(5) Glass Specifications: Comply with the following requirements.
a. Thickness of Each Lite: 6.0 mm (0.23 inch)
b.Uncoated Indoor Lite Class 1 (clear) float glass. Kind FT (fully tempered), Condition A (uncoated), Class 1 (clear) float glass.
c. Ceramic-Coated Indoor Lite: Comply with requirements specified for ceramic-coated spandrel glass products.
d. Uncoated Tinted Outdoor Lite: Class 2 (tinted, heat-absorbing and light-reducing) float glass with a tint color of bronze, gray or green.

E. Elastomeric Glazing Sealant Product Data

(1) Base Polymer: Urethane.
(2) Type: S (single component).
(3) Grade: NS (nonsag).
(4) Uses Related to Exposure: T (traffic) and NT (nontraffic).

SECTION 09250 – GYPSUM DRYWALL

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division – 1 General Requirements sections, apply to work of this section.

1.02 DESCRIPTION OF WORK

A. Types of work include:

(1) Gypsum drywall.
(2) Interior non-load bearing metal stud and furring systems.
(3) Sound attenuation insulation.
(4) Drywall finishing (joint tape and compound treatment).
(5) Tile backing panels at wainscot locations and stone at fireplaces.

Related Work specified in other sections:

(1) Exterior metal wall studs and sheathing are specified in Division 5, Section 05400.
(2) Wood framing, blocking and trim are specified in Division 6 Sections.
(3) Exterior Insulation and Finish System is specified in Division 7, Section 07240.
(4) Blanket-type Thermal Building Insulation is specified in Division 7, Section 07210.
(5) Division 15 Mechanical Sections.
(6) Division 16 Electrical Sections.

1.03 QUALITY ASSURANCE

A. Gypsum Board Standard: GA-216 by Gypsum Association.

B. Metal Support Standard: ASTM C 754.

C. Manufacturer: Obtain gypsum board products from a single manufacturer, or from manufacturers recommended by the prime manufacturer of gypsum boards.

D. Allowable Tolerances: 1/8” offsets between planes of board faces and ¼” in 8’-0” for plumb, level, warp and bow.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer’s product specifications and installation instructions for each gypsum drywall component, including other data as may be required to show compliance with these specifications.

1.05 PRODUCT HANDLING

A. Deliver, identify, store and protect gypsum drywall materials to comply with referenced standards.

1.06 JOB CONDITIONS

A. Environmental Conditions: Comply with referenced standards.

1.08 COORDINATION OF WORK

A. Coordinate drywall furring work with installers of related work including, but not limited to acoustical ceilings, building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, sprayed-on fireproofing and sprinklers.

B. All work above the ceiling line should be completed prior to installing the drywall sheet goods. There should be no materials resting against or wrapped around the suspension system, hanger wires or ties

PART II – PRODUCTS

2.01 METAL SUPPORT MATERIALS

A. Interior Wall/Partition Support Materials:

(1) Drywall Studs: ASTM C645; 20-gauge unless otherwise indicated on Drawings.

(a) Depth of Section: Generally, 3-5/8" deep (except as indicated on Drawings as 2-1/2" deep or 6" deep at Chase Walls, Column Furring, Steel Beams and other locations) with 1-1/4" flange and flange return lip.
(b) Products as manufactured by Dietrich Metal Framing; a Worthington Industries Company; MarinoWare; a division of Ware Industries; Southeastern Stud & Components, Inc.; Unimast, Incorporated (USG), or equal.
(c) Runners: Match studs; type recommended by stud manufacturer for floor and ceiling support of studs, and for vertical abutment of drywall work at other work.
(d) Stud system accessories: Provide stud manufacturer's standard clips, shoes, ties, reinforcements, fasteners and other accessories as needed for a complete stud system.
(e) Built-up Headers: Size, gauge and configuration as indicated on Drawings.

(2) Furring Members ASTM C 645; 20-gauge, hat-shaped, 7/8" deep.

2.02 GYPSUM BOARD PRODUCTS

A. Gypsum Board (GypBd): (Also known as gypsum wallboard). ASTM C630 with tapered long edges. Type "X" as referenced on Drawings.

(1) Thickness 5/8"

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

(1) American Gypsum Co.
(2) G-P Gypsum

(3) LaFarge North America, Inc.
(4) National Gypsum Company
(5) Temple
(6) USG Corporation

C. Type X:

(1) Thickness: 5/8". Comply with GA-216 for each application and support spacing.
(2) Long Edges: Tapered

D. Provide moisture resistant gypsum backing board at all locations where porcelain tile wainscot or Ledgestone finish is scheduled over gypsum board.

E. Thicknesses: As indicated above or, where not otherwise indicated, comply with thickness requirements of GA-216 for each application and support spacing. Comply with requirements for U.L. fire-resistance ratings indicated.

F. Sheet Size: Maximum length available which will minimize joints.

2.03 TRIM ACCESSORIES

A. General: Provide manufacturer's standard trim accessories of types indicated for drywall work, formed of galvanized steel unless otherwise indicated, with either knurled and perforated or expanded flanges for nailing or stapling, and beaded for concealment of flanges in joint compound. Provide corner beads, L-type edge trim beads, U-type edge trim beads, special L-kerf-type edge trim beads, and one piece control joint beads.

2.04 JOINT TREATMENT MATERIALS

A. General: ASTM C 475; type recommended by the manufacturer for the application indicated, except as otherwise indicated.

B. Joint Tape: Interior Gypsum Wallboard: Paper.

C. Joint Compound: On interior work provide chemical hardening type for bedding and filling, ready-mixed vinyl type or vinyl type powder type for topping.

2.05 AUXILIARY MATERIALS

A. General: Provide auxiliary materials for gypsum drywall work of the type and grade recommended by the manufacturer of the gypsum board.

B. Laminating Adhesive: Special adhesive or joint compound specifically recommended for laminating gypsum boards.

C. Gypsum Board Fasteners: Steel Drill Screws, complying with ASTM C1002, unless otherwise indicated.

(1) Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033" to 0.112" thick.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag, wool or rock wool; 3-1/2" unless indicated otherwise.

(1) Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly, where applicable.
(2) Provide Sound Attenuation Blankets at locations as indicated on Drawings at interior drywall partitions. SEE FLOOR PLAN LEGEND ON DRAWINGS.

PART III – EXECUTION

3.01 INSTALLATION OF METAL SUPPORT SYSTEMS

A. Wall/Partition Support Systems:

(1) Install supplementary framing, blocking, furring and bracing at openings and terminations in the work; and at locations as required to support fixtures, equipment, services, heavy trim, casework, millwork, furnishings and similar work which cannot be adequately supported on gypsum board alone.

(2) Isolate stud system from transfer of structural loading to system, both horizontally and vertically. Provide slip or cushioned type joints to attain lateral support and avoid axial loading.
(3) Install runner tracks at floors, ceilings and structural walls, beams and columns where gypsum drywall stud system abuts other work, except as otherwise indicated.
(4) Extend partition stud system through acoustical ceilings and elsewhere as indicated to the structural support or substrate above the ceiling.
(5) Space studs and joists at 24” o.c. except as otherwise indicated.
(6) Frame door openings with vertical studs securely attached by screws at each jamb either directly to frames or to jamb anchor clips on door frame; install runner track sections (for jack studs) at head and secure to jam studs.
    (a) Provide runner tracks of same gauge as jamb studs. Space jack studs same as partition studs.
    (b) Install 20 gauge studs at each jamb for all doors 2’-8” wide to 4’-0” wide weighing not more than 200 lbs.; and for all doors less than 2’-8” wide weighing more than 100 lbs. Bit not more than 200 lbs.
    (c) Install double 20 gauge studs placed back to back at each jamb for pairs of doors over 4’-0” wide weighing not more than 300 lbs.; screw attach web of back to back studs direct to jamb anchor clips nested between flange of stud.
(7) Frame openings other than door openings in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads.
(8) Space furring members 24” o.c., except as otherwise indicated.

3.02 GENERAL GYPSUM BOARD INSTALLATION REQUIREMENTS

A. Install sound attenuation blankets as indicated, prior to gypsum board unless readily installed after board has been installed.

B. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 1’-0” in alternate courses of board.

C. Install wall/partition boards vertically to avoid end-butt joints wherever possible. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs.

D. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1-1/6" open space between boards. Do not force into place.

E. Locate either edge or end joints over supports except in horizontal applications or where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that both tapered edge joints abut, and mill-cut or field-cut end joints abut. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.

F. Attach gypsum board to framing and blocking as required for additional support at openings and cutouts.

G. Unless indicated otherwise, cover both faces of stud partition framing with gypsum board in concealed spaces (above ceilings, etc.) except in chase walls which are properly braced internally.

(1) Except where concealed application is required for sound, fire, air or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. area, and may be limited to not less than 75% of full coverage.

H. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide ¼" to ½" space and trim edge with J-type semi-finishing edge trim. Seal joints with acoustical sealant. Do not fasten drywall directly to stud system runner tracks.

I. Floating Construction: Where feasible, including where recommended by manufacturer, install gypsum board with "floating" internal corner construction, unless isolation of the intersecting boards is indicated, unless control or expansion joints are indicated, or unless fire rating is indicated.

J. Where sound-rated drywall work is indicated (STC rating), including double-layer work and work on resilient furring, seal the work at perimeters, control and expansion joints, openings and penetrations with a continuous bead of acoustical sealant including a bead at both faces of partitions. Comply with manufacturer's recommendations for location of beads, and close off sound-flanking paths around or through the work, including sealing of partitions above acoustical ceiling.

K. Space fasteners in gypsum boards in accordance with referenced standards, U.L. Design requirements, and with manufacturer's recommendations, unless otherwise indicated.

3.03 METHODS OF GYPSUM DRYWALL APPLICATION

A. Single-layer and double layer application: Install exposed gypsum board as follows.

(1) On partitions/walls apply gypsum board horizontally (perpendicular to framing); use maximum length sheets possible to minimize end joints.

B. Single-layer and double layer fastening methods: Apply gypsum board to supports as follows:

(1) Fasten with screws.

3.04 INSTALLATION OF SUSPENSION SYSTEMS – GENERAL

A. Install suspension system in accordance with the manufacturer's instructions, in compliance with ASTM installation standard, and with applicable codes as required by the authorities having jurisdiction.

B. To secure to metal clips, concrete inserts, steel bar joist, steel beam or steel deck, use power actuated fastener or insert. Coordinate placement for hanger wire spaced as required for expected ceiling loads and layout.

C. Install hanger wire as required with necessary on center spacing to support expected ceiling load requirements, following local practices, codes and regulations. Provide additional wires at light fixtures. A pigtail knot shall be used with three tight wraps at top and bottom fastening locations.

D. Add additional wire as needed when using compatible clips and accessories.

E. Control and Expansion Joints: Roll formed zinc alloy, aluminum, or plastic as required for expansion and contraction.

F. Main beams shall be suspended from the overhead construction with hanger wire, spaced as required for expected ceiling loads, along the length of the main beams.

G. Install cross tees at on center spacing as specified by the drywall manufacturer.

H. Use channel molding or angle molding to interface with Drywall Grid System to provide perimeter attachment or to obtain drop soffits, verticals, slopes, etc.

I. For light fixtures use secondary framing cross tees as required to frame opening.

J. Single cross tees in a route hole to be secured by 7/16-inch framing screw or alternative methods.

3.05. INSTALLATION OF DRYWALL TRIM ACCESSORIES

A. General: Where feasible use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges by nailing or stapling in accordance with manufacturer's instructions and recommendations.

B. Install metal corner beads at external corners of drywall work.

C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim is indicated. Provide type with face flange to receive joint compound except where semi-finishing type is indicated. Install L-type trim where work is tightly abutted to other work, and install special kerf-type where other work is kerfed to receive long leg of L-type trim. Install U-type trim where edge is exposed, revealed, gasketed, or sealant filled (including expansion joints). Install where gypsum board abuts masonry.

D. Install J-type semi-finishing trim where indicated and where exterior gypsum board edges are not covered by applied moldings.

E. Install metal control joint (beaded-type) where indicated (G.C.J.).

3.06 INSTALLATION OF DRYWALL FINISHING

A. General: Apply treatment at gypsum board joints (both directions), flanges of trim accessories, penetrations, fastener heads, surface defects and elsewhere as required to prepare work for decoration. Prefill open joints and rounded or beveled edges, using type of compound recommended by manufacturer.

(1) Apply joint tape at joints between gypsum boards, except where a trim accessory is indicated.

(2) Apply joint compound in 3 coats (not including prefill or openings in base) and sand between last 2 coats and after last coat.

3.07 ADJUST AND CLEAN

A. Screw pop:

(1) Repair screw pop by installing new screw approximately 1-1/2” from pop and reseat.
(2) When face paper is punctured, install new screw approximately six months after installation or one heating season.
(3) Fill damaged surface with compound.

B. Ridging:

(1) Do not repair ridging until condition has fully developed: Approximately six months after installation or one heating season.
(2) Sand ridges to reinforcing tape without cutting through tape.
(3) Fill concave areas on both sides of ridges with topping compound.
(4) After fill is dry, blend in topping compound over repaired area.

C. Fill cracks with compound and finish smooth and flush.

3.08 PROTECTION OF WORK

A. Installer shall advise Contractor of required procedures for protecting gypsum drywall work from damage and deterioration during remainder of construction period.

END OF SECTION 09250

SECTION 09310 – TILE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 DESCRIPTION OF WORK

A Extent of tile work is indicated on drawings.

B. Types of tile work in this section include the following:

(1) Interior Glazed Porcelain Floor, Base and Wall Tile, where indicated and scheduled on Drawings.
(2) Metal Transition Strips, where indicated on Drawings.

C. Gypsum drywall substrates are specified in Section 09250 "Gypsum Drywall".

1.03 QUALITY ASSURANCE

A. Source of Materials: Provide materials obtained from one source for each type and color of tile, grout, and setting materials.

1.04 SUBMITTALS

A. Samples for Initial Selection Purposes: Submit manufacturer's stock color samples consisting of actual tiles, slabs or sections of tile showing full range of colors, textures and patterns available for each type of tile indicated. Include samples of grout and accessories involving color selection, where necessary.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Prevent damage or contamination to materials by water, freezing, foreign matter or other causes.

1.06 PROJECT CONDITIONS

A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

B. Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.

C. Maintain temperatures at not less than 50 deg. F (10 deg. C) in tiles areas during installation and for 7 days after completion, unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Porcelain Tile and Trim: The following performance specification is intended to meet specific design, maintenance and functional requirements necessary to this project. It is not intended to limit competitive bidding, but rather encourage participation from all qualified manufacturers which have the performance criteria as outlined in Part 2 of this section. Equal products by Dal-Tile and other manufacturers will be considered, subject to submission in accordance with the Prior Approval section of these specifications.

1. Available Manufacturer-Basis of Design: The following porcelain tile manufacturer and product has been accorded prior approval:

FLORIM USA – “Stonefire” Glazed Porcelain Tile

2.02 PRODUCTS, GENERAL

A. ANSI Standard: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile" for types and grades of tile indicated.

(1) Furnish tile complying with "Standard Grade" requirements unless otherwise indicated.

B. ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with products and materials indicated for setting and grouting.

C. Colors, Textures and Patterns: For tile, grout, granite and other products requiring selection of colors, surface textures or other appearance characteristics, provide products as selected by Architect from manufacturer's standard color range, and as follows:

(1) See Drawings for floor, base, wainscot and wall porcelain tile patterns.

D. Slip-Resistance: Provide porcelain floor tiles with a coefficient of Friction (wet and dry value) of 0.6 or above, per recommendations of the Americans with Disabilities Act (ADA).

2.03 TILE PRODUCTS

A. Porcelain Floor, Wainscot and Wall Tile: Provide flat tile complying with the following requirements:

(1) Nominal Facial Dimension: 12" x 12" (refer to drawings for locations).
(2) Nominal Thickness: 3/8" (10mm).
(3) Product: Equal to FLORIM USA, “Stonefire”
(4) Color by Architect

B. Porcelain Tile Bullnose Cap Trim for Base and Wainscots, where shown on Drawings: Provide flat tile complying with the following requirements:
(1) Nominal Facial Dimension: 3" x 12" (refer to drawings for locations).
(2) Nominal Thickness: 3/8" (10mm).
(3) Product: Equal to FLORIM USA “Stonefire”
(4) Color by Architect.

2.04 CRACK SUPPRESSION MEMBRANE FOR THINSET TILE INSTALLATION

A. Crack Suppression Membrane to be thin, cold applied, single component liquid and load bearing. Reinforcing fabric to be non-woven rot-proof specifically intended for crack suppression membrane. Materials to be non-toxic, non-flammable, and non-hazardous during storage, mixing, application and when cured. Crack Suppression Membrane shall also meet the following physical requirements:

1.	Elongation at break (ASTM D751):	20 - 30%
2.	Service Temperatures (LIL 1016):	-20 deg to 280 deg F(-28 deg to 137 deg. C)
3.	Breaking Strength (ASTM D751):	1700 psi (11.7 MPa)
4.	Thickness (LIL 1013):	20 mils (0.5 mm)
5.	Service Rating (TCA/ASTM C627):	Extra heavy/cycles 1-14

B. Available Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:

(1) "Laticrete Blue 92" Anti-Fracture Membrane; Laticrete International, Inc.

2.05 SETTING MATERIALS

A. Bond Coat: Dry-Set mortar or latex-portland cement mortar on cured bed; ANSI A108.5.

B. Dry-Set Mortar: Provide product complying with ANSI A118.1.

C. Latex-Portland Cement Mortar: Provide product complying with ANSI A118.4 and the following requirement for composition:

(1) Prepackaged dry mortar mix incorporating dry polymer additive in the form of a re-emulsifiable powder to which only water is added at job site.
(2) Latex additive (water emulsion) of type described below, serving as a replacement for part or all of gauging water, added at job site to prepackaged dry mortar mix supplied or specified by latex manufacturer.
(a) Latex Type: Manufacturer's standard.

2.06 GROUTING MATERIALS

A. Commercial Latex Portland Cement Grout: Provide product complying with ANSI A118..

2.07 MISCELLANEOUS MATERIALS

A. Tile Cleaner: Product specifically acceptable to manufacturer of tile and grout manufacturer for application indicated and as recommended by National Tile Promotion Federation, 112 North Alfred ST., Alexandria, VA 22134 or Ceramic Tile Institute, 700 N. Virgil Ave., Los Angeles, CA 90029.
B. Primers: As recommended by tile manufacturer for types of substrate to receive tile.

2.08 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with requirements of referenced standards and manufacturers for accurately proportioning of materials, water or additive content, mixing equipment and mixer speeds, mixing containers, mixing time, and other procedures need

to produce mortars and grouts of uniform quality with optimum performance characteristics for application indicated.

2.09 MANUFACTURED COMPONENTS AND ACCESSORIES

A. Tile Edge and Transition Strips: Roll-formed stainless steel transition strips; profile and height as indicated; with integral perforated anchoring leg for setting the strip into setting material.
   1. Profile: Sloped transition strip; compliant with Americans with Disabilities Act (ADA).
   2. Height: As required to suit application.
   3. Material and Finish:
      a. Brushed stainless steel: EGB
   4. Products:
      a. Tile to Lower Finish: Schluter - RENO-U or RENO-TK.

B. Tile Expansion and Control Joints for Thin-set Applications: Extruded rigid PVC profiles joined by a soft CPE movement joint material, with integral perforated anchoring legs for setting the joint into the setting bed.
   1. Height: As required to suit application.
   2. Color: As selected by Architect from manufacturer=s standard range.
   3. Products: Schluter - DILEX.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive tile work and conditions under which tile will be installed. Do not proceed with tile work until surfaces and conditions comply with requirements indicated in referenced tile installation standard.

3.02 INSTALLATION, GENERAL

A. ANSI Tile Installation Standard: Comply with applicable parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile".

B. TCNA Installation Guidelines: TCNA "Handbook for Ceramic Tile Installation" (latest Edition); comply with TCNA installation methods indicated or, if not otherwise indicated, as applicable to installation conditions shown.

C. Extend tile work into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions, except as otherwise shown. Terminate work neatly at obstructions, edges and corners with disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures and other penetrations so that plates, collars, or covers overlap tile.

E. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are same size. Layout tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise shown.

F. Expansion Joints: Locate expansion joints and other sealant filled joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw cut joints after installation of tiles.
(1) Locate joints in tile surfaces directly above joints in concrete substrates.
(2) Comply with expansion joint recommendations of current TCNA Handbook.

G. Grout tile to comply with the requirements of the following installation standards:
(1) For porcelain grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts) comply with ANSI A108.10.

3.03 FLOOR INSTALLATION METHODS

A. Thin-Set Porcelain Floor Tile: Install tile to comply with requirements indicated below for setting bed methods, TCNA installation methods related to types of subfloor construction and grout types:
(1) Latex-Portland Cement Mortar: ANSI A108.5.
(2) Substrate: Concrete Subfloors, Interior: TCNA F113, latest edition.
(3) Grout: Commercial latex portland cement.
(4) Install over crack suppression membrane.

B. Thresholds and Transition Strips: Install thresholds and transition strips at locations indicated; set in same type of setting bed as abutting field tile unless otherwise indicated.

C. Crack Suppression (Spot Treatment of Cracks):

(1) Crack suppression must be applied a minimum of 3 times the width of the tile or stone being installed or the tile being set over the crack must be completely over the crack suppression membrane. The tile over the crack cannot be in contact with the concrete. Install anti-fracture membrane in compliance with current revisions of ANSI A108.1 (A-1 through A-3). Review the installation and plan the application sequence. Pre-cut Anti-Fracture Membrane Reinforcing Fabric, allowing 2" (50 mm) for overlap at ends and sides. Roll-up the pieces for easy handling and placement. Shake or stir Anti-Fracture Membrane Liquid before using. Pre-treat all substrate cracks, cold joints, control joints, coves, corners and penetrations according to Manufacturer's specific recommendations. Allow-pre-treated areas to dry to the touch. Apply a liberal coat of Anti-Fracture Membrane
Liquid with brush or roller over substrate including pre-treated areas. Before the coat dries, unroll Anti-Fracture membrane Reinforcing Fabric, smooth out any wrinkles and press with brush or roller until Anti-Fracture Membrane Liquid Ableeds@ through to surface. Apply another liberal coat of Anti-Fracture Membrane Liquid and allow it to dry to the touch - 1-3 hours @ 70 deg. F (21 deg. C) & 50% RH. For installation of ceramic tile, mosaic, paver, brick or stone, follow **Thin Bed Method** (3.4 C.), which may begin as soon as last coat of Anti-Fracture Membrane Liquid has dried to the touch. Allow Anti-Fracture Membrane to cure for at least 3 days @ 70 deg. F (21 deg. C) & 50% RH before exposing installation to rain or other water, even if covered by ceramic tile, mosaics, pavers, brick or stone.

3.04 THIN-SET BASE, WAINSCOT AND WALL TILE INSTALLATION METHODS

A. Install types of tiles designated for wall (wainscot) application to comply with requirements indicated below for setting bed methods, TCNA installation methods related to subsurface wall conditions, and grout types:

B. Latex-Portland Cement Mortar: ANSI A108.5.

C. Dry-Set Mortar: ANSI A108.5.

D. Substrates:

(1) Gypsum Board, Interior: TCNA W243, latest edition.
(a) Grout: Commercial latex portland cement

(2) CMU Masonry, Interior: TCNA W202, latest edition.
(a) Grout: Commercial latex portland cement
(b) Grout-Shower Walls Only: Epoxy A118.3

3.05 CLEANING AND PROTECTION

A. Cleaning: Upon completion of placement and grouting, clean all tile and granite surfaces so they are free of foreign matter.

B. Finish Tile Work: Leave finished installation clean and free of cracked, chipped, broken, un-bonded, or otherwise defective tile or granite work.

C. Protection: When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage and wear.

D. Prohibit foot and wheel traffic when using tiled floors for at least 7 days after grouting is completed.

E. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION 09310

SECTION 09511 - LAY-IN CEILINGS

PART 1 - GENERAL

1.01 GENERAL

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 SUMMARY

A. Types of lay-in ceilings specified include the following:

(1) Non-fire resistance rated lay-in ceilings:

a. Non-directional type, angled tegular edge lay-in mineral fiber panel ceilings in exposed steel grid, as scheduled on Drawings.

b. Non-directional type, square-edge lay-in mineral fiber panel ceilings in exposed steel grid, as scheduled on Drawings.

c. Square-edge lay-in vinyl-faced gypsum board ceilings in exposed steel grid with “white” aluminum grid cap, as scheduled on Drawings.

B. Related Section: See Electrical Drawings and Specifications for new light fixture locations, and fixture support requirements.

C. Related Section: See Mechanical Drawings and Specifications for grilles, registers and diffusers in lay-in ceilings.

1.03 SUBMITTALS

A. Product data: Submit manufacturer's technical data for each type of lay-in ceiling unit and suspension system required.

B. Samples: Submit manufacturer's standard size samples of acoustical units, but not less than 6" square, and of exposed ceiling suspension members including wall and special moldings. Provide samples showing full range of colors, textures and patterns available for each type of component required.

C. Certificates: Submit certificates from testing laboratories attesting that acoustical ceiling products comply with specification requirements.

1.04 QUALITY ASSURANCE

A. Fire Performance Characteristics: Provide ceiling components that are identical to those tested for the following fire performance characteristics, according to ASTM test method indicated, by UL or other testing and inspection agency acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate marking of applicable testing and inspection agency.

(1) Surface Burning Characteristics: As follows, tested per ASTM E 84.

(a) Flame spread: 25 of less.
(b) Smoke developed: 50 or less.

1.05 SYSTEMS DESIGN CRITERIA

A. Structural Criteria: Suspension system including all its components, hangers and fastening devices shall be capable of supporting lighting fixtures, ceiling grilles and lay-in units without deflecting more than 1/360 of span when tested as a simple beam-end free center reading.

1.06 COORDINATION OF WORK

A. Coordinate layout and installation of ceiling units and suspension system components with other work supported by, or penetrating through, ceilings, including light fixtures, HVAC equipment, fire-suppression system components, and partition systems. Centerlines for ceiling system shall be established and maintained by Contractor. All trades shall work to these lines.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination or other causes.

B. Before installing ceiling units, permit them to reach room temperature and to have stabilized moisture content.

C. Handle ceiling units carefully to avoid chipping edges or damaging units in any way.

1.08 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials described below matching products installed, packaged with protective covering for storage and identified with appropriate labels. Lay-in ceiling units: Furnish quantity of full size units equal to 2.0% of amount installed.

1.09 **GUARANTEE**

A. All materials and workmanship furnished under this section of the specifications shall be guaranteed in writing for a **period of ten (10) years from date of acceptance of the building** and any defective materials or workmanship shall be replaced during this period without cost to the Owner.

PART 2 - PRODUCTS

2.01 ACOUSTICAL PANELS

A. Available manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include but are not limited to the following:

(1) Armstrong World Industries.
(2) BPB America Inc.
(3) USG Acoustical Products Co.

B. Angled Tegular Edge Acoustical Panels at Non-Fire-Resistance-Rated Ceilings:

(1) To establish minimum design and quality standards, Type 1 acoustical panels shall be non-directional type, angled tegular edge, equal to Armstrong Tegular Cortega **No. 704** (24"x24"x 5/8").

(a) Color: White

C. Acoustical Panels at Non-Fire-Resistance-Rated Ceilings:

(1) To establish minimum design and quality standards, acoustical panels are non-directional type equal to **Armstrong Fine Fissured No. 1728 Humiguard Plus** (24" x 24" x 5/8").

(a) Color: White

D. Lay-in Vinyl Faced Gypsum Board Panels at Non-fire-resistance-rated Ceilings: To establish minimum design and quality standards, vinyl-faced gypsum board panels shall be equal to **SheetRock Brand ClimaPlus**, White, No. 3260, by USG, Inc. (24" x 24" x 1/2").

2.03 METAL SUSPENSION SYSTEMS, GENERAL

A. Standard for metal suspension systems: Provide metal suspension systems of type, structural classification and finish indicated which comply with applicable ASTM C-635 requirements.

B. Finishes and colors: Provide manufacturer's standard factory-applied finish for type of system indicated. For exposed suspension members and accessories with painted finish, provide color indicated, or if not otherwise indicated, as selected by Architect from manufacturer's full range of standard colors.

C. Attachment devices: Size for 5 times design load indicated in ASTM C-635, Table 1, Direct Hung.

(1) Hanger wire: Galvanized carbon steel wire, ASTM A-641, soft temper, pre-stretched, Class 1 coating, sized so that stress at 3-times hanger design load (ASTM C-635, Table 1, Direct Hung), will be less than yield stress of wire, but provide not less than 12 gage.

D. Edge moldings and trim: Steel or Aluminum of types and profiles indicated or, if not indicated, provide manufacturer's standard molding for edges and penetrations of ceiling which fits with type of edge detail and suspension system indicated.

(1) For lay-in panels with tegular edge details, provide stepped edge “shadow” molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.

2.04 EXPOSED METAL DIRECT-HUNG SUSPENSION SYSTEMS

A. Non-fire-resistance-rated Double Web Steel Suspension System: Manufacturer's standard system roll-formed from cold rolled steel sheet with 15/16" wide exposed faces on structural members; other characteristics as follows:

(1) Material at lay-in acoustical ceilings: Double-web hot dipped galvanized steel.

(2) Material at lay-in gypsum board ceilings: Double-web hot-dipped galvanized steel with aluminum cap.
(3) Structural classification: Intermediate-duty system.
(4) Finish: Painted, white.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following:
(1) Manufacturers of non-fire-resistance-rated Double Web Steel Suspension Systems:
(a) Chicago Metallic Corporation
(b) Armstrong World Industries, Inc. (Prelude XL)
(c) Donn, USG, Inc.

PART 3 - EXECUTION

3.01 PREPARATION

A. Measure each ceiling area and establish layout of lay-in units to balance border widths at opposite edges of each ceiling. Where possible, **avoid the use of less-than-half width units at borders**. See Reflected Ceiling Plans on Drawings for layout and coordination/placement of electrical and mechanical elements.

3.02 INSTALLATION

A. General: Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations, fire-resistance rating requirements as indicated, and CISCA standards applicable to work.

B. Arrange acoustical units as follows: Install tile in non-directional pattern.

C. Install suspension systems to comply with ASTM C-635, with hangers supported only from building structural steel joists & beams, or from gypsum board fire ceiling & wood roof trusses. Locate hangers not less than 6" from each end and spaced 4'-0" o.c. each carrying channel or direct-hung runner unless otherwise indicated, leveling to tolerance of 1/8" in 12'-0".

(1) Secure wire hangers by looping and wire-tying directly to structure or other devices which are secure and appropriate for substrate, and which will not deteriorate or fail with age or elevated temperatures.
(2) Install hangers plumb and free from contact with insulation or others objects within ceiling plenum which are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing, counter-splaying or other equally effective means.

D. Install edge moldings of type indicated at perimeter of ceiling areas and at locations where necessary to conceal edges of units.

(1) Screw-attach moldings to substrate at intervals not over 16" o.c. and not more than 3" from ends, leveling with suspension system to tolerance of 1/8" in 12'-0". Miter corners neatly, accurately, and connect securely.

E. Install panels in coordination with suspension system, with edges concealed by support of suspension members. Scribe & cut panels to fit accurately at borders & penetrations.

F. Frame around pipe supports and miscellaneous bracing. Main beams and cross tees shall be spaced to accommodate recessed light fixtures and ceiling grilles as shown on Electrical and Mechanical. Furnish and install extra beams and tees as required for installation of light fixtures. Support grid system at corners of all lay-in light fixtures and other ceiling-mounted items.

(1) Ceiling contractor shall furnish and install grid tie-wire supports at corners of all recessed light fixtures. See Electrical for specific support requirements of all interior fixtures.

3.03 CLEANING

A. Clean exposed surfaces of all lay-in ceilings, including trim, edge moldings, and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09511

SECTION 09651 - RESILIENT FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 DESCRIPTION OF WORK

A. Extent of resilient flooring and accessories is shown and scheduled on drawings.

B. Types of resilient flooring specified in this Section include:

(1) Type 1, Type II and Type III Resilient Floor Tile
(2) Cove-type Rubber Base
(3) Carpet Edge Strips.
(4) Reducer Strips.
(5) Rubber Stair Nosings at Steps to Dais
(6) Rubber Safety Tile at Ramp Surface Corridor 132

1.03 QUALITY ASSURANCE

A. Manufacturer: Provide each type of resilient flooring and accessories adhesives, sealants, and leveling compounds.

B. Fire test Performance: Provide resilient flooring which complies with fire test performance criteria as determined by an independent testing laboratory acceptable to authorities having jurisdiction.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of resilient flooring and accessory.

B. Samples for Initial Selection Purpose: Submit manufacturer's standard color charts in form of actual sections of resilient and patterns available, for each type of resilient flooring required.

C. Maintenance Instructions: Submit 2 copies of manufacturer's recommended maintenance practices for each type of resilient flooring and accessory required.

1.05 PROJECT CONDITIONS

A. Maintain minimum temperature of 65 deg. F. (18 deg. C) in spaces to receive resilient flooring for at least 48 hours prior to installation, during installation, and for not less 48 hours after installation. Store resilient flooring materials in spaces where they will be installed for at least 48 hours before beginning installation. Subsequently maintain minimum temperature of 55 deg. F (13 deg. C) in areas where work is completed.

B. Install resilient flooring and accessories after other finishing operations, including painting, have been completed. Do not install resilient flooring over concrete slabs until the latter have been cured and sufficiently dry to achieve bond with adhesive as determined by resilient flooring manufacturer's recommended bond and moisture test.

1.06 EXTRA STOCK

A. Furnish and deliver stock of maintenance materials to Owner. Furnish maintenance materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.

(1) Resilient Tile Flooring: Furnish not less than one box for each 50 boxes or fraction thereof, for each type, color, pattern and size installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following:

(1) Manufacturers of Resilient Floor Tile (RFT):

Patcraft (**basis of specification**)

Resilient Floor Tile (RFT) of the specified types by other manufacturers will be considered subject to submission of their product in accordance with the Prior Approval Section of these Specifications. All approved products will be identified by written Addendum. No verbal requests will be accepted and no verbal approvals will be given.

(2) Manufacturers of Rubber Wall Base, Stair Nosings and Resilient Accessories:

Flexco
Johnson Rubber Co., Inc.
Mannington Commercial
Roppe Rubber Corp.

2.02 RESILIENT FLOORING COLORS

A. Provide color as selected by Architect from manufacturer's standards.

(1) Each type of RFT tile will be selected in one color.

(a) Tile comprising each of the two types will be selected from manufacturer's standard colors in that group.

2.03 TILE FLOORING - GENERAL

A. Resilient Floor Tile:

(1) Type I RFT - Patcraft “Stratified+”

(a) Construction: LVT
(b) Style Name: "Stratified+"
(c) Style Number: I322V (12"x24")
(d) Wear Layer Thickness: 20 mil (.020"/.5mm)
(e) Overall Thickness: .098 (2.5mm)
(f) Tile shall have a static coefficient of friction greater than or equal to 0.6, per ASTM D2047-82 (for ADA compliance).
(g) Reference Specification: Class III printed film vinyl tile
(h) ASTM F 1700: Type A Smooth
(i) Finish: ExoGuard Quartz Enhanced Urethane

Locations: Lobby 100, Vestibules 102A, 111and 118

(2) Type II RFT - Patcraft "Typography"

(a) Construction: LVT
(b) Style Name: "Charted", "Letterpress", "Typeface"
(c) Style Number:
"Charted", I313V (24"x24"),
"Letterpress", I311V (24"x24"),
"Typeface", I312V (24"x24")
(d) Wear Layer Thickness: 20 mil (.020"/.5mm)
(e) Overall Thickness: .098 (2.5mm)
(f) Tile shall have a static coefficient of friction greater than or equal to 0.6, per ASTM D2047-82 (for ADA compliance).
(g) Reference Specification: Class III printed film vinyl tile
(h) ASTM F 1700: Type A Smooth
(i) Finish: ExoGuard Quartz Enhanced Urethane

Locations: All other areas scheduled to receive resilient tile not identified in Items (1 and 3).

(3) Type III RFT - Patcraft "Timber Grove II"

(a) Construction: LVT
(b) Style Name: "Timber Grove II Resilient Plank"
(c) Style Number:
I421V (5.96"x48")
(d) Wear Layer Thickness: 20 mil (.020"/.5mm)
(e) Overall Thickness: .098 (2.5mm)
(f) Tile shall have a static coefficient of friction greater than or equal to 0.6, per ASTM D2047-82 (for ADA compliance).
(g) Reference Specification: Class III printed film vinyl plank
(h) ASTM F 1700: Type B (embossed)

(i) Finish: ExoGuard+

Locations: Kitchen/Break Room 112

B. Rubber Safety Tile:

(1) Equal to Roppe Style 992 "Low Profile Raised Circular Design"

2.04 ACCESSORIES

A. Rubber Wall Base: Provide rubber base complying with FS SS-W-40, Type I, with matching end stops and preformed corner units, and as follows:

(1) Height: 4"
(2) Thickness: 1/8" gage.
(3) Color: As selected from manufacturer's standard colors.
(4) Style: Standard top-set cove.
(5) Finish: Matte.

B. Carpet Edge Strips: Equal to Roppe Style #43 Custom Carpet Edging, or as indicated on Drawings.

C. Reducer Strip: Equal to Roppe Style #22.

D. Adhesives (Cements): Waterproof, stabilized type as recommended by flooring manufacturer to suit material and substrate conditions. All adhesives shall be asbestos-free.

E. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.

F. Leveling and Patching Compounds: Latex types as recommended by flooring manufacturer.

G. Rubber Nosings: Full width of Dais stair treads equal to Roppe #17.

PART 3 - EXECUTION

3.01 INSPECTION

A. Require Installer to inspect subfloor surfaces to determine that they are satisfactory. A satisfactory subfloor surface is defined as one that is smooth and free from cracks, holes, ridges, coatings preventing adhesive bond, and other defects impairing performance or appearance.

B. Perform bond and moisture tests on concrete subfloors to determine if surfaces are sufficiently cured and dry as well as to ascertain presence of curing compounds.

C. DO NOT allow resilient flooring work to proceed until subfloor surfaces are satisfactory.

3.02 PREPARATION

A. Prepare subfloor surfaces as follows:

(1) Use leveling and patching compounds as recommended by resilient flooring manufacturer for filling small cracks, holes and depressions in subfloors.
(2) Remove coatings from subfloor surfaces that would prevent adhesive bond, including curing compounds incompatible with resilient flooring adhesives, paint, oils, waxes and sealers.

B. Broom clean or vacuum surfaces to be covered, and inspect subfloor.

C. Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive. Apply in compliance with manufacturer's directions.

3.03 INSTALLATION, GENERAL

A. Install resilient flooring and/or accessories in patterns indicated on Drawings, using method indicated in strict compliance with manufacturer's printed instructions. Extend resilient flooring into toe spaces, door reveals, and into closets and similar openings.

B. Scribe, cut, and fit resilient flooring and/or accessories to permanent fixtures, built-in furniture and cabinets, pipes, outlets and permanent columns, walls and partitions.

C. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other non-permanent marking device.

D. Install resilient flooring on covers for telephone and electrical ducts, and similar items occurring within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers. Tightly cement edges to perimeter of floor around covers and to covers.

E. Tightly cement resilient flooring to subbase without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections. Hand roll resilient flooring at perimeter of each covered area to assure adhesion.

3.04 INSTALLATION OF ACCESSORIES

A. Apply accessories to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required. Install base in lengths as long as practicable, with preformed outside corner units and mitered or coped inside corners. Accessories shall be tightly bonded to substrate throughout length of each piece. Provide continuous contact at horizontal and vertical surfaces.

(1) On masonry surfaces, or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.

B. Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed.

3.05 CLEANING AND PROTECTION

A. Perform following operations immediately upon completion of resilient flooring:

(1) Sweep or vacuum floor thoroughly.
(2) Do not wash floor until time period recommended by resilient flooring manufacturer has elapsed to allow resilient flooring to become well-sealed in adhesive.
(3) Damp-mop floor being careful to remove black marks and excessive soil.
(4) Remove any excess adhesive or other surface blemishes, using appropriate cleaner recommended by resilient flooring manufacturer.

B. Protect flooring against damage during construction period to comply with resilient flooring manufacturer's directions.

C. Clean resilient flooring not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Clean resilient flooring by method recommended by resilient flooring manufacturer.

END OF SECTION 09651

SECTION 09680 – CARPET

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes carpet flooring as shown on Drawings and Schedules and as indicated by the requirements of this Section.

B. Related Sections which contain work related to this Section include the following:
   1. Division 9, Section “Resilient Flooring” for resilient wall base and accessories installed with carpet.

1.3 SUBMITTALS

A. Product Data: For the following, including installation recommendations for each type of substrate:

   1. Carpet: For each type indicated. Include manufacturer’s written data on physical characteristics, durability, and fade resistance.

B. Shop Drawings: Show the following if applicable:

   1. Carpet type, color, and dye lot.
   2. Seam locations, types, and methods.
   3. Type of subfloor and installation.
   4. Pattern type, repeat size, location, direction and starting point.
   5. Type, color, and location of insets and borders.
   6. Type, color, and location of edge, transition, and other accessory strip.

C. Samples: For each of the following products and for each color and texture required. Label each sample with manufacturer’s name, material description, color, pattern, and designation indicated on Drawings and in schedules.

   1. Carpet Tiles: Full size sample
   2. Carpet Roll Goods: 12” x 12” sample
   3. Exposed Edge, Transition, and other Accessory Stripping: 12-inch long samples.
   4. Carpet Seam: 6-inch sample.
   5. Mitered Carpet Border Seam: 12-inch square sample. Show carpet pattern alignment.

D. Submit manufacturer’s warranties, installation instructions and maintenance instructions.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.

F. **Warranties: Special warranties specified in this Section.**

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is a member of the Floor Covering Installation Contractors Association (FCICA) and/or certified by the Certified Floorcovering Installers Association (CFI), or who can demonstrate compliance with its certification program requirements. Installer shall be a specialty contractor normally engaged in this type of work with a minimum of three (3) years documented experience in commercial installation of these materials.

1. Carpet flooring contractor shall be responsible for the proper product installation including floor preparation in all areas scheduled to receive carpet. The carpet installation standard will be as listed in The Carpet and Rug Institute's Standard for Installation of Commercial Carpet CRI-104.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104, Section 5, "Storage and Handling".

1.6 PROJECT CONDITIONS

A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation".

B. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

C. Do not install carpet over concrete slabs until slabs have cured, are sufficiently dry to bond with adhesive, and have pH range recommended by carpet manufacturer.

D. Subfloor preparation shall include all required work to prepare new floors for installation of specified carpets. Comply with manufacturer's written installation requirements.

1.7 **WARRANTIES**

A. Special Warranty for Carpet: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Warranty Period: As indicated at each Carpet Type at Part 2, below.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents:
1. Carpet Roll Goods:
a. Full-width rolls equal to two percent (2%) of amount installed for each type indicated.

2. Carpet Tiles:
   a. (2%) of amount installed for each type indicated.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. The following performance specifications are intended to meet specific design, maintenance and functional requirements necessary to this project. It is not intended to limit competitive bidding but rather encourage participation from all qualified manufacturers which have the performance criteria as outlined in Part 1 Section of this Section. Equal products by other manufacturers will be considered, subject to submission in accordance with the Prior Approval section of these specifications. Product shall meet the following construction specifications, with no exceptions unless approved by the Owner. Manufacturer's proposed product must be a standard running line product. All warranties and testing information must be standard and cannot be issued on a special/per job basis.

B. Approved Manufacturers: **Patcraft**

2.2 **CARPET** (where scheduled on Drawings):

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following:
   1. Manufacturers of Carpet Tiles:
      Patcraft (**basis of specification**)

Carpet of the specified types by other manufacturers will be considered subject to submission of their product in accordance with the Prior Approval Section of these specifications. All approved products will be identified by written Addendum. No verbal requests will be accepted and no verbal approvals will be given.

B. **Warranties**: Lifetime Commercial Limited Warranty EcoWorx Tile Backing System covering: (Fiber-Abrasive Wear, Fiber-Static Protection, Backing-Tuft Bind, Backing-Edge Ravel, Backing-Integrity/Delamination, Backing-Integrity/Dimensional Stability).

2.3 **CARPET – GENERAL**

A. Carpet Tiles:
   (1) Patcraft "Mid Century Mad"

      (a) Style Name: "FUTURA"
      (b) Style Number: 10380
      (c) Pile Construction: Multi-level Pattern Loop
      (d) Pile Fiber & Type: Eco Solution Q Nylon
      (e) Dye Method: 100% Solution Dyed
      (f) Gauge: 1/10
      (g) Stitches per Inch: 10.2
      (h) Tufted Pile height: 5/32" High and 3/32" Low
      (i) Tufted Yarn Weight: 14 oz.
      (j) Finished Pile Thickness: .080
      (k) Density: 6.300

(l) Tile Size: 24” x 24”
(m) Protective Treatment: SSP Shaw Soil Protection
(n) Primary Backing: Non-Woven Synthetic
(o) Secondary Backing: EcoWorx Tile

(2) Performance
(a) Traffic Class: Heavy (TARR)
(b) ADA Compliance: Must meet the guidelines as set forth in the Americans with Disabilities Act for minimum static coefficient of friction 0.6 for accessible routes.

2.4 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex modified, hydraulic-cement-based formulation provided or recommended by carpet manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, non-staining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet manufacturer.

C. Metal Edge Strips: Extruded Aluminum with mill finish of width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints. Edge strips shall be in compliance with the requirements of the Americans with Disabilities Act Accessibility Guidelines (ADAAG).

D. Resilient Edge Strips, tapered to meet abutting materials as indicated on Drawings. Edge strips shall be in compliance with the requirements of the Americans with Disabilities Act Accessibility Guidelines (ADAAG).

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Examine carpet for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet manufacturer.
2. Subfloor finishes comply with requirements specified in Division 3 Section “Cast-in-Place Concrete” for slabs receiving carpet.
3. Subfloors are free of cracks, ridges, depressions, scale and foreign deposits.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 7.3, “Site Conditions; Floor Preparation”, and with carpet manufacturer’s written installation instructions for preparing substrates.

B. Use trowelable leveling and patching compounds, according to manufacturer’s written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer’s written instructions.

C. Remove coating, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet manufacturer.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.3 INSTALLATION

A. Comply with CRI 104 and carpet manufacturer’s written installation instructions for the following:
   1. Direct-Glue-Down Installation: Comply with CRI 104, Section 9 “Direct Glue-Down Installation”.

B. Comply with carpet manufacturer’s written recommendation and Shop Drawings for seam/joint locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.

C. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings and thresholds. Bind or seal cut edges as recommended by carpet manufacturer.

D. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, non-staining marking device.

3.4 CLEANING AND PROTECTING

A. Perform the following operations immediately after installing carpet:

   1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
   2. Remove yarns that protrude from carpet surface.
   3. Vacuum carpet using commercial machine with face-beater element.

B. Protect installed carpet to comply with CRI 104, Section 16, “Protection of Indoor Installations”.

C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer and carpet adhesive manufacturer.

END OF SECTION 09680

SECTION 09900 – PAINTING & STAINING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 SCOPE

A. Provide all materials, labor, services and incidentals necessary for the completion of this section of the Work.

B. Paint the work of all trades, including Divisions 15 and 16.

C. Related work specified elsewhere:

(a) Shop prime coats of paint: Refer to other Sections.

1.03 SUBMITTALS

A. Paint Materials List: Submit complete and detailed list of materials within 30 days after construction is started for Architect approval before ordering. Include the following information for each material to be used:

(1) Type of surface or use as stated in Painting Schedule herein.
(2) Type of material, description, application method.
(3) Brand name, exact identification.
(4) Manufacturer.

B. Samples:

(1) Submit manufacturer’s color charts in duplicate to the Architect within 30 days after the award of the contract with the Paint Materials List.
(2) Colors will be selected by the Architect and submitted to the Contractor in scheduled form. More than one color will be selected.
(3) Provide two samples of stained finish on hardwood, for each type specified, to Architect for approval prior to starting work. Samples shall be on specified wood and 12" x 12" in size.

1.04 ENVIRONMENTAL CONDITIONS

A. Perform all exterior work during favorable weather conditions only and when temperature is 50 degrees F or above.

B. Adequately ventilate all spaces to remove all moisture of construction from building to prevent mildew and improper drying of paint.

C. Maintain constant temperature of 65 degrees F or above after painting has started. Avoid wide variations of temperature.

D. Before painting has started in any area, broom clean and remove all direct dust.
E. After painting is started, broom cleaning not allowed. Use commercial vacuum cleaning equipment only for cleaning.

1.05 PRODUCT DELIVER, STORAGE AND HANDLING

A. Deliver materials to the Project Site in strong, undamaged, waterproof containers with manufacturer=s labels intact. Materials in previously opened or unsealed containers are not acceptable.

B. Immediately upon delivery to the Project Site, store and lock all paint materials in an area within the building. Keep locked at all times except when materials are being prepared or removed for use on the Project.

PART 2 - PRODUCTS

2.01 GENERAL

A. No materials will be allowed on the Project Site at any time during construction except those of the manufacturers specified or approved by the Architect.

B. Mix all materials in and apply directly from containers in which they are purchased except when use of other containers is approved by the Architect.

2.03 QUALITY

A. Certain manufacturer's products are specified herein to simplify description of types and qualities of finishes required. Only the highest quality materials are acceptable.

B. Primers: As specified by manufacturer of finish paint used and as approved by the Architect.

C. Turpentine: Conform to FS TT-T-801.

D. Mineral Spirits: Conform to FS TT-T-291A, Grade 1.

E. Linseed Oil: Conform to FS TT-L-190 (boiled).

F. Shellac: Conform to FS TT-S-300 4 lb. cut.

G. Thinners: As recommended by the manufacturer of the specified paint material.

2.04 MANUFACTURERS

Pittsburgh; PPG Industries, Inc.	Sherwin Williams
Glidden	Devoe
Benjamin-Moore	Olympic

PART 3 - EXECUTION

3.01 GENERAL

A. Examine all surfaces to see that they are in proper condition to be finished before proceeding with the work. Starting work will constitute the painter's acceptance of

preceding work and conditions under which finish will be applied and his assumption of responsibility for results to be obtained.

B. Number of coats and quality of finish shall be in accordance with these specifications, which require the use of materials which will produce first quality finish if properly applied.

C. Except as otherwise approved by the Architect, apply all paint by roller or brush application. Roller application not permitted for stain and transparent finishes.

D. Protect the work of this section and work of others during progress against damage and promptly repair such damage such any occur. Cover factory finished members with heavy paper and masking tape. Do not allow masking tape to touch finished surfaces.

E. Paint all exposed surfaces, whether or not colors are designated in any schedule, except where the natural finish of the material is obviously intended or a surface is specifically noted not to be painted.

3.02 PREPARATION OF SURFACES

A. General:

(1) Clean all surfaces and protect from dampness.
(2) Remove all foreign material which will adversely affect adhesion or appearance of applied coatings.
(3) Remove all efflorescence from masonry to be painted.

B. Wood:

(1) Touch up knots, resinous spots, etc., on both new and existing surfaces with WP 578 sealer 18 hours before applying prime coat of paint.
(2) Sand to smooth surface and dust before priming.
(3) Putty nail holes, cracks and blemishes after priming coat has dried. Fill nail holes flush. Concave filled holes not acceptable.
(4) Match putty color to finish coat.

C. Metal:

(1) Clean greasy or oily surfaces with turpentine or mineral spirits and wipe dry with clean cloths before applying any materials.
(2) Remove rust and scale before painting and treat with rusticide.
(3) Touch-up weld, cuts and scratches or scuffed marks with metal protective primer. (Primer shall match initial coat.) Fill all dents or scratches with spot putting DLF-40 by Ditzler Color Division and sand level and smooth before painting. Grind if necessary to remove shoulders.
(4) Clean all galvanized metal surfaces with proprietary cleaner designed for this purpose, used in accordance with their manufacturer’s directions before applying the first coat of paint.

D. Cementitious Materials: Prepare cementitious surfaces of concrete, cementitious (cement fiber) panels/trim and concrete block to be painted by removing efflorescence, chalk, dirt, dust, grease and oils. Do not paint over surface where alkalinity or moisture content exceeds that permitted in manufacturer’s printed directions.

E. Drywall:

(1) Fill all irregularities with patching material and sand to smooth level surface.
(2) When sanding, avoid raising nap of paper.

3.03 APPLICATION

A. Allow exterior paints to dry 72 hours between coats and interior paints to dry 24 hours between coats. Allow additional time until finish is dry if necessary.

B. Finish tops, edges, bottoms of all doors same as faces. Remove door if necessary.

C. Only the best workmanship is acceptable. All material shall be spread and smoothly flowed on without run, streaks, sags, brush marks, unfinished patches or other blemishes.

D. Remove all finish hardware prior to finishing doors.

E. Apply coats of material in strict accordance with manufacturer's current published specifications except where requirements of these specifications are in excess of manufacturer's requirements.

F. Sand lightly between coats at no additional cost when undercoats, stains or other conditions show through the final coat until paint film is of uniform finish, color and appearance.

G. Paint interior surfaces of ducts visible through registers, grilles with flat, non-specular black paint.

H. Paint back side of all access panels, hinged covers to match exposed surfaces.

3.04 CLEAN-UP

A. Clean all paint spots from all work and touch up or otherwise repair any defective or damaged work.

B. Remove all surplus materials and equipment after work is completed, except leave excess paint with Owner for future touch-up work.

C. Leave entire job clean and acceptable to Architect.

D. Perform all "touch-up" work necessary after other mechanics have finished their work.

3.05 SCHEDULE OF FINISHES

A. General: The following specification for finishing is not intended to mention every particular item which will receive painter's finish, but it is intended to establish type and quality of finish which will be required on various materials.

B. EXTERIOR PAINT SCHEDULE:

(1) General: Provide the following paint systems for the various substrates indicated

(2) Ferrous materials:
1st Coat: B50NZ6 Kemkronik Universal Metal Primer, or equal.

2nd Coat: semi-gloss alkyd enamel (TT-E-529, Class A).
3rd Coat: semi-gloss alkyd enamel (TT-E-529, Class A).
First coat not required on items delivered shop primed.

Extent: Hollow Metal Doors and Frames, C.I. Downspout boots and any other exposed ferrous metal items.

(3) Plumbing Roof Vents as follows:
(a) Primer (where required): Zinc dust zinc oxide primer (TT-P-641) on zinc-coated metal.
First coat: Semi-gloss alkyd enamel (TT-E-529).
Second coat: Semi-gloss alkyd enamel (TT-E-529).

(4) Zinc Coated Metal:
1st and 2nd Coat: B50WZ30 Galvite HS Primer, or equal.
3rd Coat: Semi-gloss enamel (TT-E-509)
Not less than 2.5 mils dry film thickness.

(5) Exterior Steel Tube Handrails at locations where they occur:

(a) Powder Coating: Shop-applied exterior-grade polyester resin, equal to Tiger Drylac Series 38 two-coat system.

- Prepare, clean and pretreat steel members by sandblasting, phosphatyzing or other methods as recommended by paint manufacturer.
- Primer: Equal to Tiger Drylac 69/70000; 2.4-2.6 mil dry film thickness.
- Topcoat: Equal to Tiger Drylac Series 38 (Smooth Matte) 2.4-2.6 mil dry film thickness.
- Color: As selected by Architect.

C. INTERIOR PAINT SCHEDULE:

(1) General: Provide the following paint systems for the various substrates indicated.

(2) Zinc Coated Metal:
1st and 2nd Coat: B50WZ30 Galvite HS Primer, or equal.
3rd Coat: semi-gloss enamel (TT-E-509).
Not less than 2.5 mils dry film thickness.
Extent: Electrical panel board conduit covers, exposed conduits in finish areas.

(3) Ferrous Metals

Extent:
(a) Hollow Metal Doors and Frames;
(b) Steel Pipe Hand Rails at Interior Ramp.
(c) Steel steps and supports to Mechanical Mezzanine

1st Coat: Enamel undercoater (TT-E-543). Touch-up shop primer as required.
2nd Coat: Semi-gloss enamel (TT-E-509).
3rd Coat: Semi-gloss enamel (TT-E-509).
No less than 2.5 mils dry film thickness.
First coat not required on items delivered shop primed.

(4) Gypsum Drywall Systems with Eggshell Enamel:

(a) Odorless Eggshell Latex Enamel Finish: Three coats with total dry film thickness not less than 2.5 mils.

(b) Primer: White, interior, latex-based primer.
Devoe - 50801 Wonder-Tones latex Primer and Sealer.
Glidden - 5019 PVA Primer.
Moore - Moore's Latex Quick-Dry Prime Seal #201
PPG - 6-2 Quick-Dry Latex Primer Sealer.
S-W - Prep Rite 200 Latex Wall Primer.

(5) Woodwork - Painted:

(a) Semi-gloss Enamel Finish: 3 coats.
Undercoat: Interior Enamel Undercoat (FS TT-E-543).
1st and 2nd Coats: Interior Semi-gloss Odorless Alkyd Enamel (FS TT-E-509).

(b) Extent of Painted Woodwork: Plywood Backboards at Electrical Equipment; Crown Moulding, Chair Rail and Base; any other miscellaneous exposed wood trim not scheduled or indicated to receive stain finish.

(6) Gypsum Drywall Ceiling Systems with Eggshell Finish:

(a) Odorless Eggshell Latex Enamel Finish: Three coats with total dry film thickness not less than 2.5 mils.

(b) Primer: White, interior, latex-based primer.
Devoe - 50801 Wonder-Tones latex Primer and Sealer.
Glidden - 5019 PVA Primer.
Moore - Moore's Latex Quick-Dry Prime Seal #201
PPG - 6-2 Quick-Dry Latex Primer Sealer.
S-W - Prep Rite 200 Latex Wall Primer.

(c) First and Second Coats: Interior latex eggshell enamel.
Devoe - 34XX Wonder-Tones Interior Latex Eggshell enamel.
Moore - Regal AquaVelvet 319.
S-W - Pro XP Interior Latex Eggshell (B20-3200 Series).

(7) Woodwork - Stained:

(a) 3 finish coats over stain.
Stain Coat: Oil-type interior wood stain (FS TT-S-711); Color as selected by Architect.
First Coat: Sanding sealer.
Second Coat: Clean Satin Polyurethane.
Third Coat: Clean Satin Polyurethane.

(b) Extent of Stained Woodwork:

- Wood Crown Moulding, Chair Rail and Related Wood Trim if painted finish option is not chosen by Owner (match color and clear coat finish of pre-finished doors).
- Wood Baseboards if painted finish option is not chosen by Owner (match color and clear coat finish of pre-finished doors).
- At exposed surfaces of Millwork Items (match color and clear coat finish of pre-finished doors).

3.06 FIRE RATED AND STRUCTURAL LOAD-BEARING WALL IDENTIFICATION SIGNS

A. Paint fire and/or structural load-bearing wall identification signs with red enamel paint, using stencils or templates as follows:

B. All Two-Hour fire-rated walls and partitions shall be permanently identified on both sides of the wall (where applicable), above the ceiling line, with wording as follows:

FIRE BARRIER - PROTECT ALL OPENINGS

C. All 4" metal stud, load-bearing walls and partitions supporting Mechanical Mezzanine shall be permanently identified on both sides of the wall (where applicable), above the ceiling line, with wording as follows:

LOAD-BEARING STRUCTURAL WALL –
CONSULT STRUCTURAL ENGINEER
PRIOR TO ANY MODIFICATIONS.

(1) Such identification shall consist of 2" high red letters painted directly on the wall. Use red enamel paint. Spacing shall be 5'-0" o.c. maximum.

(2) See Floor Plans on Drawings for locations of fire-rated and structural load-bearing walls and partitions.

END OF SECTION 09900

SECTION 10155 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and other Part 1 Specification sections, apply to this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 SUMMARY

A. Extent of toilet compartments and screens is indicated on Drawings.

B. Types of toilet compartments include:

(1) S.P.C. (Solid Phenolic Core).

C. Styles of toilet compartments include:

(1) Floor-anchored, overhead braced.

D. Styles of screens include:

(1) Floor-anchored, overhead braced.

E. Toilet compartment accessories are specified elsewhere in Division 10.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's detailed technical data for materials, fabrication, and installation, including catalog cuts of anchors, hardware, fastenings, and accessories.

B. Shop Drawings: Submit shop drawings for fabrication and erection of toilet partition assemblies not fully described by product drawings, templates, and instructions for installation of anchorage devices built into other work.

C. Samples: Submit full range of color samples for each type of unit required.

1.04 QUALITY ASSURANCE

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible, to ensure proper fitting of work. However, allow for adjustments within specified tolerances wherever taking of field measurements before fabrication might delay work.

B. Coordination: Furnish inserts and anchorages which must be built into other work for installation of toilet partitions and related work; coordinate delivery with other work to avoid delay.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

Bobrick Washroom Equipment, Inc.
Columbia Partitions, Partition Systems, Inc.
General Partitions Mfg. Corp.
Metpar

2.02 MATERIALS

A. General: Provide materials which have been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable.

B. Finish: Matte finish, high pressure melamine fusion welded to surface of core.

C. Core Material (minimum thickness):

(1) Toilet Compartment Dividers: 1/2" thick solid phenolic.
(2) Toilet Compartment Doors: 3/4" thick solid phenolic.
(3) Urinal Screens: 3/4" thick solid phenolic.
(4) Pilasters: 1" thick solid phenolic.

D. Pilaster Shoes: ASTM A167, Type 302/304 stainless steel minimum 3" high, 20 gage.

E. Wall and Pilaster Brackets: Full-length, heavy-duty Type 304 stainless steel channel type brackets at toilet compartments and screens.

F. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories of cast stainless steel.

G. Overhead-Bracing: Continuous extruded aluminum, anti-grip profile, with clear anodized finish.

H. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, chromium-plated steel, or brass finished to match hardware, with theft-resistant type heads and nuts. For concealed anchors, use hot-dip galvanized, cadmium-plated, or other rust-resistant protective-coated steel.

2.03 FABRICATION

A. General: Furnish standard doors, panels, screens, and pilasters fabricated for partition system, unless otherwise indicated. Furnish units with cutouts, drilled holes, and internal reinforcement to receive partition-mounted hardware, accessories, and grab bars, as indicated.

B. Door Dimensions: Unless otherwise indicated, furnish 24" wide in swinging doors for

ordinary toilet stalls and 34" wide out-swinging doors at stalls equipped for use by handicapped.

C. Solid Phenolic Core (S.P.C.):

(1) General: High pressure one-piece melamine face sheets fusion welded to core material with no splices or joints, and with edges straight and sealed.

(2) Overhead-Braced Partitions: Furnish galvanized steel supports and leveling bolts at pilasters, as recommended by manufacturer to suit floor conditions. Make provisions for setting and securing continuous extruded aluminum anti-grip overhead-bracing at top of each pilaster. Furnish shoe at each pilaster to conceal supports and level mechanism.

(3) Floor-Supported Screens: Furnish pilasters not less than 1" in thickness, panels and pilasters of same construction and finish as toilet compartments. Furnish galvanized steel anchorage devices, complete with threaded rods lock washers, and leveling adjusting nuts at pilasters, to permit structural connection to floor. Furnish shoe at pilaster to conceal anchorage.
(a) Furnish anti-grip overhead bracing between screen pilasters, as indicated on Drawings.

(4) Hardware: Furnish hardware for each compartment in partition system, as follows:
(a) Continuous Hinge:
(1) Continuous Piano Type, door hinge made of extruded aluminum, 6063-T5. Satin anodized finish. Knuckles shall have nylon separators; pivot pin shall be 1/4" type 304 stainless steel.
(2) Pre-drill hinge for stainless-steel tamper-proof bolts, spaced at maximum of 8" on center.
(3) Fasteners shall be concealed beneath snap on cover. Cover shall be attached at top and bottom with theft proof fasteners.
(b) Latch and Keeper: Manufacturer's standard surface-mounted slide latch unit, designed for emergency access, with combination rubber-faced door strike and keeper.
(c) Coat Hook: Manufacturer's standard unit, combination hook and rubber-tipped bumper, sized to prevent door hitting mounted accessories.
(d) Door Pull: Manufacturer's standard unit for out-swing doors.
(e) Door Bumper at Out-swing Doors @ Handicap Stalls adjacent to walls: Provide wall bumper equal to Rockwood Manufacturing Co. No. 408, concealed mounting, US26D finish. Confirm final mounting location with Architect.
(f) At handicap stalls, furnish latch, pull and keeper hardware to comply with Title III of the Americans with Disabilities Act (ADA).

(5) Colors: Plastic laminate or melamine facing to be selected from Architect’s choice of any Wilsonart or Formica product. Other components to be selected from manufacturer’s standard selection of colors.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Comply with manufacturer's recommended procedures and installation sequence. Install partitions rigid, straight, plumb, and level. Provide clearance of not more than 1/2" between pilasters and panels, and not more than 1" between panels and walls. Secure panels to walls and pilasters with full length channel type brackets. Secure panels in position with manufacturer's recommended anchoring devices.

B. Overhead-Braced Partitions: Secure pilasters to floor and level, plumb, and tighten installation with devices furnished. Secure overhead-brace to each pilaster with not less than two fasteners. Hang doors and adjust so that tops of doors are parallel with overhead-brace when doors are in closed position.

C. Screens: Attach to walls and pilasters with full length channel type brackets. Set units to provide support and to resist lateral impact.

3.02 ADJUST AND CLEAN

A. Hardware Adjustment: Adjust and lubricate hardware for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return to fully closed position.

B. Clean exposed surfaces of partition systems using materials and methods recommended by manufacturer, and provide protection as necessary to prevent damage during remainder of construction period.

END OF SECTION 10155

SECTION 10425 - SIGNAGE AND PLAQUES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections apply to the work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 DESCRIPTION OF WORK

A. Extent of signage is indicated on Drawings and as follows:
   (1) Interior panel signs.
   (2) Exterior dimensional letters.
   (3) Cast Metal Plaque

B. Exterior post-mounted handicap parking signs and other site required exterior site signage is specified on the Civil Drawings.

C. Illuminated exit signs are specified in a Division 16 section.

D. Painted fire wall identification Signs are specified in Section 09900 "Painting."

E. Temporary signage is specified in a Division 1 section.

1.03 QUALITY ASSURANCE

A. Uniformity of Manufacturer: For each sign form and graphic image process indicated, furnish products of a single manufacturer.

1.04 SUBMITTALS

A. Shop drawings: Submit shop drawings for fabrication and erection of signs and plaques. Include plans, elevations and large-scale details of sign wording and lettering layout. Show anchorages and accessory items. Furnish location template drawings for items supported or anchored to permanent construction.

   1. Submit full size rubbing of cast metal plaque

B. Product data: Submit manufacturer's technical data and installation instructions for each type of sign required.

C. Samples: Submit samples of each sign form and material showing finishes, colors, surface textures and qualities of manufacturer and design of each sign component including graphics.

   (1) Architect will select colors for panel signs from manufacturer's standard colors.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Available manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following.

(1) Manufacturers of Panel Signs and Die-Cut Vinyl Signs:
ASI Sign Systems, Inc.
Leeds Aluminum Letters, Inc.

(2) Manufacturers of Dimensional Letters:
A.R.K. Ramos Manufacturing Co., Inc.
ASI Signs Systems, Inc.
Leeds Aluminum Letters, Inc.

2.02 MATERIALS

A. Signage: For purposes of determining minimum performance and quality standards, interior and exterior signage, as shown and scheduled on Drawings and specified herein, shall be equal to products of ASI Sign Systems, Inc., 621 N. Avenue, NE, Building D, Atlanta, GA 30308 (404-815-0566/FAX 404-815-0917).

(1) Other sign manufacturers wishing to be considered must submit their request to the Architect in accordance with the Prior Approval section of the specifications. At the Architect's determination, submissions may require samples and other detailed information needed to compare submitted products to those specified on Drawings. Acceptance of approved submissions will be by written Addendum only. No Exceptions.

B. Aluminum Castings: Provide aluminum castings of F-214 alloy and temper recommended by the aluminum producer and finisher for the casting process used and for the use and finish indicated.

C. Bronze Castings: Provide bronze castings, copper alloy UNS C83600, complying with the requirements of ASTM B584.

E. Aluminum Sheet: Provide aluminum sheet of alloy and temper recommended by the sign manufacturer for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 209 for 5005-H15.

F. Aluminum Extrusions: Provide aluminum extrusions of alloy and temper recommended by the sign manufacturer for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 221 for 6063-T5.

G. Anchors and Inserts: Use non-ferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.03 FABRICATION

A. Panel Signs: Fabricate panel signs with edges mechanically and smoothly finished to conform to the following requirements:

(1) Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions with a tolerance of plus or minus 1/16” measured diagonally.

2.04 GRAPHIC IMAGE PROCESS

A. Graphic Content and Style: Provide sign copy to comply with the requirements indicated for sizes, styles, spacing, content, positions, materials, finishes and colors of letters, numbers, symbols and other graphic devices. Graphic technique for all signage not indicated to have 1/32” raised lettering, braille, or graphics shall be screen process.

Raised Copy: 1/32” high machine-cut text, graphics, and border. Produce precisely formed characters with square cut edges free from burrs and cut marks. No adhesive mounted (surface applied) text, graphics or borders will be accepted.

(1) Panel Material: 1/8” thick MP Plastic consisting of two-color melamine surface laminate with non-glare surface over phenolic core.

2.05 CAST METAL PLAQUES

A. Cast Metal Plaques: Fabricate cast metal plaques to comply with requirements specified for metal, border style, background texture and finish and to comply with requirements shown for thickness, size, shape and copy. Produce castings free from pits, scale, sand, holes or other defects. Hand tool and buff borders and raised copy to produce the manufacturer's standard satin polished finish. Refer to "Finish" article for other finish requirements.

(1) Metal: Aluminum
(2) Border: Raised flat band, as indicated on Drawings.
(3) Background Texture: Manufacturer's standard dark leatherette finish.
(4) Finish: Two coats of clear acrylic lacquer.
(5) Size: Approximately 24" high x 30" wide.
(6) Text: To be furnished by Architect - 300 letters maximum per Plaque.
(7) Letter Style: Times Roman.

2.06 DIMENSIONAL LETTERS

A. Cast Letters: Form individual letters by casting. Produce characters with smooth, flat faces, sharp corners, and precisely formed lines and profiles, free from pits, scale, sand holes, or other defects. Cast lugs into the back of characters and tap to receive threaded mounting studs, for installation on E.I.F.S. Panel. Comply with requirements indicated for finish, style and size.

(1) Metal: Aluminum
(2) Letter Height: As indicated on Drawings.
(3) Letter Style: Equal to Metal Arts Style Times Roman
(4) Finish & Color: Equal to Metal Arts No. 30 Colored Satin anodized; Final color to selected.
(5) Flush Mounting: Equal to Metal Arts Method “FMM-1" or “FMM-2", for mounting to E.I.F.S. wall finish or face brick wall.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Locate sign units and accessories as shown or scheduled, using mounting methods of the type described and in compliance with the manufacturer's instructions.

(1) Install sign units' level, plumb and at the height indicated, with surfaces free from distortion or other defects in appearance.

B. Panel Signs: Attach panel signs to surfaces using the methods indicated on Drawings or as recommended by manufacturer.

C. Dimensional Letters: Mount letters using standard fastening methods recommended by the manufacturer for letter form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish letter spacing and to locate holes for fasteners.
(1) Flush Mounting: Mount letters with backs in contact with the wall surface.

3.02 CLEANING AND PROTECTION

A. At completion of the installation, clean soiled sign surfaces in accordance with the manufacturer′s instructions. Protect units from damage until acceptance by the Owner.

3.03 SCHEDULE OF INTERIOR AND EXTERIOR SIGNAGE

A. As indicated on Drawings.

END OF SECTION 10425

SECTION 10520 - FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and other Part 1 Specification sections, apply to this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 DESCRIPTION OF WORK

A. Extent of fire extinguishers and cabinets is indicated on drawings.

B. Definition: "Fire Extinguishers" as used in this section refers to units which can be hand-carried as opposed to those which are equipped with wheels or to fixed fire extinguishing systems.

C. Types of products required include:

(1) Fire extinguishers.
(2) Fire extinguisher cabinets.

1.03 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain products in this section from one manufacturer.

B. UL-Listed Products: Provide new portable fire extinguishers which are UL-listed and bear UL "Listing Mark" for type, rating and classification of extinguisher indicated.

1.04 SUBMITTALS

A. Product Data: Submit product data for each type of product included in this section.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

- Amerex Corporation.
- J.L. Industries
- Larsen's Mfg. Co.
- Watrous, Inc.

2.02 FIRE EXTINGUISHERS

A. General: Provide fire extinguishers for each extinguisher cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard which comply with requirements of governing authorities.

(1) Abbreviations indicated below to identify extinguisher type related to UL classification and rating system and not, necessarily to type and amount of extinguishing material contained in extinguisher.

B. Multi-Purpose Dry Chemical Type: UL-rated 4-A:60-B:C, 10 lb. nominal capacity, in red enameled steel container, for Class A, Class B and Class C fires.

2.03 EXTINGUISHER CABINETS

A. General: Provide fire extinguisher cabinets where indicated, of suitable size for housing fire extinguishers of types and capacities indicated.

B. Construction: Manufacturer's standard enameled steel box, with trim, frame, door, and hardware to suit cabinet type, trim style and door style indicated. Weld all joints and grind smooth. Miter and weld perimeter door frames.

C. Cabinet Type: Suitable for mounting conditions indicated, of the following types:

(1) Semi-recessed: Cabinet box (tub) partially recessed in walls of shallow depth

D. Trim Style: Fabricate trim in one piece with corners mitered, welded, and ground smooth.

(1) Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

(a) Rolled-Edge Trim with 4 inch backbend depth.
(b) Trim Metal: Aluminum

E. Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.

(1) Aluminum: Manufacturer's standard flush, hollow aluminum door construction.

(2) Door Glazing: Tempered float glass complying with ASTM C 1048, Quality q3, Type I, Class as follows:

(a) 1/8" thick clear glass, Class 1 (transparent).

F. Door Style: Manufacturer's standard design with full-glass panel.

G. Door Hardware: Provide Manufacturer's standard door-operating hardware of proper type from cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam action latch, or door pull, exposed or concealed, and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 deg.

2.04 ALUMINUM FIRE EXTINGUISHER CABINET FINISHES

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Protect mechanical finishes on exposed surfaces from damage by application of strippable, temporary protective covering prior to shipment.

C. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

D. Class II “Clear Satin” Anodized Finish: AA-M12C22A31 (Mechanical Finish: as fabricated, non-specular; Chemical Finish: etched, medium matte; Anodic Coating: Class II Architectural, clear film thicker than 0.4 mil).

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install items included in this section in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.

B. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.

END OF SECTION 10520

SECTION 10670 - MECHANICAL ASSIST HIGH-DENSITY MOBILE STORAGE SYSTEM (Additive Alt. No.1)

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Division 1 Specification Sections, apply to work of this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 DESCRIPTION OF WORK

A. The work of this section includes all mobile storage shelving shown on the drawing to include:
   (1) Files Room 105

B. Scope:
   (1) Furnish labor, materials, equipment, special tools, supervision and services required to complete the mechanical assisted high-density mobile storage system specified herein and shown on the drawings, including shelving and miscellaneous items. Bids shall include all necessary freight costs, applicable taxes, and installation of systems.

1.03 QUALITY ASSURANCE

A. The high-density storage system and other related items within this section shall be furnished and installed by those firms engaged in the manufacture of this type of equipment for the last five years. The entire system shall be warranted by the manufacturer against defective parts and/or workmanship for a period of one (1) year from final acceptance.

1.04 SUBMITTALS

A. Furnish shop, setting and erection drawings, standard color charts or chips, manufacturer’s written installation instructions and descriptive technical literature. Submit a list of five installations comparable in product and size for reference by the end-user. Submit a complete bill of materials. Additionally, a 3/4” shelf mounting recess for positive shelf alignment and attachment is desired. If this item is not standard, submit alternate plan for positive shelf alignment and attachment as well as technical information regarding your drive mechanism and drive shaft.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements:
   (1) Spacesaver Corporation / Walter H. Hopkins Company / Montel Mobilex Systems
   (2) Approved Equal (approval to be by Addendum from the Architect prior to bid opening). No verbal approval will be given.
   (3) Submit for prior approval request in accordance with the Prior Approval section of these Specifications.

2.02 RAIL

A. All rails shall provide dual flange guidance for the system. Openings on either side of rail shall be as small as possible. All rail splice joints shall have interlocking braces and splice plates which provide permanent horizontal and vertical rail alignment. Bidders shall include as a submittal a

technical drawing showing these splice joints. All rail assemblies shall have infinite leveling adjustability using leveling screws and shall be fully grouted with a non-shrink hydraulic cement type grout. Rails shall be designed and manufactured to carry loads of 1,000# per lineal foot of carriage.

2.03 RAISED FLOOR

A. A raised floor shall be placed between rails to prevent tripping. The floor shall be made of 3/4" BCX grade plywood panels. When floor covering is placed on top of raised floor, the floor shall be flush with the top of the rail. A ramp of the same material shall be placed at the front of the system. The front ramp shall not extend beyond the front edge of the face panel.

2.04 CARRIAGE DESIGN & CONSTRUCTION

A. Wheels and Drive System:
(1) Wheels shall be precision machined with dual flange guidance design. Provide spacers at both sides of wheel bearings to eliminate all friction between wheels and carriage frame.

B. Guidance System:
(1) All wheels shall provide dual flange guidance.

C. Standard Profile Carriages:
(1) Carriages shall be minimum 1,000 lbs. (1500 kg) per linear carriage foot (meter) capacity and be constructed of a minimum of 12 gauge steel. A 3/4" shelf mounting recess for positive shelf alignment and attachment is desired. If this recess is not standard, submit alternate plan for positive shelf alignment and attachment.

D. Carriage and Platform Splice:
(1) All carriage splices shall be offset angle, tension bolted type, designed to maintain proper unit alignment and weight load distribution.

2.05 MECHANICAL ASSIST SYSTEM OPERATION

A. Mechanical Assist Control Operation requirements:
(1) Each movable unit shall be controlled from the face end of the unit. Each movable unit shall be equipped with one three-spoke turn handle, which transmits power through a direct drive to all drive wheels. One pound of effort shall move a minimum of 4,000 lbs. carriage weight. Additionally, a maximum of 6.8 turns of the turn-handle shall open a 36" aisle.

2.06 LAMINATED PANELS

A. Face Panels:
(1) All exposed ends and shall have low pressure laminate panels (color to be selected from manufacturer's standards). Two 3" x 5" (76 mm x 127 mm) cardholders shall be provided per aisle entry location with the centers located 60" (1525 mm) above the finished floor.

2.07 SHELVING

A. 4-Post Shelving
(1) Design: Four-post, wedge-locking design, consisting of three basic parts: uprights, shelves, and shelf supports, which are assembled without nuts, bolts, or clips of any kind and without sway braces or gussets. There shall be no holes on any exposed surface. The front and back flange of the shelf shall be flush with the outside face of the post.

(2) Materials and Workmanship: The shelving shall consist of only the finest materials and highest quality of workmanship. The sheet metal shall be cold rolled, Class I steel.

(3) Closed Uprights: Uprights shall consist of 2" wide minimum 18 gauge cold rolled steel posts rolled into a hollow "tee" formation for intermediate uprights and an angle formation for end uprights, with keyhole slots on the inner wall only, on 1-1/2" centers. There shall be no holes in the face of the post. Uprights shall be provided with solid 24 gauge steel panel full height and depth of end uprights. The closed "tee" upright shall be used as a common upright between units.

(4) Shelves: Shall be minimum 22 gauge cold rolled steel minimum with 5/8" flange on all sides and front and back edges turned in 9/32". Ends formed flush to clear inside offset panel of upright. Shelves shall be slotted for attachment of file dividers.

(5) Shelf Support: Shall be formed of minimum 14 gauge (11 gauge on 42" and 48" wide supports) hot rolled, pickled steel, 3/4" high with four solid steel shoulder rivets. Rivets shall be 7/16" diameter at the head. Each ear of the shelf support shall contain two shoulder rivets spaced to set into the keyhole slots on the inner wall of the upright.

(6) Dimensional and Performance Requirement:
- (a) Nominal standard section lengths are 36" (see floor plans).
- (b) Number of vertical shelf spaces shall be as defined in 3.03 LAYOUT below.
- (c) Vertical shelf to shelf spacing shall be as defined in 3.03 LAYOUT below.
- (d) Vertical profile (thickness) of shelf edges: 3/4" maximum.
- (e) Minimum clear vertical space between shelves as required to accommodate standard file folders.
- (f) Vertical adjustment interval for shelves: 1-1/2" maximum.
- (g) Shelving depths: 15" with one back or center stop per opening.
- (h) Horizontal (width) profile of intermediate uprights: 2" maximum.
- (i) Clear shelving space between uprights: Minimum space shall be the nominal section length less 2".
- (j) Shelving components shall exhibit no dents, oil-canning, buckling, or other surface irregularities.
- (k) Loading and deflection: Shelves shall support book loads of 40 pounds per lineal foot without deflection in excess of L/140 and without permanent set after load is removed.
- (l) Plumbness of complete shelving: 1/8" maximum deviation between level of bottom shelf and canopy top, measured on the edge of any upright in any direction.
- (m) All shelving components shall be free of burrs, sharp edges, projecting hardware and other defects which could present a hazard to books, files or people. All surfaces and edges shall be smooth and non-abrasive.
- (n) Shelves in single and double faced ranges individually adjustable from top to bottom of uprights, readily removable and inter-changeable with any like size module for maximum flexibility.
- (o) Canopy tops of the same construction as the shelves shall be included on all units.
- (p) Shelf reinforcements shall be provided as required to meet the shelf loading and deflection requirements.
- (q) Provide four file dividers per shelf opening.

(7) Powder Coat Finish: All shelving components to be painted using the Powder Coat paint method.
- (a) Color to be selected from manufacturer's standard color card. Submit standard color chart with submittal.

PART 3 - EXECUTION

3.01 INSPECTION

A. Require Installer to inspect new and existing subfloor surfaces to determine that they are satisfactory. A satisfactory subfloor surface is defined as one that is smooth and free from cracks, holes, ridges, coatings and other defects impairing performance or appearance.

B. DO NOT allow installation to proceed until subfloor surfaces are satisfactory.

3.02 PREPARATION

A. Prepare new and existing subfloor surfaces as follows:
   (1) Use leveling and patching compounds for filling small cracks, holes and depressions in subfloors.

B. Broom clean or vacuum surfaces to be covered, and inspect subfloor.

3.03 LAYOUT

A. FILE ROOM 125
   (1) Provide a mobile storage system as per specification and indicated drawing at the end of this section.

   (2) Provide one stationary unit as indicated. Unit shall be for the storage of City Clerk records. This range of shelving shall be made up of three 36” wide (all 15” deep) sections of shelving. Each closed upright shall be 85.25” tall. Each section shall have 7 openings with shelves spaced on 12” centers. Each opening shall have one backstop. This range shall have a full height and width laminated face panel on the exposed front end.

   (3) Provide two movable carriages as indicated. Carriages shall be for the storage of City Clerk records. Both ranges of shelving shall be made up of three 36”wide by 15” deep sections of shelving. Each closed upright shall be 85.25” tall. Each section shall have 7 openings with shelves spaced on 12” center. Each opening shall have one center-stop or backstop as applicable. These ranges shall have a full height and width laminated face panel on the exposed end.

   (4) Provided system shall have the capability of adding additional future platforms as indicated on the drawings.

3.04 ADJUST AND CLEAN

A. Adjustment: Adjust operating hardware for proper operation.

B. Clean exposed surfaces of systems using materials and methods recommended by manufacturer, and provide protection as necessary to prevent damage during reminder of construction period.

END OF SECTION 10670

SECTION 10730 - ALUMINUM CANOPY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Part 1 Specifications sections, apply to work of this section.

1.02 DESCRIPTION OF WORK

A. Extent and location of aluminum canopies is indicated on the Drawings and by provisions of this section, as follows:

1. Wall and Post-Supported Aluminum Canopy over Porch at East Side of City Hall Building.

B. Provide Aluminum Deck, Aluminum Tube Columns, Beams, Fascia/Gutter, Wall Flashings, Anchors, Grout and all accessories required for complete Canopy installation systems under Base Bid.

D. Related Sections: The following sections contain requirements that relate to this Section:

1. Cast-in-Place Concrete - Division 3
2. Joint Sealants - Division 7
3. Light gage metal stud framing – Division 5
4. Face Brick and Concrete Unit Masonry – Division 4
5. Exterior Insulation and Finish System – Division 7
6. Flashing and Sheet Metal Trim – Division 7

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, details, installation instructions and general product recommendations.

B. Shop Drawings: Submit complete shop drawings, including all necessary plan dimensions, elevations and details. General Contractor shall field-verify all dimensions and elevations as shown on Shop Drawings, before releasing to manufacturer for fabrication.

C. Certification: Submit design calculations that are signed by a Registered Professional Engineer, stating that the aluminum canopy system designs comply, in all respects, with the specified loading requirements.

1.04 PROJECT CONDITIONS

A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation.

1.05 DESIGN PARAMETERS:

A. Aluminum canopy system shall be designed, fabricated and erected to support all dead loads, and the requirements of the ***2021 International Building Code*** for live load, horizontal and uplift wind loads.

1.06 QUALITY ASSURANCE:

A. Aluminum canopy systems shall be wholly produced by a recognized manufacturer with at least 5 years experience in the design and fabrication of aluminum walkway cover systems. Components shall be assembled in shop to greatest extent possible to minimize field assembly. **Base Bid Canopy systems shall be installed by the Manufacturer or his approved installer**, after all concrete and EIFS work are complete.

1.07 DELIVERY AND STORAGE:

A. Deliver and store all items in protected area. Keep free of any damage. Replace any damaged items or parts at no cost to the Owner.

1.08 COORDINATION:

A. Provide necessary anchors, flashings and other items required to be built-in, in ample time to avoid delays in the Work and coordinate installation of same with related trades.

PART 2 - PRODUCTS

2.01 AVAILABLE MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

Evans Awning Company, Decatur, AL
Mapes Industries, Inc.
Superior Metal Products Co., Birmingham, AL
Tennessee Valley Metals, Inc. - Oneonta, AL (Basis of Design)

B. PRIOR APPROVAL: Other manufacturers will be considered, subject to the following conditions:
(1) Other manufacturers wishing to submit bids must provide required data on proposed product and submit same in accordance with the Prior Approval section of these specifications.
(2) Complete details, including sizes of all members and structural calculations showing loads applied in accordance with these specifications must be submitted to the Architect for review.
(3) List of comparable projects completed within the last five (5) years must be submitted to the Architect for review.

2.02 MATERIALS

A. Aluminum Members: All sections shall be extruded aluminum 6063 alloy, heat-treated to T-6 temper.

B. Fasteners: Fasteners for anchorage of canopy column brackets, gutter/fascia and framing to structural concrete and other substrates shall be as shown and described on Drawings. Other fasteners shall be aluminum, 18-8 stainless steel, 300-series stainless steel or 410 stainless steel. Trim rivets may be aluminum.

C. Gaskets: Gaskets shall be dry-seal santoprene pressure type.

D. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the

metal alloy to be welded.

2.03 COMPONENTS

A. Aluminum Columns: Columns shall be radius-cornered tubular extrusion, of size(s) shown on Drawings, with cutout and internal diverter for drainage where indicated. Circular downspout opening in column is not acceptable.

B. Aluminum Beams: Beams shall be open-top or closed-top tubular extrusions, of sizes and shapes as shown on Drawings.

C. Aluminum “Flush” Roof Panels at Post-supported Canopy: Composed of self-supporting panels with interlocking side joints, accurately roll-formed into a nominal 8" wide x 2-3/4" deep “Flush” (as viewed from underside) panel in 0.32" thick aluminum (minimum dimensions and gauges).

(1) NOTE: Interlocking side joints are designed to provide a load-bearing lock.

(2) Aluminum shall be 3003-H16 Alloy in .032" minimum. Finish shall be baked-on-polyester, coated two sides, with manufacturer=s standard color on topside of panel and on underside as selected by Architect.

D. Structural Roof Perimeter:

(1) Gutter/Fascia: Extruded from 6061-T6 aluminum alloy, accurately extruded to designs shown on drawings, to serve as built-in gutter for roof drainage. Fascia for corner sections shall be of the same material and design and be heliarc welded. Gutter/Fascia is to be nominal 6-1/2" high box style with .080" thick walls.
(2) See Drawings for gutter outlet and “wet” column locations.
(3) Install gutter/fascia at all sides and all ends of canopies.

E. Component Accessories: Including but not limited to anchors, deflector plates, post brackets, flashing and related accessories as indicated on Drawings, and as required for a complete canopy systems installation.

(1) Component accessories shall be of similar materials and finishes as specified for prime components. Each part of its use shall be described in the engineering prints and calculations provided by manufacturer.

F. Hardware: All bolts, nuts, washers, and screws used in joining the members of the canopy together shall be stainless steel up to 1/4" diameter nominal size. Any hardware 1/4" diameter and larger shall be galvanized to withstand 200 hours salt spray test of maximum resistance to rust and corrosion.

G. Flashings: Flashing and Counter-flashing at building walls shall be formed from .040" thick aluminum (min.), and shall be finished to match the canopy. The canopy manufacturer shall furnish and install all flashings related to their products.

2.04 FACTORY FINISHING

A. Electrostatically applied, baked-on, high solid polyester paint. Colors as selected from manufacturer=s standard colors.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

A. Installation shall be in accordance with the instructions and recommendations of the manufacturer and erected straight and true in accordance with standard construction procedures.

B. Erect canopy straight and true in accordance with standard construction procedures.

(1) Erection shall be performed after all concrete, EIFS and Tower work is complete.

C. Attach anchors and flashings to new concrete slab, to new Tower framing, and to building walls, as indicated on Drawings.

D. Provide “wet” columns as indicated on Drawings, for drainage.

3.02 INSTALLATION

A. Erection: Deflectors shall be installed at all “wet” columns.

3.03 PROTECTION

A. Protect all materials during and after completion. Upon completion, all surfaces of work shall be left in a clean condition. Repair all scrapes, mars or other blemishes as recommended by manufacturer. Replace all items damaged beyond acceptable repair.

END OF SECTION 10730

SECTION 10801 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and other Part 1 Specification sections, apply to this Section. Complete compliance with all provisions contained therein which affect work or requirements of this Section is mandatory.

1.02 DESCRIPTION OF WORK

A. Extent of each toilet and bath accessory is indicated and scheduled on Drawings.

B. Types of toilet and bath accessories required include the following:

(1) Toilet tissue dispensers
(2) Grab bars
(3) Mirrors
(4) Napkin Disposal Units
(5) Shelf with Mop & Broom Holders
(6) Paper towel dispensers

1.03 QUALITY ASSURANCE

A. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.

B. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.

C. Products: Provide products of same manufacturer for each type of accessory unit and for units exposed in same areas, unless otherwise acceptable to Architect.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each toilet accessory.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering toilet accessories which may be incorporated in the work include, but are not limited to, the following:

Bobrick Washroom Equipment, Inc.
Bradley Corporation

B. In order to establish a standard of design and quality, catalog numbers on Drawings refer to Bobrick products. Equal items by above manufacturers will be accepted, subject to submission in accordance with the Prior Approval section of these specifications.

2.02 MATERIALS, GENERAL

A. Stainless Steel: AISI Type 302/304, with polished or satin finish, 22 gage (.34") minimum as indicated.

B. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 20-gage (.40") minimum, unless otherwise indicated, Surface preparation and metal pretreatment as required for applied finish.

C. Galvanized Steel Sheet: ASTM A 527, G60.

D. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

E. Mirror Glass: FS DD-G-451, Type I, Class 1, Quality q2, 1/4" thick, with silver coating, copper protective coating, and non-metallic paint coating complying with FSDD-M-411.

(1) Mirrors shall be guaranteed against silver spoilage for a minimum of ten (10) years.

F. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

G. Fasteners: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed.

2.03 SPECIFIC TOILET ACCESSORIES

A. Provide all accessories as indicated at "Toilet Accessories Schedule", on Drawings.

2.04 FABRICATION

A. General: Only an unobtrusive stamped logo of manufacturer, as approved by Architect is permitted on exposed face of toilet or bath accessory units. On either interior surface not exposed to view or back surface, provide additional identification by means of either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.

C. Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all welded construction, without mitered corners. Hang doors or access panels with full-length stainless steel piano hinge. Provide anchorage which is fully concealed when unit is closed.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install toilet accessory units in accordance with manufacturers' instructions, using fasteners which are appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated.

(1) Provide concealed wood blocking in drywall partitions as required for anchoring of accessories.

3.02 ADJUSTING AND CLEANING

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces after removing temporary labels and protective coatings.

END OF SECTION 10801

SECTION 12304 – MODULAR LAMINATE CASEWORK

PART 1 – GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and provisions of the contract including General Conditions, Supplementary Conditions, and Division 1, apply to this contract.

1.02 WORK INCLUDED:

A. Furnish and install all high-pressure laminate casework and accessories as shown and listed on drawings and specified herein, including:

1. Base and/or Wall Cabinets at locations indicated on Floor Plans and Interior Elevations.
3. Filler panels, trim and accessories, as necessary for a complete casework installation.

B. The Casework Subcontractor shall verify all critical building dimensions prior to fabrication of casework. The Casework Manufacturer shall re-engineer the casework arrangements to dimensions requiring 2-1/2” or less of filler at each end of wall-to-wall elevations, and to ensure all complete and satisfactory installation.

C. Provide all labor for unloading, distribution, and installation of casework and related items as specified.

D. Provide cutouts for electrical outlets.

E. Provide caulking of casework and tops to walls.

1.03 WORK RELATED NOT INCLUDED:

A. Rough Carpentry: Wood blocking within walls to adequately support casework.

B. Finished Base, as scheduled on Drawings and specified in Division 9 Sections.

C. Division 16: Electrical: Furnishing, installation, and final connections of wiring, conduit, and/or electrical items within casework (not indicated herein to be furnished under this Section), shall be performed by the Electrical Subcontractor in compliance with state and local codes.

1.04 STANDARD OF QUALITY:

A. APPROVED MANUFACTURERS:

- CASE SYSTEMS, INC.
- STEVENS INDUSTRIES
- LSI
- TMI

1. Casework of other nationally recognized Casework Manufacturers will be considered, subject to submission in accordance with the Prior Approval section of these specifications. Proposed manufacturers' products shall be equal in construction and design, according to Drawings and as specified herein.

2. Other proposed manufacturers shall provide proof of AWI membership and continuous AWI Section 400 and 1600 Premium Grade Compliance.

3. Any manufacturers or dealerships requesting pre-bid approval must show proof of similar projects provided on a continual basis over the last 5 years, by the manufacturer or dealership under current ownership during the past 5 years.

B. Casework shall meet or exceed the following general requirements, including, but not limited to the following:

C.

1. Cabinets must be Mod-Eez fastener or dowel-pinned construction. No stapled, or screwed cabinets will be permitted.
2. All cabinet backs must be captured, 4 sides and be ½" thick particleboard with thermos-fused or GP28 laminate finish. No stapled backs or glued backs with shims permitted.
3. No cabinet sides to floor. Separate, factory attached plywood base only.

D. Laminate selections shall be available in a minimum of 300 solid or 50 wood grain colors, as well as 3 thermo-fused interior colors and 75, 3MM edge colors. A maximum of 2 colors per project will be available.

1.05 SUBMITTALS:

A. Comply with Division 1.
B. Product Data: Submit the Casework Manufacturers catalog showing casework construction details, and materials and hardware used.
C. Submit exterior systems in specified colors.
D. Submit interior systems in specified colors.
E. Submit five sets of shop drawings showing:
1. Construction options selection sheet.
2. Small scale floor plan showing casework in relation to the building.
3. Large scale elevations and plan views.
4. Cross-section, service runs, blocking locations and sinks centerlines.
F. Shop drawings shall be submitted within 21 days of casework contract award.

1.06 **WARRANTY:**

A. **All products must be warranted unconditionally for a period of five (5) years on all parts**.

PART II – PRODUCTS

2.01 GENERAL:

A. Decorative laminated casework shall be Case Systems as specified or approved equal with the following features:

1. ½" Thick Inset and Captured Cabinet Backs
2. Reveal Overlay Door and Drawer Fronts
3. Five Knuckle Institutional Grade Hinges
4. PVC edges applied with hot melt glue, 3MM PVC at Door Edges
5. Thermo-fused Laminate Interior which exceeds NEMA LD3-1995 for GP-28 Performance
6. GP-28 Laminate Exterior
7. Separate and Factory attached Plywood Base Construction
8. M-3 engineered board for all cabinet components
9. "Balanced" high pressure laminates applied with rigid PVA glue
10. Casework shall be independently tested to meet the following minimum performance values:

Base Unit Racking	1460 lb/f
Base Front Joint Loading	725 lb/f
Wall Unit Racking	1600 lb/f
Wall Unit Static Load	2500 lb/f

B. Color and finish selections shall be as follows:

1. Color and finish selections shall be selected by Architect from the full range of colors and finishes offered by laminate manufacturer.
2. Open and Closed Interiors shall be white, beige (almond) or grey thermos-fused laminate.

2.02 MATERIALS:

A. Exterior vertical surfaces:

1. All finished end panels, separate; attachable back panel shall be surfaced with .028" thick high-pressure decorative laminate conforming to NEMA LD3-Latest Edition, GP-28.
2. Laminate patterns, wood grains, and solid colors will be selected from Formica, Wilsonart, Nevamar or Pionite current non-specialty, non-premium grade offering in laminate manufacturer's standard suede, textured or matte finish. All standard laminate patterns, wood grains and solid colors will be available for both cabinet and countertop selections.
3. Where wood patterns are selected, grain direction shall be vertical on doors, end panels, and exposed backs; horizontal on drawer fronts and aprons.
4. All exterior vertical high-pressure laminate panels shall be balanced with textured .020" thick high-pressure cabinet liner conforming to NEMA Standard LD3-Latest Edition, CL-20. Surface texture shall be similar to exterior finish.

B. Hardware:

1. Pulls: (Epoxy Coated Wire)
   a. One 128 mm wire; finish as selected by Architect.
2. Hinges: (Epoxy Coated 5 Knuckle)
   a. Hinges shall be epoxy-coated steel, five-knuckle hospital-tip institutional grade quality with .87" diameter tight pin. Residential, kitchen type pivot, plain butt, or hinges with removable pins "SHALL NOT BE ACCEPTABLE". Each hinge shall be secured with a minimum of nine No. 8 screws. Hinge shall permit door to swing 270 degrees without binding. Doors less than 48" in height shall have two hinges. Doors over 48" in height shall have three hinges. Finish as selected by Architect.
3. Drawer Slides:
   a. Standard Drawer: Self-closing, bottom mount epoxy coated with captive roller and positive in stop. Slide shall have 100# rating, must be self-closing within last 3% of travel and must prevent drawer fronts from contacting the cabinet body.
4. Door Catches:
   a. Base and Wall Cabinets: 7-pound magnetic catch.
5. Adjustable Shelf Supports:
   a. Shelf supports shall be injected molded clear plastic, with a double pin engagement 32 mm on center and shall have ¾" and 1" anti-tip locking tabs. Capable of supporting 125 pounds each.
6. Locks:
   a. Provide manufacturer's standard drawer and/or door locks where indicated on drawings and schedule.

2.03 CONSTRUCTION:

A. All cabinet body components shall be secured utilizing concealed interlocking mechanical fasteners or Dowel Pin as approved by the Architectural Woodwork Institute Quality Standard, 8th Edition – 2003 Sections 400 A-T-12, 400 B-T-10 and 1600-T-11. Also as approved by the Woodwork Institute of California's "Manual of Millwork" Section 15-6.2.195. They shall be specifically designed for use in joining particleboard panels.

B. All joints are tight fitting and will not rupture or loosen due to:

1. Dimensional changes in the particleboard.
2. Racking of casework during shipment and installation.
3. Normal use.
4. All fastening devices and screws shall be treated to deter or resist corrosion.

C. Construction features – All cabinets:

1. All structural components shall be ¾" thick with balanced surfaces.
2. All back panels shall be:
   a. ½" thick surfaced both sides for balanced construction.
   b. Fully captured on both sides and bottom: face-mounted, stapled backs are not acceptable.

3. Mounted stretchers are ¾" thick structural components fastened to end panels by mechanical fasteners, and are concealed by the cabinet back.
4. When the rear of a cabinet is exposed, a separate finished ¾" thick decorative laminate back panel shall be applied.

5. Exterior Grade Plywood core individual bases, factory applied to base and tall cabinets shall support and carry the load of the end panels, and the cabinet bottom, directly to the floor. The base shall be let in from the sides and back of the cabinet to allow cabinets to be installed tightly together and tight against a wall. There shall be a front to back center support for all bases over 30" wide.
6. A 5mm diameter row hole pattern 32mm (1-1/4") on center shall be bored in cabinet ends for adjustable shelves. This row hole pattern shall also serve for hardware mounting and replacement and/or relocation of cabinet components.
7. Adjustable shelves shall be M-3 engineered board core with balance surfaces and have a nominal 1mm (.020") thick PVC front edge.
   a. Adjustable shelves 36" and over shall be 1" thick.
   b. All adjustable shelves in open cabinets shall be 1" thick.
8. Fixed interior components such as fixed shelves, dividers, and cubicle compartments shall be full ¾" thick M-3 engineered board core attached with concealed interlocking mechanical fasteners.

2.04 PERFORMANCE:

A. Laminates:

1. "High Pressure Laminates" shall meet the definition and performance requirements of NEMA LD3-1991. Vertical grade laminate shall be GP-28 balanced with a minimum grade of CL-20. Countertops shall be GP-50 or PF-42 for Post-Formed Tops. Both provided with proper balancing laminate.
2. Thermo-fused laminate shall meet the performance requirements of NEMA LD3-1991 for GP-28. Panel manufacturer shall provide published specification.
3. Core material shall be engineered board meeting ANSI-A208. 1-lasted, M-3 Industrial Grade.
4. All high-pressure laminate must be laminated using a PVA adhesive, set under pressure, resulting in a rigid glue line. Contact adhesives shall not be used.

PART III – EXECUTION

3.01 SHIPPING:

A. All casework shall be blanket wrapped and delivered to the storage site in furniture vans.

B. General Contractor shall provide adequate roadways and access for delivery vans (Tractor Trailers) to within 40 feet of the building. General contractor will also provide adequate dry pathway to the building from the delivery van.

3.02 CASEWORK INSTALLATION

A. Casework shall not be delivered or stored at the job site until building has become adequately dry and secure. All overhead work (Except Ceiling Tiles) must be complete. The ambient relative humidity must be maintained between 25% and 55% prior to delivery and through the life of the installation.

B. Installation shall be by Casework Manufacturers authorized representative.

C. Casework shall be installed plumb and true, and is to be securely anchored in place. Scribe casework fillers as necessary for a tight fit.

D. Adjustable Shelf Units shall be securely fastened to horizontal blocking or to concrete block, not to plaster, lath, or wallboard. Reinforcement of stud walls shall be provided to appropriate trade during erection of walls. Casework Manufacturer shall accurately locate blocking requirements on shop drawings.

E. Installation to follow AWI Division 1700, Eighth Edition Guidelines.

3.03 CLEANING AND PROTECTION BY CASEWORK CONTRACTOR:

A. Wipe out cabinets interiors to remove dirt and dust. Remove pencil or other marks, excess adhesive, etc. from cabinets. Remove all packaging, scraps, and debris resulting from casework installation activities.

B. PROTECTION AND FINAL CLEANING OF CASEWORK IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR.

END OF SECTION 12304

SECTION 13070 - BALLISTIC-RATED PANELS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary (or Special) Conditions and Part 1 Specification sections, apply to work of this section. Complete compliance with all provisions contained therein which affect work or requirements of this section is mandatory.

1.02 Locations: This section covers ballistic-rated fiberglass panels, to be located as shown and detailed on Drawings at the following locations:

A. Council Dais at Council Chambers117 - See Details on Drawings A9.2.

C. Related Sections:

1. Division 6 Section 06202 "Finish Carpentry" and 06402 “Millwork” for wood panel facings to be installed over ballistic-rated panels at Council Dais.

1.03 Shop Drawings: Shop drawings shall be submitted for approval prior to the fabrication or purchase of material and include plan view elevations, sections and details of the proposed installation including attachment methods.

1.04 Certification shall be furnished indicating that all materials have been tested in accordance with the appropriate test procedure.

A. Ballistic-Rated Panels shall meet standards of U.L. 752 Ballistic Performance Requirements Test, as well as all bullet resistant test requirements set forth by the National Institute of Justice.

PART II - PRODUCTS

2.01 Available Manufacturers:

A. The following performance specifications are intended to meet specific design, maintenance and functional requirements necessary to this project. It is not intended to limit competitive bidding but rather encourage participation from all qualified manufacturers which have the performance criteria as outlined in Part 2 Section of this Section. Products of the following manufacturers are approved, subject to compliance with this Section:

1. C. R. Laurence Co., Inc., Los Angeles, CA (Basis of Design).
2. North American Bullet Proof, Inc., San Antonio, TX
3. Safeguard Security Services, Inc., San Antonio, TX
4. Waco Composites, Inc., Waco, TX

B. Equal products by other manufacturers will be considered, subject to ten (10) day prior approval. Product shall meet the following construction specifications, with no exceptions unless approved by the Owner. Manufacturer’s proposed product must be a standard running line product.

2.02 Materials:

A Ballistic-Rated Fiberglass Panels:

1. Model: C. R. Laurence BFR300 (Basis of Design)
2. Protection Level: 3 S.P.S.A.
3. Panels to be constructed of a multiply ballistic fiberglass laminate produced from ballistic fiberglass and impregnated with a thermostat polyester resin binder. The multiply configuration is to provide a delamination effect when ballistically attacked.
4. Nominal thickness: 7/16".
5. Nominal panel weight.: 138 lbs.
6. Panel size: 96"x48".
7. Impact Velocities: 1470 Ft./Sec.
8. Testing by Underwriters Laboratories (listed product with UL 752 Label).

PART III - EXECUTION

3.01 Examination: Prior to commencing installation, examine all areas to receive bullet resistant material.

3.02 Installation: Install components in accordance with manufacturers instructions and drawings.

A. Panel Installer shall coordinate work of this section with other trades, where ballistic-rated panel installation is integral with work of other trades.

B. At full-height partitions, install ballistic-rated panels over metal stud framing, to completely cover wall area from top of floor slab to finish ceiling line. Cut and fit panels tightly around door openings, pass window openings and other penetrations or openings in partition.

C. At Dais, install ballistic-rated panels over wood stud framing, to completely cover framing at front and end walls of Dais, as indicated on Drawings.

3.03 Cleaning: After installation, clean surfaces and touch up any damaged areas.

END OF SECTION 13070


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REGISTERED
No. 24747
PROFESSIONAL
ENGINEER
WADE STEWART
2/28/2024

SECTION 15000- TABLE OF CONTENTS PLUMBING AND FIRE PROTECTION

END OF TABLE OF CONTENTS – PLUMBING AND FIRE PROTECTION

SECTION 15401 – GENERAL PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes general plumbing requirements. Applies to all Division 15400 sections, except Section 15450's (Fire Protection).

1.02 DEFINITIONS

A. "Provide" means to furnish and install, complete and ready for operation.

1.03 REFERENCES

A. AGA: American Gas Association.

B. ANSI: American National Standards Institute, Inc.

C. ASHRAE: American Society of Heating, Refrigeration, and Air Conditioning Engineers.

D. ASME: American Society for Mechanical Engineers.

E. ASSE: American Society of Sanitary Engineers.

F. ASTM: American Society of Testing and Materials.

G. AWWA: American Water Works Association.

H. CISPI: Cast Iron Soil Pipe Institute.

I. FM: Factory Mutual.

J. NAIMA: North American Insulation Manufacturers Association.

K. NEMA: National Electrical Manufacturers Association.

L. NFPA: National Fire Protection Association.

M. NSF: National Sanitation Foundation.

N. MSS: Manufacturers Standardized Society of the Valve and Fittings Industry.

O. PDI: Plumbing and Drainage Institute.

P. UL: Underwriters Laboratories, Inc.

1.04 REGULATORY REQUIREMENTS

A. Comply with current edition, unless otherwise noted, of the following codes and standards:

1. ANSI B31.9 – Building Services Piping.

2. ADA – American's with Disabilities Act.

3. ASME – Boiler and Pressure Code.

4. NFPA 13 – Installation of Sprinkler Systems.

5. NFPA 24 – Installation of Private Fire Service Mains

6. NFPA 30 – Flammable and Combustible Liquids Code.

7. NFPA 31 – Installation of Oil-Burning Equipment.

8. NFPA 54 – National Fuel Gas Code.

9. NFPA 70 – National Electrical Code.

10. NFPA 96 – Standards for Ventilation Control and Fire Protection of Commercial Cooking Operations.

11. NFPA 101 – Life Safety Code.

12. IBC – International Building Code with Fire, Mechanical, Plumbing, and Gas Codes.

13. Local Health Department.

B. Permits, Licenses, Inspections and Fees:

1. Obtain and pay all permits, licenses, inspections and fees, and comply with all rules, laws and ordinances pertaining to the Contractor's portion of the Work.

2. Obtain and pay for certificates of required inspections, and file certificates with Owner.

1.05 PRODUCT REQUIREMENTS

A. Provide new standard, materials throughout.

B. Multiple items of similar equipment shall be the product of the same manufacturer.

C. Substitutions:

1. Comply with the provisions of Division 1, Section "Product Requirements" and the following.

2. When several manufacturers are named in the specifications, the corresponding products and models made by the specified manufacturers will be accepted and Contractor may base his bid on any one of those products. However, if the Contractor's bid is based on products other than the scheduled or specified **basis of design**, it shall be understood that there will be no extra cost involved whatsoever, and the effect on other trades has been

included in the Contractor's proposal. Coordination with other trades for substituted equipment or use of products other than the named basis of design shall be the responsibility of the Contractor furnishing the equipment.

3. The basis of design manufacturer's equipment has been used to determine space requirements. Should another approved manufacturer's equipment be used in preparing proposals, Contractor shall be responsible for determining that said equipment will fit space allocated. Submission of shop drawings or product data on such equipment shall be considered as indicating that the Contractor has reviewed the space requirements and the submitted equipment will fit the space allocated with due consideration given to access required for maintenance and code purposes.

4. The basis of design manufacturer's equipment and scheduled Plumbing equipment electrical requirements have been used to coordinate the electrical requirements of the plumbing equipment with the electrical systems serving that equipment.

   a. Contractor shall coordinate the electrical requirements of the equipment actually furnished on this project and provide the electrical systems required by that equipment at no additional cost to the Owner.

   b. Equipment of higher or lower electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified at no additional cost to the Owner.

   c. Prior to approval of submittals of plumbing equipment with electrical requirements that are greater or lower than those shown on the Drawings, Contractor shall submit letter verifying that required changes to the electrical system, serving the specific piece of equipment in question, have been coordinated with the electrical contractor. Letter to be included with the associated equipment submittal, addressed to the Architect with a copy to the electrical engineer.

   d. If minimum energy ratings or efficiencies are specified, equipment shall comply with specified requirements.

5. Each Bidder may submit to the Architect a list of any substitutes which he proposes to use in lieu of the equipment or material named in the specifications with a request for the approval of proposed substitutes. To be considered, such requests must be delivered to the office of the Architect not later than 10 days prior to bid due date. The submittal shall include the following:

   a. Specific equipment or material proposed for substitution giving manufacturer, catalog and model number.

   b. All performance and dimensional data necessary for comparison of the proposed substitute with the equipment or material specified.

   c. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the substitute may require.

6. The burden of proof of the merit of the proposed substitute is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution is final.

1.06 SUBMITTALS

A. Submit under provisions of Division 1, Section "Submittal Procedures" and the following.

B. Product Data: Submit to the Architect and obtain his approval of a complete list of materials and equipment which are to be provided under the 15400 Sections of Division 15.

1. List shall be complete with manufacturer names, catalog number, dimensions, specifications, rating data and options utilized. Capacities shall be in the terms specified.

2. Call attention to deviations from specified items as to operation and physical dimensions.

3. Include performance curves for pumps.

4. Final equipment orders shall not be placed until submittals have been returned marked "No Exceptions Noted" or "Make Corrections Noted."

5. Bind all equipment submittals and provide index tab for each type of equipment. Submit all at one time. Reserve two sets for project Close-Out Documents.

1.07 QUALITY ASSURANCE

A. Installer's Qualifications: Firm experienced in installation of systems similar in size and complexity to those required for this project, plus the following:

1. Acceptable to, or licensed by, manufacturer.

2. Not less than 3 years experience with systems.

3. Successfully completed no less than 5 comparable scale projects using systems similar to these for this project.

4. Current Master Plumbing's Certificate and Master's Gas Certificate issued by the State, County, and City in which the work occurs.

1.08 SUMMARY OF WORK

A. Scope: Provide all labor, materials, equipment and services necessary for the completion of all plumbing work shown or specified, except work specified to be done or furnished by others, complete and ready for operation.

B. Equipment Furnished by Others:

1. Connect to all equipment shown on plumbing drawings that require plumbing connections.

2. Provide piping, shut-off valves, and unions required for a complete installation.

3. Equipment furnished by others include:

   a. Casework.

   b. Ice machines.

   c. Pantry units.

   d. Coffee makers.

1.09 DRAWING INTERPRETATION AND COORDINATION

A. Drawings are intended to show size, capacity, approximate location, direction and general relationship of one phase to another, but not exact detail or arrangement.

B. Do not scale drawings for location of system components. Check all measurements, location of pipe, ducts, and equipment with the detail architectural, structural, and electrical drawings and conditions existing in the field and lay out work so as to fit in with ceiling grids, lighting and other parts.

C. Make minor adjustments in the field as required to provide the optimum result to facilitate ease of service, efficient operation and best appearance.

D. Where doubt arises as to the meaning of the drawings and specifications, obtain the Architect's written decision before proceeding with parts affected; otherwise assume liability for damage to other work and for making necessary corrections to work in question.

E. Refer to Architectural Drawings for all dimensions.

1.10 PROJECT / SITE CONDITIONS

A. Visiting Site: Visit site and become familiar with location and various conditions affecting work. No additional allowance will be granted because of lack of knowledge of such conditions.

B. Determine sizes, locations, and inverts of existing and new utilities near site.

C. Cause as little interference or interruption of existing utilities and service as possible. Schedule work which will cause interference or interruption in advance with Owner, authorities having jurisdiction, and all affected trades.

1.11 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit under provisions of Division 1, Sections "Closeout Procedures" and "Project Record Documents" and the following.

B. Record Drawings:

1. Keep accurate record of corrections, variations, and deviations, including those required by change orders to the Plumbing drawings.

2. Accurately show location, size and elevation of new exterior work dimensioned from permanent structure.

3. Record changes daily on a set of prints kept at the job site.

4. Submit prints marked as noted above to Architect for review prior to request for final payment.

5. Marked prints will be returned to Contractor for use in preparing Record Drawings.

6. Engineer will use marked up drawing showing as-built conditions provided by Contractor to prepare Record Drawings.

C. Prior to the issuance of a certificate for final payment, submit to Architect and obtain his approval of the following:

1. Record drawings – plumbing and fire protection (reproducible) and electronic files in AutoCAD.

2. Equipment Submittal Data (2).

3. Equipment operating and maintenance manuals (2).

4. Equipment warranty dates and guarantees (2).

5. Pressure vessel certificates (2).

6. Certificate of Disinfection of domestic water lines.

7. List of Owner's Personnel who have received operating and maintenance instructions.

8. Install valve charts and valve location plans in main mechanical room. (See Division 15, Section “Plumbing Identification”).

9. Submit factory start-up/field reports for:

   a. Domestic water heaters.

10. Current Flow Test.

END OF SECTION 15401

SECTION 15403 - BASIC PLUMBING MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SUMMARY

A. Description of common piping, equipment, materials and installation for Plumbing systems.

B. This Section includes the following:
1. Piping materials and installation instructions common to most Plumbing piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Sleeves.
5. Concrete.
6. Grout.
7. Escutcheons.
8. Access doors - Building.
9. Protection and cleaning of equipment and materials.
10. Flashing
11. Workmanship.
12. Cutting and patching.
13. Excavation, trenching and backfilling.
14. Connection to existing systems.
15. Piping systems installation - Common Requirements.
16. Equipment installation - Common Requirements.
17. Painting and finishing.
18. Supports and anchorages.

1.02 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. CPVC: Chlorinated polyvinyl chloride plastic.

2. PE: Polyethylene plastic.

3. PVC: Polyvinyl chloride plastic.

1.03 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.

2. Dielectric fittings.

3. Escutcheons.

4. Access doors - building.

1.04 INFORMATIONAL SUBMITTALS

A. Shop Drawings: For multi-story buildings, submit detailed drawings of the floor penetration sleeve sizes and locations, including the following information:

1. Fully dimensioned off column lines with location respective to adjacent walls shown.

2. Sleeve size.

3. Pipe size and insulation thickness.

4. Pipe service.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture. If pipes do not ship with end caps, cover ends of pipe stored on site with 6 mil plastic.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.06 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for Plumbing installations.

B. Coordinate installation of required supporting devices and set sleeves and inserts in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate installation of building access doors for Plumbing items requiring access that are concealed behind finished surfaces.

D. Electrical Characteristics for Plumbing Equipment:

1. Coordinate electrical system installation to match requirements of equipment actually furnished on this project.

2. If minimum energy ratings or efficiencies are specified, equipment shall comply with these requirements.

3. Include a letter with the respective equipment submittal from the electrical contractor and approved by electrical design consultant, detailing changes to the electrical system required to accommodate changes in the power distribution system to accommodate Plumbing equipment that has different electrical power requirements from that equipment used as basis of design, or power provisions, as shown on the electrical drawings.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements. Provide products by one of the following:

2.02 PIPE, TUBE AND FITTINGS

A. Refer to individual Division 15 Plumbing Piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.03 JOINING MATERIALS

A. Refer to individual Division 15 Plumbing Piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.

b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated.

G. Solvent Cements for Joining PVC Piping: ASTM D2564. Include primer according to ASTM F656.

1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Model 24).

3. Solvent cement and adhesive primer shall comply with the testing and product requirements of the California Department of Health Services "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.04 TRANSITION FITTINGS

A. Plastic-to-Metal Transition Fittings:

1. For pipe sizes NPS 2 and smaller: PVC or CPVC, Schedule 80, one-piece fitting; one end with threaded brass insert, and one solvent-cement socket or threaded end.

2. For pipe sizes larger than NPS 2: Flanged joints.

B. Fitting-Type Transition Couplings:

1. Manufactured piping coupling or specified piping system fitting.

2.05 DIELECTRIC FITTINGS

A. Dielectric Nipples:

1. Manufacturers:

a. Perfection Corp.

b. Precision Plumbing Products, Inc.

c. Sioux Chief Manufacturing Co., Inc.

d. Victaulic Co. of America; Clearflow Dielectric Waterway Style 47.

2. Zinc electroplated steel nipple with inert and noncorrosive, thermoplastic lining; treaded ends; and 300 psig minimum working pressure at 230 deg F. Ring-groove to lock liner to steel casing and provide indentifying roll marking.

B. Dielectric Flanges:

1. Manufacturers:

   a. Capital Manufacturing.

   b. Central Plastics.

   c. Watts.

   d. Wilkins, a Zurn Company.

2. Standard: ASSE 1079.

3. Factory-fabricated, bolted, companion-flange assembly.

4. End Connections: Solder-joint or thread copper alloy and thread ferrous.

5. Dielectric Flange Insulating Kits:

   a. Non-conducting materials for field assembly or companion flanges.

   b. Gasket: Neoprene or phenolic.

   c. Bolt Sleeves: Phenolic or polyethylene.

   d. Washers: Phenolic with steel backing washers.

2.07 SLEEVES

A. Galvanized-Steel Sheet: 20 gauge minimum thickness; round tube closed with longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Firestopping Sealant: See Division 7 Sections “Through-Penetration Firestop Systems” and “Fire Resistive Joint Systems” for firestopping sealant requirements.

D. Stuffing Insulation: Glass fiber type, non-combustible.

2.08 CONCRETE

A. Nominal weight concrete (145 PCF) using Type I Portland Cement, 1-inch maximum size coarse aggregate to provide a minimum 28 day compressive strength of 3000 psi.

2.09 GROUT

A. Description: ASTM C 1107, Grade B, non-shrink and non-metallic, dry hydraulic-cement grout.

   1. Characteristics: Post-hardening, volume-adjusting, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.

   2. Design Mix: 5000-psi, 28-day compressive strength.

2. Packaging: Premixed and factory packaged.

2.10 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

1. Finish: Polished chrome-plated.

2.11 ACCESS DOORS – BUILDING

A. Manufacturers:
1. Bilco.
2. Milcor.
3. Nystrom.

B. Construction:

1. Door: 14-gauge, cold rolled steel.
2. Frame: 16-gauge, cold rolled steel of configuration to suit material application.
3. Hinge: Concealed spring hinge.
4. Latch: Screwdriver cam latch.
5. Finish: Phosphate dipped and prime coated.
6. UL labeled when in fire-rated construction with rating to match construction.
7. Stainless steel (Type 304) shall be used in ceramic tile or glazed structural tile.

C. Size: 16 inch x 16 inch minimum, as indicated on drawings, or as required to allow inspection, service, and removal of concealed items.

2.12 FLASHING

A. Flexible Flashing: 47 mil thick sheet butyl compatible with roofing.

B. Lead Flashing: Waterproofing, 5 lb/SF sheet lead.

C. Pitch Cups: 20 gauge galvanized steel, minimum 8 inches deep, bases mitered and soldered and extending at least 4 inches horizontally.

D. Shower Pans: Specified in Division 9, Section “Ceramic Tile.”

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. First class and in accordance with best practice. Work to be orderly, neat, appearance and performed by skilled craftsman.

B. Poor or improper workmanship shall be removed and replaced as directed by the Architect without additional cost to the Owner or design professionals.

3.02 CUTTING AND PATCHING

A. Comply with the requirements of other Divisions for the cutting and patching required to accommodate the installation of Plumbing work. Repair and finish to match surrounding.

B. Architect's approval required before cutting any part where strength or appearance of finished work is involved.

C. Openings are to be laid out and built-in, set sleeves and inserts and furnish detailed layout drawings to other trades in advance of their work.

D. Core drill or saw cut openings in existing masonry construction.

3.03 EXCAVATION, TRENCHING AND BACKFILLING

A. Provide trenching, excavation, backfilling necessary for performance of work, including excavation of rock and all other materials which may be encountered.

B. Grade bottom of trenches evenly and excavate bell holes to insure uniform bearing for the full pipe length. Excavate minimum 6 inches below pipe. Refill cuts below grade with sand.

C. Backfill after inspection by Architect and authorities having jurisdiction. Backfill compacted areas (engineered fill) with sand or fine gravel in accordance with requirements in Division 2. Section "Earthwork" no less than 95% compactancy. Backfill paved areas with sand or fine gravel compacted to meet requirements of Paving Section. Backfill shall be free of rock, wood, steel, brick, etc. Do not disturb pipe.

D. Refer to Division 15, Plumbing Piping Sections for specific bedding and backfill requirements.

1. For factory or field insulation or coated piping, the bedding shall be a minimum of 6 inches of sand. The first 12 inches of backfill above the pipe shall be sand.

E. Restore existing pavement, curbs, sidewalks, sodding, bushes, etc., matching surroundings.

F. Restore all pavement cuts to meet the requirements of the cuts of the local authority.

3.04 DEMOLITION:

A. Refer to the Architectural Demolition Plans for areas to be demolished and remove all fixtures noted to be removed.

B. All fixtures and equipment noted "To Be Removed" on the drawings shall remain the property of the Owner. If Owner decides against retention of any or all items this Contractor shall remove from the site.

C. Where fixtures are removed, remove all abandoned or unused piping back to main or nearest active connection and cap or plug.

D. When vent stack(s) thru roof(s) are abandoned leave existing vent stack thru roof in place, cut pipe and cap as close as possible to underside of roof deck.

E. Coordinate all system shut down with Owner. Request shut down minimum 72 hours prior to scheduled shut down period. Do no shut down any system without approval of Owner. Perform shut down at premium time if required.

F. Refer to Architectural Demolition Plans for fixtures to be removed.

3.05 CONNECTIONS TO EXISTING SYSTEMS:

A. Make connections to existing systems only at time authorized, in writing, by Owner.

B. Do not take system out of service during occupied working, office or school hours.

C. Drain existing systems and fill, vent, test, balance and put existing systems into operation after connections have been made.

D. Repair existing insulation at points of connection to existing work.

3.06 PIPING SYSTEMS INSTALLATION - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 15 Plumbing Sections specifying piping systems.

B. Drawings, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and in service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections. No mitering or notching for fittings permitted.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons where exposed, non-insulated piping penetrates walls, ceilings, and floors in finished spaces.

3.07 SLEEVES

A. Sleeves are not required for core-drilled holes, or wall hydrants.

1. In mechanical room floors and other potentially wet areas, provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.

B. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length so that sleeve extends out ½ inch from both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas, or other potentially wet areas, 1-1/2 inches above finished floor level. Caulk space outside of sleeves water tight.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

3. Use the following sleeve materials:

a. Sleeves for Piping Through Concrete Beams, Concrete Walls, Footings, and Potentially Wet Floors: Steel pipe.

b. Sleeves for Piping Through Masonry Walls and Gypsum Board Partitions: Steel sheet sleeves 1/2 inch larger than pipe or pipe covering.

4. Where piping penetrates non-rated equipment room wall, floors or roofs outside of a shaft, close off space between pipe or duct and adjacent work with stuffing insulation and caulk air tight.

5. Above ground, non-rated, exterior wall penetrations: Seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.

6. Provide for continuous insulation wrapping thru sleeve.

7. Seal space around the outside of sleeves with grout at masonry walls and floors and dry wall mud at gypsum board partitions.

C. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

D. Fire-Rated Penetrations: Where pipes pass through fire-rated and fire-resistive floors, walls, and partitions, install appropriately rated sleeves and firestopping

sealant. Firestopping materials and installation methods are specified in Division 7 Sections “Through Penetration Firestop Systems” and “Fire Resistive Joint Systems”.

3.08 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 15 Plumbing Piping Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

G. Flanged Joints:

1. 125 Pound Cast Iron Flange (Plain Face): Mating flange shall have raised face, if any, removed to avoid overstressing the cast iron flange.

2. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

H. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.

2. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.

3. PVC Non-pressure Piping: Join according to ASTM D 2855.

I. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

3.09 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller at final connection to each piece of equipment.

2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3. Wet Piping Systems: Install dielectric fittings to connect piping materials of dissimilar metals.

3.10 PIPE CLEANING

A. Keep pipe clean and free of dirt. Keep caps on ends of pipe when it is stored on site and reinstall caps on ends of installed piping at the end of each day.

3.11 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations.

D. Install equipment in accordance with manufacturer's instructions. If manufacturer's instructions conflict with Contract Documents, obtain Architect's decision before proceeding.

E. Install equipment to allow right of way for piping installed at a required slope.

F. All equipment shall be firmly fastened in place:

1. Pad mounted equipment shall be secured to pads using poured in place anchor bolts or cinch anchors.

2. Vibration isolators shall be secured to floors or pads and equipment shall be bolted to the isolators.

3.12 PAINTING AND FINISHING

A. Except as specified below or noted on the Drawing, requirements for painting of Plumbing systems, equipment, and components are specified in Division 9 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

C. Paint water pipe and insulation downstream of backflow preventor (non-potable water) to termination point, or to connection with mechanical system piping, yellow.

D. Painting of mechanical piping:

1. The following piping within boiler and chiller room shall be painted in its entirety under Division 9: Painting. Color codes are listed here for information only.

   a. Domestic Cold Water: Dark Blue, Metalatex B42L4.

   b. Domestic Hot Water: Rose Red, Metalatex B42 (mix of R6 and W101).

2. Should there be a conflict of colors in existing installations, contact the Architect.

3.13 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 5 Section "Metal Fabrications" requirements.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.14 GROUTING

A. Mix and install grout for Plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

3.15 ACCESS DOORS – BUILDING

A. Provide access doors in wall and inaccessible ceilings to allow access to service and maintain concealed Plumbing equipment, valves, etc.

B. Coordinate installation of access doors with Divisions responsible for Building System in which panels are being installed.

3.16 FLASHING

A. Provide flexible flashing and metal counter-flashing where pitch cups and piping penetrate weather or waterproofed walls, floors and roofs.

B. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

C. Flashing for vent and soil pipes through the roof and roof drains specified under Division 7.

D. Flashing floor drains and floor sinks in floors with topping over finished area with lead, 10-inches clearance sides with minimum 36x36 inch sheet size. Fasten flashing to drain clamp device.

E. Seal floor and shower drains water tight to adjacent materials.

3.17 PROTECTION AND CLEANING OF EQUIPMENT, FIXTURES, AND MATERIALS

A. Equipment, fixtures, and materials shall be carefully handled, properly stored, and protected from weather, dust-producing procedures, or damage during construction.

B. At completion of all work, thoroughly clean, exposed materials (pipe, etc.), equipment, and fixtures and make ready for painting.

END SECTION 15403

SECTION 15405 - PLUMBING IDENTIFICATION

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following plumbing identification materials and their installation:
   1. Pipe markers.
   2. Valve tags.
   3. Valve schedules.
   4. Equipment labels.
   5. Warning signs and labels.

1.02 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Valve numbering scheme.

C. Valve Schedules: For each piping system. Furnish extra copies (in addition to mounted copies) to include in maintenance manuals.

1.03 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.04 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.01 PIPING IDENTIFICATION DEVICES

A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.

   1. Colors: Comply with ASME A13.1, unless otherwise indicated.

   2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.

   3. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers extending 360 degrees around pipe at each location.

4. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band pipe markers at least three times letter height and of length required for label.

5. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.

B. Pre-tensioned Pipe Markers: Pre-coiled semi-rigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.

2.02 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers, with numbering scheme approved by Architect. Provide 5/32-inch hole for fastener.

1. Material: 3/32-inch thick laminated plastic with 2 black surfaces and white inner layer.

2. Valve-Tag Fasteners: Brass wire-link chain, beaded chain or S-hook.

2.03 VALVE SCHEDULES

A. Valve Schedules: For each piping system, on standard-size bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-Schedule Frames: Glazed display frame for removable mounting on masonry walls for each page of valve schedule. Include mounting screws.

2. Frame: Extruded aluminum.

3. Glazing: ASTM C 1036, Type I, Class 1, Glazing Quality B, 2.5-mm, single-thickness glass.

2.04 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

2. Color Coding:

System	Background Color	Letters
Other equipment	Black	White

3. Temperatures up to 160 deg F.

4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

5. Letter shall be a minimum of 1/2” high. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

6. Fasteners: Stainless-steel self-tapping screws.

7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number.

2.05 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Yellow.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: Minimum 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information as indicated elsewhere in the specifications and on the Drawings.

PART 3 - EXECUTION

3.01 APPLICATIONS, GENERAL

A. Products specified are for applications referenced in other Division 15 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.02 PIPING IDENTIFICATION

A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.

1. Pipes with OD, Including Insulation, Less Than 6 Inches: Pre-tensioned pipe markers. Use size to ensure a tight fit.

2. Pipes with OD, Including Insulation, 6 Inches and Larger: Shaped pipe markers. Use size to match pipe and secure with fasteners.

B. Locate pipe markers and color bands where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior non-concealed locations as follows:

1. Near each valve and control device.

2. Near each branch connection, excluding short takeoffs for fixtures. Where flow pattern is not obvious, mark each pipe at branch.

3. Near penetrations through walls, floors, ceilings, and non-accessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.

5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.

7. Label 2 psi gas piping at 5 foot intervals.

3.03 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets; convenience and lawn-watering hose connections. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following:

1. Valve-Tag Size and Shape:

a. Cold Water: **2 inches square**.
b. Hot Water: **2 inches square**.
c. Gas: **2 inches square**.

2. Valve-Tag Color:

a. Cold Water: **Black**
b. Hot Water: **White**
c. Gas: **Yellow**

3. Letter Color:

a. Cold Water: **White**.
b. Hot Water: **White**.

c. Gas: **White**.

3.04 VALVE-SCHEDULE INSTALLATION

A. Mount valve schedule on wall in accessible location in each major equipment room.

END OF SECTION 15405

SECTION 15407 - PLUMBING SYSTEMS INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Jackets and Accessories.

C. Equipment Insulation.

D. Covering.

1.02 RELATED SECTIONS

A. Division 7 – Firestopping.

B. Division 15 – Section 15405 “Plumbing Identification.”

C. Division 15 – Section 15410 “Plumbing Piping”: Placement of hangers and hanger inserts.

1.03 SUBMITTALS FOR REVIEW

A. Section 15401: Procedures for submittals.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing insulation work with minimum 3 years experience.

1.05 REGULATORY REQUIREMENTS

A. Conform to maximum flame spread/smoke developed rating of 25/50 in accordance with ASTM E84, NFPA 255 or UL 723.

B. All insulation materials, adhesives, mastic and coating shall be asbestos free.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufactures for Fiberglass Insulation Materials:

1. Owens-Corning.
2. Certaniteed.
3. Knauf.
4. Manville Corporation

B. Acceptable Manufacturers for Foamed Plastic Closed Cell Elastometric Insulation Materials:

1. Armstrong AP.
2. Rubatex.

C. Acceptable Manufacturers for Adhesives, Mastics and Coatings:

1. Armstrong.
2. Benjamin Foster.
3. Childers.
4. Marathon.

2.02 GLASS FIBER PIPE INSULATION

A. Manufacturer: Owens-Corning Model SSL-11.

B. Insulation: ASTM C547; rigid molded, noncombustible.

1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
2. Maximum service temperature: 850 degrees F.
3. Maximum moisture absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket:

1. White kraft paper with glass fiber yarn, bonded to aluminized film.
2. Moisture vapor transmission: ASTM E96; 0.02 perm-inches.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Barrier Lap Adhesive:
1. Compatible with insulation.

F. Insulating Cement/Mastic:

1. ASTM C195; hydraulic setting on mineral wool.

2.03 FOAMED PLASTIC PIPE INSULATION

A. Manufacturer: Armaflex AP.

B. Insulation: ASTM C534; flexible cellular elastomeric insulation, pre-slit or slip on.

1. 'K' value: ASTM C177; 0.27 at 75 degrees F.
2. Minimum service temperature: -40 degrees F.
3. Maximum service temperature: 220 degrees F.
4. Moisture vapor absorption: ASTM D1056; 5.0 percent by weight.
5. Moisture vapor transmission: ASTM E96; 0.10 perm-inches.
6. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried adhesive, compatible with insulation.

D. Protective Coating: Weather resistant, compatible with insulation.

E. Do not use in plenum unless meets ASTM E-84 flame spread rating of less than 25 and smoke density rating of less than 50.

2.04 JACKETS – PIPING AND EQUIPMENT

A. PVDC Jacket for Indoor Applications: 4-mil thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms when tested according to ASTM E96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E84.

B. PVC Jacket.

1. Jacket: ASTM D1784, one piece molded type fitting covers and sheet material, off-white color.
   a. Minimum service temperature: 0 degrees F.
   b. Maximum service temperature: 150 degrees F.
   c. Moisture vapor transmission: ASTM E96; 0.002 perm-inches.
   d. Thickness: 20 mil.
   e. Connections: Brush on welding adhesive.

2.05 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor and jacketed outdoor use on below ambient services.

1. Products:

   a. Childers Products, Division of ITW; CP-35.
   b. Foster Products Corporation, H.B. Fuller Company; 30-90.
   c. ITW TACC, Division of Illinois Tool Works; CB-50.
   d. Marathon Industries, Inc.; 590.
   e. Mon-Eco Industries, Inc.; 55-40.
   f. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.

3. Service Temperature Range: Minus 20 to plus 180 deg F.

4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.

5. Color: White.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that piping and equipment have been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with NAIMA National Insulation Standards.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

D. Fit pipe hangers over insulation.

E. Inserts and Shields:

1. Application: Protect insulated piping at hangers and supports with insulation shield. On pipe sizes over 2 inches, provide insert.

2. Insulation Protection Shield: Galvanized steel formed in half circle to fit insulation. Length and gauge as follows:

    a. Up to NPS 4: 12 inches long and 22 gauge.
    b. NPS 6: 18 inches long and 22 gauge.
    c. NPS 8 through 12: 24 inches long and 18 gauge.
    d. NPS 14 and Large: 24 inches long and 16 gauge.

3. Insulation-Insert Material: Water repellent treated, ASTM C533, Type I calcium silicate; or ASTM C552, Type II cellular glass of same thickness and vapor barrier jacket specified for surrounding insulation. Insert shall be a minimum of 2 inches longer than the shield.

4. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

5. For Clevis Hangers: Insert shall cover lower 180 degrees of pipe.

6. Option: At Contractor’s option, insert may be factory fabricated Thermal Hanger Shield (insulation insert encased in sheet metal shield) equal to Pipe Shield, Inc. “Insulated Pipe Supports.”

7. Option: At Contractor’s option, steel pipe saddles may be used on hot water pipe in lieu of insert and shield. Fill interior void of saddle with insulation that matches adjoining insulation.

F. Continue insulation through metal studs, walls, sleeves, pipe hangers, and other pipe penetrations. Finish firestopping at supports, protrusions, and interruptions. At fire separations, refer to Division 7 and Section 15410: Sleeves.

G. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03 GLASS FIBER PIPE INSULATION APPLICATION

A. Provide vapor barrier jackets, factory or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding stapes 4 inch on center and vapor barrier mastic.

B. Insulate fittings, joints and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

C. **Finish fittings exposed in equipment rooms, boiler rooms and in finished spaces with vinyl acrylic mastic over glass fab**.

D. For hot piping do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

3.04 FOAMED PLASTIC PIPE INSULATION APPLICATION

A. Pipe insulation may be seamless insulation slipped over piping before erection or may be slit longitudinally and installed over erected pipe.

B. Fabricate fittings from mitered sections of pipe insulation.

C. Cement all joints and seams per manufacturer’s instructions.

3.05 SCHEDULES - PIPING

A. Plumbing Piping:

1. Domestic Cold Water, Above Grade:

a. Glass Fiber Pipe Insulation

1)	All pipe sizes:	1 inch thick.
2)	Pipes located in walls armaflex:	½ inch thick.

b. Foamed Plastic Pipe Insulation

1)	All pipe sizes:	1 inch thick.
2)	Pipes located in walls armaflex:	½ inch thick.

2. Domestic Hot and Recirculating Water Interior, Above Grade:

a. Glass Fiber Pipe Insulation

1)	All pipe sizes:	1 inch thick.
2)	Pipe located in walls:	½ inch thick.

b. Foamed Plastic Pipe Insulation

1)	All pipe sizes:	1 inch thick.
2)	Pipes located in walls armaflex:	½ inch thick.

3.06 INSTALLATION – EQUIPMENT INSULATION GENERAL

A. Install in accordance with NAIMA Insulation Standards.

B. Factory Insulated Equipment: Do not insulate.

C. Exposed Equipment: Locate insulation and cover seams in least visible locations.

D. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires or bands.

E. Fill joints, cracks, seams and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.

F. Insulated equipment containing fluids below ambient temperature: Insulate entire system.

G. Finish insulation at supports, protrusions, and interruptions.

H. Equipment in Mechanical/ Boiler Rooms or Finished Spaces: Finish with canvas jacket.

I. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.

J. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation so it can be easily removed and replaced without damage.

END OF SECTION 15407

SECTION 15410 - PLUMBING PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Pipe, pipe fittings, valves for the following piping systems:

1. Sanitary, waste and vent piping.
2. Domestic, hot and cold water piping.
3. Natural gas piping.
4. Fire protection piping.
5. Valves and specialties.

1.02 RELATED SECTIONS

A. Section 15401 – General Plumbing Requirements.

B. Section 15403 – Basic Plumbing Materials and Methods.

C. Section 15405 – Plumbing Identification.

D. Section 15407 – Plumbing Systems Insulation.

1.03 SUBMITTALS FOR REVIEW

A. Division 1 – Submittals and Section 15401: Procedures for submittals.

B. Provide product data on the following:

1. Pipe materials, pipe fittings and accessories.
2. Manufacturers catalogue data and cut sheets on all fixtures and equipment.
3. Valve data and ratings.

C. Manufacturer’s drawings of listed closing methods to be used to close penetrations through rated assemblies.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with the City of Glencoe, Alabama, codes and standards.

B. Perform sanitary sewer work beyond 30 inch of building in accordance with County Standards.

C. Valves: Manufacturer’s name and pressure rating marked on valve body.

PART 2 - PRODUCTS

2.01 SANITARY WASTE AND VENT PIPING:

A. Waste and vent piping to be Schedule 40 PVC plastic pipe.

B. Copper DWV Tube:

1. Pipe: ASTM B306, DWV.
2. Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper.
3. Joints: 50-50, ASTM B32, solder, Grade 50B.

B. PVC Pipe:

1. Pipe: ASTM D1785, Schedule 40 and ASTM D2265.
2. Fittings: ASTM D2465, PVC.
3. Joints: ASTM D2855, solvent weld with ASTM F-656 purple primer and ASTM D2564 solvent cement.
4 Use heavy duty no –hub clamps (Mission or Husky), when transitioning from cast iron to PVC
5. Foam Core PVC will not be allowed. Solid wall pipe only.
6. Pipe and Fittings by one manufacturer.

2.02 WATER PIPING, BELOW SLAB ON GRADE OR BELOW GRADE

A. Water Piping less than 3 inch; copper tube;

B. Water piping: Copper tube.

C. Copper Tubing:

1. Pipe: ASTM B88, Type K soft copper.
2. Fittings: ASME B16.22 wrought copper and bronze.
3. Joints: "Sil-Fos".
4. Piping to be installed to minimize the number of joints below grade of or below slab on grade.
5. Encase all below ground copper piping in plastic sleeve or 1/2" unsplit foam insulation.

2.03 WATER PIPING, ABOVE GRADE

A. Water piping 4 inch and smaller, copper tube;

B. Water piping: copper tube.

C. Copper Tubing:

1. Pipe: ASTM B88, Type L, hard drawn.
2. Fittings: ASME B16.22, wrought copper and bronze.
3. Joints: ASTM B32, 95-5 solder, Grade 95TA, lead free with lead free flux.

D. Insulation:

1. Insulate all water piping (cold, hot and hot return) above slab on grade with 1" fiberglass insulation. Insulation thickness may be reduced to ½ inch walls. Foam type insulation may be used in concrete block walls. (Armaflex or approved equal)
2. Insulation shall be installed continuous through walls.
3. See Section 15407 of the specifications for insulation description.

E. Identification:

1. Identify all piping in accordance with Section 15405 of the specification.

2.04 NATURAL GAS PIPING, BELOW GRADE

A. Plastic Pipe:

1. Pipe: ASTM S-1248 polyethylene for grade P24, Class B (PE 2406).
2. Fittings: Injection molded as described in ASTM-D-2683 and ASTM D-3216 Federal Department of Transportation Title 49 Part 192 minimum safety regulations and API 15 LE for polyethylene lines.
3. Joints: Butt fused in accordance with manufacturers recommendations.
4. Trace all below grade pipeline with single strand #16 yellow insulated copper wire laid directly on top of piping prior to covering pipe extended above grade and wrapped around pipe at each termination point.

2.05 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe:

1. Pipe: ASTM A53 Schedule 40 black.
2. Fittings: ASME B16.3, malleable iron.
3. Joints: NFPA 54, threaded with Teflon tape applied to male threads only.

B. Copper Tubing:

1. Pipe: Type “L” ASTM B68 or B75, general purpose.
2. Fittings: ASME B16.22, wrought copper.
3. Joints: Flared or “Sil-Fos.”

C. All gas piping in the 2 psi system shall be labeled with plastic labels indicating 2 psi at the beginning of the system, at the end of the system and at intervals not exceeding six feet.

2.06 FLEXIBLE PIPE CONNECTIONS

A. Stainless steel corrugated tubing with stainless steel wire braid.

B. Working pressure 200 psi minimum.

C. End connections 2” and smaller-male pipe threads, larger than 2” flanged.

D. Manufacturers: Minnesota Flexible Corporation, Metaflex, Flexicraft and Hyspan.

2.07 FLANGES, UNIONS, AND COUPLINGS

A. Pipe Size 2 Inches and Under:

1. Ferrous pipe: Class 150 malleable iron threaded unions.
2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Pipe Size Over 2 Inches:

1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.08 PIPE HANGERS AND SUPPORTS

A. Hangers:
1. Hangers for Pipe Sizes ½ to 1-1/2 Inch: Carbon steel, adjustable swivel, split ring.
2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods or Unistrut multiuse channel.
4. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
5. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
6. Vertical Support: Steel riser clamp.
7. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
8. Copper Pipe Support when applied directly to the copper piping: Copper steel ring, adjustable.
9. Install hanger over insulation on insulated pipe with sheet metal saddle rolled on the ends centered in hanger. See Section 15407.

B. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

C. Inserts: Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

D. For fasteners in existing concrete structures, use drilled in expansion anchors with load rating 150% greater than the pipe hanger rating. Note: Powder drive anchors are not acceptable.

E. Beam Clamps: Grinnell Figure #229.

2.09 BALL VALVES

A. Up to and including 2 inches:

1. Manufacturers:

a. Watts Model LFB-6080 or LFB-6081, full port.
b. Nibco, Apollo, Milwaukee, Kitz.

2. MSS-SP-110 Class 125, bronze body, chrome plated full port ball, ptfe seats and seals, blow-out proof stem and threaded ends.

B. 2-1/2 and larger:

1. Manufacturers:

a. Watts LFG-4000 Series.
b. Nibco Model T-580-70, S-580-70, T-FP-600N, or S-FP-600N.

2.10 OUTSIDE WATER MAIN VALVES

A. Manufacturers:

1. Stockham.
2. American Darling
3. Crane.

B. Iron body, bronze trim, 200 psig WP, non-rising stem, double disc, and parallel seat. Provide cast iron or ductile iron access to grade with tee handle wrench.

2.11 SWING CHECK VALVES

A. Up To and Including 3 Inches:

1. Manufactures:

a. Nibco Model S-413-B.
b. Crane, Stockham, Milwaukee, Kitz.

2. MSS SP-80, Class 125, bronze body and cap, bronze trim and seat, threaded ends.

B. Larger than 3”

1. Manufactures:

a. Nibco Model F-918-B.
b. Crane, Stockham, Milwaukee, etc.
c. MSS SP-71, Class 125, iron body, bronze trim flanged ends.

2.12 WATER PRESSURE REDUCING VALVES

A. Provide water pressure reducing valve at the service entry on all buildings where main pressure is in excess of 80 psi. Set out pressure at 70 psi.

B. Up To and Including 2 Inches:

1. Manufactures:

a. Watts Model U5B.
b. Wilkins, Cash, Acme.

2. MSS SP-80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, internal by-pass, inlet strainer, threaded ends with single union and ball valve upstream of strainer.

C. Over 2 Inches:

1. Manufactures:

a. Watts Model ACV-115-74C.
b. Williams, Cash, Acme.

2. MSS SP-85, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

D. Provide pressure gage (0-150 PSI) with needle valve stop on leaving side of pressure reducing valve

2.13 NATURAL GAS VALVES

A. Manufactures:

1. 2" and smaller:

a. Watts Series FBC-1, Conbraco Series GB-10, Nibco GB-1, GB-2, T-FP600.

2. Larger than 2":

a. Rockwell 143 lubricated 175 psi.

3. All gas valves shall be third party listed.

2.14 GAS PRESSURE REGULATOR

A. System Regulator: Equal to American Meter Co. Model 1813B with built-in over pressure shut off, size and capacity as shown on drawings.

B. Appliance Regulator: Equal to American Meter Company J-78 for sizes ½", ¾" and 1" and J-48 for sizes 1"-3".

C. Regulator valves shall be full line size with capacity as shown on Drawings. Provide regulators with positive shut-off and vent limiting device. Where vent limiting devices are not acceptable (over 200 C.F.H.), pipe relief line to exterior one pipe size larger than vent discharge and elbow down with screened opening per ASME CSD-1 requirements. Provide pressure gauges on inlet and outlet side of all regulators.

D. Gas regulators for building heating finned-tube boilers are specified to be provided with the boiler. Plumbing contractor to install and adjust regulator per regulator manufacturer's instructions. Provide pressure gauges on inlet and outlet side of all regulators. Where vent limiting devices are not acceptable (over 200 C.F.H.), pipe relief line to exterior, one pipe size larger than vent discharge connection and terminate with elbow down with screened opening per ASME CSD-1 requirements.

2.15 THERMOMETERS

A. Lights actuated digital thermometer reading in degrees Fahrenheit. Provide with well for minimum 1" insulation.

B. Weiss Vari-angle Digital Thermometer.

2.16 SLEEVES

A. Refer to Division 15, Section “Basic Plumbing Materials and Methods” for requirements.

2.17 FIRE STOP SYSTEM

A. All wall and floor penetrations are to be closed. Refer to the Arch. Life Safety Plans and close all openings with a U.L. Listed assembly compatible with the rating of the wall or floor being penetrated.

B. Non-rated walls:

1. Sheet rock joint compound may be used to seal opening. Insulation to be continuous through wall.

C. For piping passing through sheet rock walls or partitions:

1. Insulated pipe passing through 2 walls or partitions – Hilti FS605 with sleeve U.L. Listing #WL1056.
2. Insulated pipe passing through 2 hour walls or partitions – Hilti FS611A with no sleeve, U.L. Listing #WL5029. Insulation to be continuous through sleeve.

D. For piping passing through concrete floors, concrete walls or concrete block walls:

1. Uninsulated Schedule 40 steel on copper pipe: Hilti #F5605 with sleeve, U.L. #CAT155.
2. Insulated Schedule 40 steel on insulated copper pipe: Hilti #FS6114A, U.L. #CAT5045.

E. For non-metallic piping passing through concrete floors, walls or concrete block.

1. 2” and smaller piping: Hilti #FS611A, U.L. #CAT2062 or U.L. #CAT2065.
2. Larger than 2”: Hilti #FS611A with collar, U.L. #CAT095.

2.18 FLASHING

A. Refer to Division 15, Section “Basic Plumbing Materials and Methods” for requirements.

PART 3 - EXECUTION

3.01 PREPARATION

A. Cut pipe square and ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

3.02 PIPING INSTALLATION GENERAL

A. Install in accordance with manufacturer's instructions.

B. Provide dielectric fittings wherever jointing dissimilar metals.

C. Make piping connections to equipment with flanges or unions.

D. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

E. Run piping concealed, except where specifically shown to be exposed.

F. Install piping to maintain headroom, conserve space, and not interfere with use of space.

G. Group piping whenever practical at common elevations.

H. Install piping to allow for expansion and contraction without stressing pipe, joints or connected equipment.

I. Provide clearance in hanger and from structure and other equipment for installation of insulation and access to valves and fittings.

J. Provide access where valve is not accessible. Provide minimum 18"x18" access doors at valves in hard ceiling.

K. Establish elevations of buried pressure piping outside the building to ensure not less than 18 inches of cover.

L. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

M. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09900.

N. Install chrome plated floor, wall and ceiling plates on all exposed piping passing through finished surfaces in finished spaces.

O. Install bell and spigot pipe with bell end upstream.

P. Install valves with stems upright or horizontal, not inverted.

Q. Install water piping to ASME B31.9. PDI shock arrestors are required to be installed on all branchlines.

R. Inserts:

1. Provide inserts for placement in concrete formwork.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, or in existing concrete structures use drilled in expansion anchors with load rating at least 150% of pipe hanger rating (powder driven anchors not acceptable).

S. Pipe Hangers and Supports:

1. Support horizontal piping as scheduled.
2. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.
3. Place hangers within 12 inches of each horizontal elbow.
4. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
5. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
6. Where several pipes can be installed in parallel and at same elevation, trapeze hangers may be used.
7. Provide copper hangers and supports when applied directly to copper piping.
8. Prime coat exposed steel hangers and supports located outdoors, in crawl spaces, pipe shafts. Above suspended ceiling spaces is not considered exposed.
9. Provide hangers adjacent to motor driven equipment.
10. Support cast iron drainage and vent piping at every joint and minimum 5'-0" on center.
11. Support of all pipe, tubing and fixtures and equipment shall be accomplished by means of engineered products specified to each application. Makeshift, field devised methods of plumbing pipe supports, such as scrap wood, wire or duct tape are not allowed. These shall be HoldRite, B-Line, Sioux Chief or approved equal.

T. Provide pipe line markers and valve tags in accordance with other sections of the specifications.

U. Sleeves:

1. Refer to Division 15, Section “Basic Plumbing Materials and Methods” for requirements.

V. Flashing:

1. Refer to Division 15, Section “Basic Plumbing Materials and Methods” for requirements.

3.03 EXCAVATION AND BACKFILLING

A. Refer to Division 15, Section “Basic Plumbing Materials and Methods” for requirements.

3.04 APPLICATION

A. Install unions at equipment or apparatus connections.

B. Install brass male adapters each side of valves in copper piped system.

C. Install valves for shut-off and to isolate equipment, part of systems, or vertical risers.

D. Provide check valves on discharge of water pumps.

E. Provide flow indicators in water recirculating systems where indicated.

3.05 ERECTION TOLERANCES

A. Slope all sanitary waste piping and storm piping at a minimum 1/8" per foot. Slope all sanitary sewer piping 2" and smaller below slab on grade at a minimum 1/4" per foot.

B. Arrange all water piping to drain to low points and provide ball valve with plug at low point.

3.06 SANITARY, WASTE AND VENT SYSTEM

A. Install vent stacks through roof. Terminate 12 inches above finish roof and minimum 10'-0" from HVAC roof top unit outside air intakes. Flashings for penetrations are under another section.

B. Connect to site sanitary sewer approximately 5'-0" from building. Verify exact size, location and invert with Civil Drawings prior to beginning work.

C. Insulate all mechanical floor drain bodies and horizontal piping between drain and connection to stack on elevated floors.

3.07 WATER PIPING SYSTEM

A. Connect to site water service approximately 5’-0" from building installed under another section. Verify with Civil drawings exact size and location of site water service.

3.08 NATURAL GAS PIPING SYSTEM

A. Arrange with local gas company to provide new gas service complete with connection to gas main, service from main to meter and meter installation all per gas company’s requirements. Include all costs associated with new meter and service.

B. Provide regulators on each line serving gas appliance sized in accordance with equipment requirements. Regulators shall have vent limiting device as required by local code or shall be vented to the exterior. Provide pressure gauge on inlet and outlet side of all regulators.

C. Install no gas piping beneath slabs on grade. Where gas pipe must be installed below building slabs, install in steel encasement with vent to atmosphere. See detail on drawings.

D. Where gas piping is installed exposed on the roof, the piping shall be installed on Erico PP50H6 pipe pier supports with integral strut channel.

E. Where piping installed out of doors, coat all piping and joints with Sherman Williams “TARGUARD” coal tar epoxy. Do not coat joints until after testing and inspection. Clean rust from pipe prior to applying coating.

F. Install union plug valve or gas shut-off and dirt pocket at each piece of equipment.

3.09 FIELD QUALITY CONTROL

A. Perform all tests as required by local codes. Contractor shall furnish testing equipment and keep a record of all testing listing tests made, results and those witnessing test. Include testing record in close out documents.

B. If local codes are more stringent than the following, local codes shall govern.

C. Sanitary, Waste, and Vent Water Systems:

1. Test piping by stopping lower outlets and filling to 10 feet hydrostatic head for a minimum period of 15 minutes with all joints exposed throughout test. Stop all leaks and retest system until tight.
2. Test all piping by stopping all outlets and applying 5 pounds per square inch of air pressure to the system for a period of 15 minutes. Stop all leaks and retest system until tight.
3. Provide ball test on all piping 3" and larger. Three Tests are usually required by U.A. Facilities Dept.

D. Domestic Water Piping:

1. Hydrostatic test at 150 psig without pressure drop for 4 hours. Stop all leaks and retest system until free from leaks.

2. Leave City pressure on system for duration of project.

E. Natural Gas Piping:

1. Air pressure test at 25 psig without pressure drop for 4 hours.
2. Black steel piping below grade shall be Holiday tested prior to backfilling.

3.10 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify hot and cold water systems are complete, flushed and clean.

B. Ensure PH of water to be treated is between 7.4 and 7.6.

C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 ppm residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 ppm, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water.

H. Submit sample of water from all new or modified systems to local Health Department and receive certification that water is acceptable for human consumption. Include certification of water in close out documents.

3.11 SCHEDULES

A. Pipe Hanger Spacing:

1. Metal Piping:

a. Pipe size: ½ to 1-1/4 inches:

1) Maximum hanger spacing: 6.5 ft.
2) Hanger rod diameter: 3/8 inch.

b. Pipe size: 1-½ to 2 inches:

1) Maximum hanger spacing: 10 ft.
2) Hanger rod diameter: 3/8 inch.

c. Pipe size: 2-½ to 3 inches:

1) Maximum hanger spacing: 10 ft.
2) Hanger rod diameter: 1/2 inch.

d. Pipe size: 4 to 6 inches:

1) Maximum hanger spacing: 10 ft.
2) Hanger rod diameter: 5/8 inch.

e. Pipe size: 8 to 12 inches:

1) Maximum hanger spacing: 14 ft.
2) Hanger rod diameter: 7/8 inch.

f. Pipe size: 14 inches and over:

1) Maximum hanger spacing: 20 ft.
2) Hanger rod diameter: 1 inch.

2. Plastic Non-Metallic Piping:

a. All Sizes:

1) Maximum hanger spacing: 4 ft.
2) Hanger rod diameter: 3/8 inch.

END OF SECTION 15410

SECTION 15440 - PLUMBING FIXTURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Plumbing fixtures.

B. Plumbing miscellaneous equipment.

1.02 RELATED SECTIONS

A. Section 15401 – Basic Plumbing Requirements.

B. Section 15403 – Basic Plumbing Materials and Methods.

C. Section 15405 – Plumbing Identification.

D. Section 15407 – Plumbing Systems Insulation.

E. Section 15410 – Plumbing Piping.

1.03 SUBMITTALS FOR REVIEW

A. See Section 15401, Submittal for Review.

B. Plumbing Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, trim and finishes.

1.04 SUBMITTALS AT PROJECT CLOSEOUT

A. Refer to Division 1 and Section 15401 – Submittals for Project Closeout.

B. Maintenance Data: Provide 3 sets of manufacturer’s maintenance and parts listing including the manufacturers nearest sales and service representative. Include the sales representative’s address and telephone number. Provide with the listing, a suggested maintenance schedule for all equipment along with warranty dates. Items are to be provided in three ring binders with tabs identifying different equipment types.

C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner’s name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.06 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE AND PROTECTION

A. Accept fixtures on site in factory packaging, inspect for damage and store.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.08 WARRANTY

A. See other sections of the specification for additional warranty information.

B. The Contractor shall warrant all materials, workmanship and equipment for a period of one year from the date of substantial completion. Any defect in equipment or workmanship shall be made known to the Contractor within 1 year. Such deficiencies shall be corrected by the Contractor at no cost to the Owner.

1.09 EXTRA MATERIALS

A. See other sections of the specification for additional extra material requirements.

B. Provide two sets of washers for all faucet types, two flush valve repair kits for all flush valve type and one loose key for each hose bibb or wall hydrant.

PART 2 - PRODUCTS

2.01 CLEANOUTS

A. Furnish and install cleanouts where indicated on drawings and at all 90-degree bends, angle, upper terminals and not over 75 feet apart on straight runs. All cleanouts on cast iron piping to have bronze countersunk tapered slotted plugs, except PVC and acid waste piping cleanouts, which shall be standard of piping system used. Flush-with-floor cleanout access covers shall have non-skid covers. All wall cleanout access covers shall have polished satin finish. All cleanouts shall be full size of pipe, piping larger than 6" shall have minimum 6" cleanout covers.

B. Exposed Cleanouts: Cast brass plug type, J.R. Smith #4470.

C. Wall type cleanout plug and access covers, J.R. Smith #4472. Cleanout plug must be within 1" of finish wall and must be tapped for access cover. On PVC plastic and waste pipe in wall; cleanout access cover J.R. Smith 4710.

D. Install wall cleanouts on stacks at flush valve fixtures 12" above top of flush value, 12” above top of flush tanks, 12" above finish floor on sinks, lavatories and water coolers and 12" above grab bars at fixtures with grab bars. Locate cleanouts to clear baseboard at floor.

E. Floor type cleanout access covers: J.R. Smith #4248-NB. Plug must be within 3" of finished floor. Provide J.R. Smith #4188 where installed in terrazzo floors and J.R. Smith #4168 where located in floor with asphalt or vinyl tile covering. Grout cleanout below access cover to seal watertight. Provide option "Y" cleanout carpet markers where installed in carpeted floors.

F. Floor type cleanout covers for acid waste piping: J.R. Smith #4940.

G. Outside Cleanouts: J.R. Smith #4258 cleanout access encased in a 18" X 18" X 6" deep concrete pad. See Detail on Drawings.

2.02 PLUMBING FIXTURES AND EQUIPMENT

A. Water Heaters with side feed connections shall be installed with a vacuum relief valve equal to a Watts No. 36A installed in the cold water line. The relief valve shall be located down stream of the cold water cut-off valve and minimum 6" above the top of the heater.

B. All “wetted” domestic potable fixtures, piping materials, valves shall meet the Federal Lead Free Guidelines. All materials shall be clearly marked and submitted with complete data during submittal review.

C. Unless otherwise specified, all fixtures complete as catalogued, commercial grade, white color, exposed metal trim chromium plated.

D. Fixtures and brass shall be securely anchored. Carriers shall be securely anchored to floor with lug bolts in all holes as recommended by the manufacturer.

E. Flush valve "YJ" supports shall be installed 1 inch below vacuum breaker on all water closet flush valves and around vacuum breaker on urinal flush valves. Handles on A.D.A. water closets to be installed on wide side of room or stall.

F. Seal wall hung fixtures at wall with white silicone sealant. Seal countertop fixtures with clear silicone sealant.

G. Mount all fixtures at standard mounting height unless otherwise noted.

H. All faucets to be furnished with ceramic discs.

I. Furnish sinks and lavatories with correct number of drillings required for the faucet and accessories. Hole covers are not acceptable.

J. All similar products shall be by the same manufacturer.

K. All fixtures noted to be A.D.A. approved must be set with great care to assure proper mounting height and proper distance from wall.

L. Provide Symmons "Maxline" LF5-210-CK thermostatic mixing valve or approved equal under all public and A.D.A. lavatories. Set hot water temperature at 109 deg F.

M. All items complete as catalogued as follows: Reference schedule sheets

2.03 ACCEPTABLE MANUFACTURERS

A. Where Kohler is listed above, Zurn or American Standard may be substituted.

B. Where Sloan is listed above, Zurn may be substituted.

C. Where J. R. Smith is listed above, Josam, Zurn, Mifab, Watts, or Wade may be substituted.

D. Where Elkay water coolers are mentioned above, Oasis, or Acorn may be substituted, only if water ways are constructed of totally lead free materials.

E. Where Armstrong is listed above, the equal of B & G, Taco, Grundfos or Thrush may be substituted.

F. Where Church is listed above, Bemis, Beneke, Centoco, Olsonite or Comfort Seats may be substituted.

G. Where Stern Williams is listed above, Acorn or Fiat may be substituted.

H. Where EBC is listed above for traps, outlets and stops, McGuire, Kohler, Crane, Eljer or American Standard may be substituted.

I. Where Chicago is listed above for shower valves, Leonard, Powers or Lawler may be substituted.

J. Where EBC-IK is listed above, Pro-wrap by Mcguire, "Handi Lav-Guard" by Truebro, "Trap-Wrap" by Brocar Industries, Inc. or Plumberex may be substituted.

K. Where Amtrol is listed for expansion tanks, Watts or Armstrong may be substituted.

L. Where Navien is listed, Rinnai or Noritz may be substituted.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Verify all electrical characteristics of electrical motors, starters and equipment with Electrical Drawings. Should the Contractor change the characteristics of the electrical equipment, it shall be the responsibility of the Contractor to coordinate all changes with the other trades and bear all costs of such changes.

B. Coordinate all cutouts in millwork and casework with supplier for proper cutout dimensions.

C. Install all fixtures and equipment in accordance with manufacturer's recommendations.

D. All wall hung fixtures are to be installed on floor mounted fixture supports. Fixture supports are to be anchored to floor with anchors in all mounting holes. Anchors to be sized as per the manufacturers recommendations. Seal all fixtures to walls and floor with white silicone sealant. Seal all sinks to counter tops with clear silicone sealant.

E. Adjust all stops, flush valves and valves for intended water flow rate.

F. Clean plumbing fixtures and equipment and remove tags.

G. Install all electric water heaters with clearance for removal of heating elements.

H. Provide backing in wall for flush valve YJ brackets, faucet supports, etc. Anchor to the backing with anchoring screws of sufficient length to penetrate backing. See Section 15410, Part 3.

I. Provide stops with chrome-plated nipples penetrating wall and cover penetrations with chrome-plated escutcheons. Note: Compression type stops and plastic stems are not acceptable.

END OF SECTION 15440

SECTION 15451 - GENERAL FIRE PROTECTION REQUIREMENTS

PART ONE - GENERAL:

1.1 RELATED DOCUMENTS

A. Division 1 – Section “ALTERNATES”: Coordinate related Division 15 work and modify surrounding work to integrate the Work of each Alternate.

1.2 SUMMARY

A. Description of General Fire Protection Requirements. Applies to all Division 15, Section 15450’s (Fire Protection).

1.3 DEFINITIONS

A. "Provide" means to furnish and install, complete and ready for operation.

1.4 REFERENCES

A. ASME: American Society for Mechanical Engineers.

B. ASTM: American Society of Testing and Materials.

C. AWWA: American Water Work Association.

D. FM: Factory Mutual.

E. NEMA: National Electrical Manufacturer’s Association.

F. NFPA: National Fire Protection Association.

G. MSS: Manufacturer’s Standardization Society of the Valve and Fitting Industry.

H. UL: Underwriters Laboratories, Inc.

1.5 REGULATORY REQUIREMENTS

A. Comply with current edition, unless otherwise noted, of the following codes and standards.
   1. ANSI B31.9 - Building Services Piping.
   2. ADA - American’s with Disabilities Act.
   3. NFPA 13 – Installation of Sprinkler System.
   4. NFPA 24 – Installation of Private Fire Service Mains
   5. NFPA 30 – Flammable and Combustible Liquids Code.
   6. NFPA 31 – Installation of Oil-Burning Equipment.
   7. NFPA 54 – National Fuel Gas Code.
   8. NFPA 70 - National Electrical Code.
   9. NFPA 101 - Life Safety Code.
   10. IBC - International Building Code with Fire, Mechanical, Plumbing and Gas Codes.

B. Permits, Licenses, Inspections and Fees.
   1. Obtain and pay for all permits, licenses, inspections and fees, and comply with

all rules, laws and ordinances pertaining to the Contractor's portion of the Work.

2. Obtain and pay for certificates of required inspections, and file certificates with Owner.

1.6 PRODUCT REQUIREMENTS

A. Provide new standard, materials throughout.

B. Multiple items of similar equipment shall be the product of the same manufacturer.

C. Substitutions:

1. Comply with the provisions of Division 1, Section "Product Requirements" and the following:
2. When several manufacturers are named in the specifications, the corresponding products and models made by the specified manufacturers will be accepted and Contractor may base his bid on any one of those products. However, if the Contractor's bid is based on products other than the scheduled or specified **basis of design**, it shall be understood that there will be no extra cost involved whatsoever, and the effect on other trades has been included in the Contractor's proposal. Coordination with other trades for substituted equipment or use of products other than the named basis of design shall be the responsibility of the Contractor furnishing the equipment.
3. The basis of design manufacturer's equipment has been used to determine space requirements. Should another approved manufacturer's equipment be used in preparing proposals, Contractor shall be responsible for determining that said equipment will fit space allocated. Submission of shop drawings or product data on such equipment shall be considered as indicating that the Contractor has reviewed the space requirements and the submitted equipment will fit the space allocated with due consideration given to access required for maintenance and code purposes.
4. The basis of design manufacturer's equipment and scheduled Fire Protection equipment electrical requirements have been used to coordinate the electrical requirements of the plumbing equipment with the electrical systems serving that equipment.
   a. Contractor shall coordinate the electrical requirements of the equipment actually furnished on this project and provide the electrical systems required by that equipment at no additional cost to the Owner.
   b. Equipment of higher or lower electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified at no additional cost to the Owner.
   c. Prior to approval of submittals of Fire Protection equipment with electrical requirements that are greater or lower than those shown on the Drawings, Contractor shall submit letter verifying that required changes to the electrical system, serving the specific piece of equipment in question, have been coordinated with the electrical contractor. Letter to be included with the associated equipment submittal, addressed to the Architect with a copy to the electrical engineer.
5. Each bidder may submit to the Architect a list of any substitutes which he proposes to use in lieu of the equipment or material named in the specifications with a request for the approval of proposed substitutes. To be

considered, such requests must be delivered to the office of the Architect not later than 10 days prior to bid due date. The submittal shall include the following:

a. Specific equipment or material proposed for substitution giving manufacturer, catalog and model number.
b. All performance and dimensional data necessary for comparison of the proposed substitute with the equipment or material specified.
c. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the substitute may require.

6. The burden of proof of the merit of the proposed substitute is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution is final.

1.7 SUBMITTALS

A. Submit under provisions of Division 1, Section "Submittal Procedures" and the following:

B. Product Data: Submit to the Architect and obtain his approval of a complete list of materials and equipment which are to be provided under the 15450 Sections of Division 15.
1. List shall be complete with manufacturer's names, catalog number, dimensions, specifications, rating data and options utilized. Capacities shall be in the terms specified.
2. Call attention to deviations from specified items as to operation and physical dimensions.
3. Performance curves for pumps shall be included.
4. Final equipment orders shall not be placed until submittals have been returned marked "No Exceptions Noted" or "Make Corrections Noted".
5. Bind all equipment submittals and provide index tab for each type of equipment. Submit all at one time. Reserve two sets for project close-out documents.

C. Shop Drawings: Before starting work, submit and obtain approval from Architect of detailed drawings of the following, fully dimensioned and drawn to 1/8" to 1'-0" scale. Submit six (6) prints of each drawing. Engineer will return five (5) of the prints with comments noted. Failure to submit shop drawings will make the Contractor responsible for changes required to facilitate installation.
1. Fire Protection Systems. See Division 15, Section "Fire Protection System."
2. For multi-story buildings, submit detailed floor penetration sleeve layout drawings. See Division 15, Section "Plumbing Basic Materials and Methods," Article "Informational Submittals."

1.8 COORDINATION DRAWINGS

A. General:
1. Within 60 days of Notice to Proceed provide Coordination Drawings for the following the building:
2. Do not base Coordination Drawings on reproduction of Contract Documents or standard printed data.
3. Submitted Coordination Drawings are for information only and typically will not be returned to the Contractor. Architect will not take any action, but may

define coordination conflicts or problems and inform the Contractor of such conflicts or problems.

B. Content:
1. Project specific information, drawn accurately to scale.
2. Show sequencing and spatial relationship of separate units of work that must function in a restricted manner to fit in the space provided, or function as indicated.
3. Indicate dimensions shown on Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

C. Format:
1. Coordination shop drawings shall be drawn to a scale of not smaller than ¼" = 1'-0".
2. Provide drawings on electronic media in AutoCad .dwg format.
3. Provide layering system separate from wall outline and unique to each discipline.
4. In addition to plan view, provide sections as required to clarify congested situations and verify vertical clearances.
5. Base drawings and building sections in .dwg format will be provided by Architect.

D. Fire Protection Shop Drawings: Fire Protection subcontractor shall add all fire protection equipment, piping, sprinkler heads and other elements to database.
1. Upon completion of Fire Protection shop drawings, transmit electronic database to Electrical subcontractor.

E. General Contractor's Final Coordination: General Contractor shall thoroughly review shop drawings, adding additional building elements where appropriate, and shall resolve conflicts, coordinating with the Architect, and the various subcontractors.

F. Submit Coordination Shop Drawings: Upon completion of final coordination, General Contractor shall approve coordination shop drawings and transmit 3 sets of hard copies and electronic files on CD's to Architect.

1.9 QUALITY ASSURANCE

A. Installer's Qualifications: Firm experienced in installation of systems similar in size and complexity to those required for this project, plus the following:
1. Acceptable to, or licensed by, manufacturer.
2. Not less than 3 years experience with systems.
3. Successfully completed not less than 5 comparable scale projects using systems similar to those for this project.
4. Professional Engineer licensed in the State in which the work occurs; or NICET Level 3 and licensed by the State Fire Marshall in the State in which the work occurs. NICET Level 3 Contractor to supervise / inspect installation.

1.10 SUMMARY OF WORK

A. Scope: Provide all labor, materials, equipment and services necessary for the completion of all fire protection work shown or specified, except work specified to be done or furnished by others, complete and ready for operation.

1.11 DRAWING INTERPRETATION AND COORDINATION

A. Drawings are intended to show size, capacity, approximate location, direction and general relationship of one phase to another, but not exact detail or arrangement.

B. Do not scale drawings for location of system components. Check all measurements, location of pipe, ducts, and equipment with the detail architectural, structural, and electrical drawings and conditions existing in the field and lay out work so as to fit in with ceiling grids, lighting and other parts.

C. Make minor adjustments in the field as required to provide the optimum result to facilitate ease of service, efficient operation and best appearance.

D. Where doubt arises as to the meaning of the Drawings and Specifications, obtain the Architect's written decision before proceeding with parts affected; otherwise assume liability for damage to other work and for making necessary corrections to work in question.

E. Refer to Architectural Drawings for all dimensions and location of lights, ceiling diffusers and sprinkler heads.

1.12 PROJECT/SITE CONDITIONS

A. Visiting Site: Visit site and become familiar with location and various conditions affecting work. No additional allowance will be granted because of lack of knowledge of such conditions.

B. Determine sizes and locations, and inverts of existing and new utilities near site.

C. Cause as little interference or interruption of existing utilities and services as possible. Schedule work which will cause interference or interruption in advance with Owner, authorities having jurisdiction, and all affected trades.

1.13 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit under provisions of Division 1 Sections - "Closeout Procedures" and "Project Record Documents" and the following.

B. Record Drawings:
1. Keep accurate record of corrections, variations, and deviations, including those required by change orders to the Fire Protection drawings.
2. Accurately show location, size and elevation of new exterior work dimensioned from permanent structure.
3. Record changes daily on a set of prints kept at the job site.
4. Submit prints marked as noted above to Architect for review prior to request for final payment.
5. Marked prints will be returned to Contractor for use in preparing Record Drawings.

6. Engineer will use marked up drawing showing as-built conditions provided by Contractor to prepare Record Drawings.

C. Prior to the issuance of a certificate for final payment, submit to Architect and obtain his approval of the following:
   1. Record drawings – fire protection piping (pdf / dwg / reproducibles) and electronic files in AutoCAD.
   2. Equipment Submittal Data (2).
   3. Equipment operating and maintenance manuals (2).
   4. Equipment warranty dates and guarantees (2).
   5. List of Owner's Personnel who have received operating and maintenance instructions.
   6. Install valve charts and valve location plans in main mechanical room. (See Division 15, Section “Plumbing Identification.”)
   7. Submit start-up/field inspection reports for:
      a. Fire system

D. Contractor’s Material and Test Certificate for above ground piping.

E. Contractor’s Material and Test Certificate for underground piping.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 15451

SECTION 15453 - BASIC FIRE PROTECTION MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SUMMARY

A. Description of common piping, equipment, materials and installation for Fire Protection systems.

B. This Section includes the following:
1. Piping materials and installation instructions common to most Fire Protection piping systems.
2. Sleeves.
3. Concrete.
4. Grout.
5. Escutcheons.
6. Access doors - Building.
7. Flashing
8. Workmanship.
9. Cutting and patching.
10. Excavation, trenching and backfilling.
11. Connection to existing systems.
12. Piping systems installation - Common Requirements.
13. Equipment installation - Common Requirements.
14. Painting and finishing.
15. Concrete bases.
16. Supports and anchorages.
17. Protection and cleaning of equipment and materials.

1.02 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.03 SUBMITTALS

A. Product Data: For the following:
1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.

4. Escutcheons.
5. Access doors - building.

1.04 INFORMATIONAL SUBMITTALS

A. Shop Drawings: For multi-story buildings, submit detailed drawings of the floor penetration sleeve sizes and locations, including the following information:

1. Fully dimensioned off column lines with location respective to adjacent walls shown.
2. Sleeve size.
3. Pipe size.
4. Pipe service.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture. If pipes do not ship with end caps, cover ends of pipe stored on site with 6 mil plastic.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.06 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for Plumbing installations.

B. Coordinate installation of required supporting devices and set sleeves and inserts in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate installation of building access doors for fire protection items requiring access that are concealed behind finished surfaces.

D. Electrical Characteristics for Fire Protection Equipment:

1. Coordinate electrical system installation to match requirements of equipment actually furnished on this project.

2. Include a letter with the respective equipment submittal from the electrical contractor and approved by electrical design consultant, detailing changes to the electrical system required to accommodate changes in the power distribution system to accommodate Fire Protection equipment that has different electrical power requirements from that equipment used as basis of design, or power provisions, as shown on the electrical drawings.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements. Provide products by one of the following:

2.02 PIPE, TUBE AND FITTINGS

A. Refer to individual Division 15 Fire Protection Piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.03 JOINING MATERIALS

A. Refer to individual Division 15 Fire Protection Piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.

b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated.

2.05 SLEEVES

A. Galvanized-Steel Sheet: 20 gauge minimum thickness; round tube closed with longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Firestopping Sealant: See Division 7 Sections “Through-Penetration Firestop Systems” and “Fire Resistive Joint Systems” for firestopping sealant requirements.

D. Stuffing Insulation: Glass fiber type, non-combustible.

2.06 CONCRETE

A. Nominal weight concrete (145 PCF) using Type I Portland Cement, 1-inch maximum size coarse aggregate to provide a minimum 28 day compressive strength of 3000 psi.

2.07 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.

2. Design Mix: 5000-psi, 28-day compressive strength.

3. Packaging: Premixed and factory packaged.

2.08 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

1. Finish: Polished chrome-plated.

2.09 ACCESS DOORS – BUILDING

A. Manufacturers:

1. Bilco.
2. Milcor.
3. Nystrom.

B. Construction:

1. Door: 14-gauge, cold rolled steel.
2. Frame: 16-gauge, cold rolled steel of configuration to suit material application.
3. Hinge: Concealed spring hinge.
4. Latch: Screwdriver cam latch.
5. Finish: Phosphate dipped and prime coated.
6. UL labeled when in fire-rated construction with rating to match construction.
7. Stainless steel (Type 304) shall be used in ceramic tile or glazed structural tile.

C. Size: 16 inch x 16 inch minimum, as indicated on drawings, or as required to allow inspection, service, and removal of concealed items.

2.10 FLASHING

A. Flexible Flashing: 47 mil thick sheet butyl compatible with roofing.

B. Lead Flashing: Waterproofing, 5 lb/SF sheet lead.

C. Pitch Cups: 20 gauge galvanized steel, minimum 8 inches deep, bases mitered and soldered and extending at least 4 inches horizontally.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. First class and in accordance with best practice. Work to be orderly, neat in appearance and performed by skilled craftsman.

B. Poor or improper workmanship shall be removed and replaced as directed by the Architect without additional cost to the Owner or design professionals.

3.02 CUTTING AND PATCHING

A. Comply with the requirements of other Divisions for the cutting and patching required to accommodate the installation of Fire Protection work. Repair and finish to match surrounding.

B. Architect's approval required before cutting any part where strength, or appearance of finished work is involved.

C. Openings are to be laid out and built-in, set sleeves and inserts and furnish detailed layout drawings to other trades in advance of their work.

D. Core drill or saw cut openings in existing masonry construction.

3.03 EXCAVATION, TRENCHING AND BACKFILLING

A. Provide trenching, excavation, backfilling necessary for performance of work, including excavation of rock and all other materials which may be encountered.

B. Grade bottom of trenches evenly and excavate bell holes to insure uniform bearing for the full pipe length. Excavate minimum 6 inches below pipe. Refill cuts below grade with sand.

C. Backfill after inspection by Architect and authorities having jurisdiction. Backfill compacted areas (engineered fill) with sand or fine gravel in accordance with requirements in Division 2. Section "Earthwork" no less than 95% compactancy. Backfill paved areas with sand or fine gravel compacted to meet requirements of Paving Section. Backfill shall be free of rock, wood, steel, brick, etc. Do not disturb pipe.

D. Refer to Division 15, Fire Protection Piping Sections for specific bedding and backfill requirements.

E. Restore existing pavement, curbs, sidewalks, sodding, bushes, etc., matching surroundings.

F. Restore all pavement cuts to meet the requirements of the cuts of the local authority.

3.04 PIPING SYSTEMS INSTALLATION - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 15 Fire Protection Piping Sections specifying piping systems.

B. Drawings, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas and stairwells.

D. Install piping indicated to be exposed and in service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections. No mitering or notching for fittings permitted.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install escutcheons where exposed piping penetrates walls, ceilings, and floors in finished spaces.

3.05 SLEEVES

A. Sleeves are not required for core-drilled holes.

1. In mechanical room floors and other potentially wet areas, provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.

B. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length so that sleeve extends out ½ inch from both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas, or other potentially wet areas, 1-1/2 inches above finished floor level. Caulk space outside of sleeves water tight.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

3. Use the following sleeve materials:

a. Sleeves for Piping Through Concrete Beams, Concrete Walls, Footings, and Potentially Wet Floors: Steel pipe.

b. Sleeves for Piping Through Masonry Walls and Gypsum Board Partitions: Steel sheet sleeves 1/2 inch larger than pipe or pipe covering.

4. Where piping penetrates non-rated equipment room wall, floors or roofs outside of a shaft, close off space between pipe or duct and adjacent work with stuffing insulation and caulk air tight.

5. Above ground, non-rated, exterior wall penetrations: Seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.

6. Provide for continuous insulation wrapping thru sleeve.

7. Seal space around the outside of sleeves with grout at masonry walls and floors and dry wall mud at gypsum board partitions.

C. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

D. Fire-Rated Penetrations: Where pipes pass through fire-rated and fire-resistive floors, walls, and partitions, install appropriately rated sleeves and firestopping sealant. Firestopping materials and installation methods are specified in Division 7 Sections “Through Penetration Firestop Systems” and “Fire Resistive Joint Systems”.

3.06 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 15 Fire Protection Piping Sections specifying piping systems.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

D. Flanged Joints:

1. 125 Pound Cast Iron Flange (Plain Face): Mating flange shall have raised face, if any, removed to avoid overstressing the cast iron flange.

2. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.07 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, and at final connection to each piece of equipment.

2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.08 PIPE CLEANING

A. Keep pipe clean and free of dirt. Keep caps on ends of pipe when it is stored on site and reinstall caps on ends of installed piping at the end of each day.

3.09 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations.

D. Install equipment in accordance with manufacturer's instructions. If manufacturer's instructions conflict with Contract Documents, obtain Architect's decision before proceeding.

E. Install equipment to allow right of way for piping installed at a required slope.

F. All equipment shall be firmly fastened in place:

1. Pad mounted equipment shall be secured to pads using poured in place anchor bolts or cinch anchors.

2. Vibration isolators shall be secured to floors or pads and equipment shall be bolted to the isolators.

3.10 PAINTING AND FINISHING

A. Except as specified below or noted on the Drawing, requirements for painting of Fire Protection systems, equipment, and components are specified in Division 9 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

C. Painting of fire piping:

1. The following piping within boiler and chiller room shall be painted in its entirety under Division 9: Painting. Color codes are listed here for information only.

   a. Fire Protection Piping: Red Metaltex B47R3.

2. Should there be a conflict of colors in existing installations, contact the Architect.

3.11 CONCRETE BASES

A. Provide concrete foundations with nominal dimensions conforming to the following schedule for floor-mounted equipment:

Equipment	Foundation
Equipment and piping stands and supports	4” high pad
Equipment located in equipment rooms, not listed above	4” high pad or as indicated on the Drawings

B. Concrete bases shall be continuous and shall have beveled edges and smooth float finish. Concrete bases shall be reinforced with No. 3 bars a maximum of 12” on center each way, and held in place with dowel rods at each corner anchored in the slab. Dowel rods shall not penetrate through the slab.

C. Roughen and clean exposed slabs before pouring foundations. Apply bonding agent to surfaces in contact.

D. Concrete pads shall extend a minimum of 4” beyond the equipment footprint in all directions, including appurtenances, vibration isolators, base elbow supports, and motors.

E. Equipment attached directly to foundations or inertia bases; bases provided with grout holes; and bases consisting of a structural frame shall have voids filled with grout after attachment to foundation.

F. Fill voids between baseplates and foundations, and level equipment, with grout.

3.12 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 5 Section "Metal Fabrications" requirements.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing and fire protection materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.13 GROUTING

A. Mix and install grout for Fire Protection equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

3.14 ACCESS DOORS – BUILDING

A. Provide access doors in wall and inaccessible ceilings to allow access to service and maintain concealed Plumbing equipment, valves, etc.

B. Coordinate installation of access doors with Divisions responsible for Building System in which panels are being installed.

3.15 FLASHING

A. Provide flexible flashing and metal counterflashing where pitch cups and piping penetrate weather or waterproofed walls, floors and roofs.

3.16 PROTECTION AND CLEANING OF EQUIPMENT, FIXTURES, AND MATERIALS

A. Equipment and materials shall be carefully handled, properly stored, and protected from weather, dust-producing procedures, or damage during construction.

B. At completion of all work, thoroughly clean exposed materials (pipe, etc.) and equipment and make ready for painting.

END SECTION 15453

SECTION 15455 - FIRE PROTECTION SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Pipe, Fittings, Valves for:

1. Service from the water main to the building.

2. Wet sprinkler system.

B. System design and installation. Base system design hydraulic calculations using the area/density method on the following criteria and in accordance with NFPA 13 latest edition.

1. Sprinkler Protection:

a. All sleeping, office, waiting areas, educational areas, dining areas, corridors and attics: Light hazard, 0.10 gpm/sq. ft. over the hydraulically most remote 1500 sq. ft.

b. Kitchen, Mechanical Equipment Rooms, Transformer Rooms, Electrical Switchgear Rooms, Electric Closets, Elevator Shafts (if required), Elevator Machine Rooms, Refrigeration Service Rooms, and storage between 100 and 250 sq. ft.: Ordinary Hazard, Group 1, 0.15 gpm/sq. ft. over the hydraulically most remote 1500 sq. ft.

c. Storage rooms, storage rooms over 250 sq. ft., boiler plants, loading docks, and energy centers: Ordinary Group 2, 0.20 gpm/sq. ft. over the hydraulically most remote 1500 sq. ft.

d. Supply Areas with storage limit less than 12 ft. high: Ordinary Hazard Group 2. Storage height exceeding 12 ft., per NFPA 13 latest edition.

e. Provide sprinklers in accessible shafts per NFPA 13 latest edition.

2. Add water allowance of 250 gpm for inside and outside hose streams to the sprinkler requirements at the connection to the distribution main.

3. Hydraulic Calculations: The calculated demand including hose stream requirements shall fall no less than 10 percent below the available supply curve.

4. Comply with IBC, NFPA 13, NFPA 30, Flammable and Combustible Liquid Code, NFPA 45, Standard on Fire Protection for Laboratory Using Chemicals, NFPA 54, National Fuel Gas Code, NFPA 58, Liquefied Petroleum Gas Code, NFPA 70, National Electric Code, NFPA 72, National Alarm and Signaling Code, and NFPA 101, Life Safety Code.

1.1 RELATED SECTIONS

A. Section 15405 – Plumbing Identification.

B. Section 15451 – General Fire Protection Requirements.

C. Section 15453 – Basic Fire Protection Materials and Methods.

1.2 SYSTEM

A. A wet sprinkler system providing coverage for the entire fire station.

B. Fire service from approximately 5ft outside the building to inside the building.

1.3 SUBMITTALS FOR REVIEW

A. Submit under provisions of Division 1, Section “Submittal Procedures” and the following:

B. Product Data: Submit to the Architect and obtain his approval of a complete list of materials and equipment which are to be furnished under Division 15.

1. List shall be complete with manufacturer’s names, catalog number, dimensions, specifications, rating data and options utilized. Capacities shall be in the terms specified.

2. Call attention to deviations from specified items as to operation and physical dimensions.

3. Performance curves for equipment such as pumps shall be included.

4. Final equipment orders shall not be placed until submittals have been returned marked “No Exceptions Noted” or “Make Corrections Noted”.

5. Bind all equipment submittals and provide index tab for each type of equipment. Submit all at one time. Reserve two sets for project close-out documents.

C. Shop Drawings: (Wet Sprinkler)

1. A reflected ceiling plan indicating locations of sprinkler heads, lights, HVAC devices, smoke detectors, exit lights and any additional items attached to ceiling. In lift out ceilings, sprinkler heads are to be centered in ceiling tiles. In hard ceilings, sprinkler heads to follow the general arrangement of the ceiling. After review by the Architect, revise layout as required.

2. Prepare a working pipe shop drawing based on hydraulic calculations. The piping shop drawing shall indicate routing and configuration of piping, size of pipe, piping support, elevation of piping and coordination of piping with ductwork. Shop drawings shall include low point drain downs.

3. Hydraulic calculations are to be prepared utilizing a current water flow test (maximum 90 days old). If current flow test is not available, obtain a current flow test and pay for all fees required.

4. If water flow information is not available due to new main extension or other construction which prohibits the availability of flow information at the start of construction, the contractor shall estimate probable flow information based on information available. Once permanent water is available at the site, the Contractor shall perform a flow test, incorporate the information into the calculation and make any modifications to the system as may be required.

5. When drawings and hydraulic calculations are submitted to the Engineer for review, they shall bear the seals of Nicet Level 3 Designer, review and approval of the Architect, General Contractor and the Owners Insurance Underwriter. Note: Nicet designer shall be an employee of the Fire Protection Contractor.

6. The Contractor shall incorporate all comments for approval by local Fire Marshall's Office and any State of Alabama Reviewing Agency. Contractor shall provide signed, sealed and approved set of plans to Engineer upon approval by state and local authorities.

1.4 SYSTEM INSTALLATION AND INSPECTION

A. Required Inspections:

1. All underground and above ground fire line piping must be inspected by a Fire Inspector prior to being covered or concealed.

B. Fire Stopping:

1. All fire stopping of any and all fire rated assemblies must be inspected and approved by a Fire Inspector prior to the work being concealed.

C. Hydrostatic Testing Requirements:

1. The required hydrostatic testing of the underground and above ground fire line piping must be witnessed and approved by an Fire Inspector prior to being covered or concealed.

D. Underground Fire Line Pipe Flush Test Requirements:

1. The required flush test of the underground fire line piping must be witnessed by an Fire Inspector prior to being connected to the above ground piping or riser.

E. Acceptance Inspections & Testing:

1. Allow fire protection and life safety systems installation and acceptance test must be inspected, test, witnessed and approved by an Fire Inspector before the system can be accepted by the University.

F. Plans Review & Approval:

1. All fire protection and life safety system drawings and specifications must be reviewed by this office to ensure code compliance prior to start of any work.

G. RMS Inspection Schedule Notification:

1. Provide a minimum one week notice of all inspections.

1.5 REGULATORY REQUIREMENTS

A. Materials: Conform to UL and FM Global Requirements and Standards.

B. Sprinkler System: Conform to NFPA 13, State of Alabama Fire Marshall Requirements and, City of Glencoe Fire and Rescue Requirements.

C. Private Service Mains: Conform to NFPA 24.

D. NFPA 25, Inspections, Testing and Maintenance of Water-Based Fire Protection Systems.

E. NFPA 72, Standard for the Installation, Maintenance and Use of Protective Signaling Systems.

F. NFPA 72E, Standard on Automatic Fire Detectors.

G. NFPA 75, Standards for the Protection of Technology Equipment.

H. Applicable Building Codes.

I. Welding Materials and Procedures: Conform to ASME Code.

J. Valves: Bear UL, FM label or marking. Provide manufacturer’s name and pressure rating marked on valve body.

K. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

1.6 EXTRA MATERIALS

A. Provide extra sprinklers under provisions of NFPA 13, State and Local requirements.

B. Provide suitable wrenches for each sprinkler type.

C. Provide metal storage cabinet in location designated. (Designate location).

PART 2 - PRODUCTS

2.1 PIPING BELOW GRADE AND BELOW SLAB ON GRADE

A. Ductile Iron: Cement lined ANSI A-21.50.

B. Joints on Ductile Iron: Standard mechanical joint ANSI A-21.11. Provide with retainer glands at all fittings and thrust blocks minimum 1 cubic yard of concrete at all changes of direction.

2.3 WET SPRINKLER SYSTEM

A. Wet System - Above Ground Piping:

1. Black Steel Pipe:

a. All piping 1-1/2” and smaller, all piping larger than 1-1/2” with cut grooves on threaded and all welded piping, Schedule 40 black steel ASTM A53, ASTM A795, ASTM A135.

b. Piping larger than 1-1/2” for roll grooving only, Schedule 10 ASTM A795, ASTM B36.10. Schedule 10 pipe may not be used for threading or cut grooving.

c. Cast iron threaded fittings ANSI B16.4 cast iron flanges and flanged fittings ANSI B16.1.

d. Malleable iron threaded fittings, ANSI B16.3.

e. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, “C” shaped elastomeric sealing gasket, steel bolts, nuts and washers; galvanized for galvanized pipe.

f. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement into pipe.

g. Malleable Iron Fittings 175 lb. (250 lb.); ASME B16.3, threaded fittings.

2. Copper Tubing: ASTM B75; ASTM B88; Type K, hard drawn.

a. Fittings: ASME B16.22, wrought copper and bronze, solder joint, pressure type.

b. Joints: AWS A5.8 Classification BCuP-3 or BCuP-4 silver braze.

2. Copper Tubing: ASTM B75; ASTM B88; Type K, hard drawn.

a. Fittings: ASME B16.22, wrought copper and bronze, solder joint, pressure type.

b. Joints: AWS A5.8 Classification BCuP-3 or BCuP-4 silver braze.

3. All piping shall be pitched to drain down at low points. Low point shall be at sanitary drains at Mechanical Rooms only. Note: Unless approved by Owner / Engineer.

C. Sprinklers - Wet System:

1. Sprinklers to be UL approved glass bulb quick response type.

2. Suspended Ceiling (Layin and Gypsum):

a. Manufactures:

1) Viking Model M.

2) Tyco, Reliable, Victaulic.

b. Type: Quick response concealed pendant type with painted cover plate.

c. Cover Plate: White. Unless indicated otherwise. Provide color chart to Architect for color selection.

d. Finish: Sprinkler Head – chrome plated.

e. Fusible Link: Glass bulb type temperature rated for specific area hazard.

4. Exposed Area Type:

a. Manufactures:

1) Viking Model M.

2) Tyco, Reliable, Victaulic.

b. Type: Quick response upright type with guard.

c. Finish: Brass or chrome plated.

d. Fusible Link: Glass bulb type temperature rated for specific area hazard.

e. Guards: Finish to match sprinkler finish.

D. Pipe Hangers and Supports:

1. Conform to NFPA 13.

2. Hangers for Pipe Sizes ½ to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.

3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.

4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.

7. Vertical Support: Steel riser clamp.

8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

9. Copper Plate Support: Carbon steel ring, adjustable, copper plated.

10. All hangers to be a maximum of 12 inches from the end of a branch line or an arm-over for drop.

E. Gate Valves:

1. Up to and including 2 Inches:

a. Manufactures:

1) Nibco Model T-104-O.

2) Where Nibco is listed, Victaulic, Stockham, Watts, Tyco and Milwaukee are equal.

b. Bronze body, bronze trim 175 psi WP, UL Listed, rising stem, handwheel, solid wedge or disc, threaded ends.

2. Over 2 Inches:

a. Manufactures:

1) Nibco Model F-607-OTS.

2) Where Nibco is listed, Victaulic, Stockham, Watts, Tyco and Milwaukee are equal.

b. Iron body, bronze trim 175 psi WP, UL Listed, rising stem pre-grooved for mounting tamper switch, handwheel, OS&Y, solid bronze or cast iron wedge, flanged or grooved ends.

F. Butterfly Valves:

1. Cast or Ductile Iron Body

a. Manufactures:

1) Nibco Model GD-4765-4/8.

2) Where Nibco is listed, Victaulic, Stockham, Watts, Tyco and Milwaukee are equal.

2. Cast or ductile iron, chrome or nickel plated ductile iron or aluminum bronze disc, resilient replaceable EPDM seat, lug, or grooved ends, extended neck, handwheel and gear drive and integral indicating device, and internal tamper switch rated, UL / FM approved.

G. Check Valves:

1. Up to and including 2-1/2 inches to 6 inches:

   a. Manufacturers:

      1) Nibco Model G-917-W.

      2) Where Nibco is listed, Victaulic, Stockham, Watts, Tyco and Milwaukee are equal.

   b. Iron body and swing disc, bronze seat, stainless steel spring, grooved ends, 175 psi WP.

2.4 EQUIPMENT

A. Water Flow Switch:
   1. System sensor pressure activated detector. Potter, Viking, and Tyco are acceptable manufacturers.

B. Pressure Switch:
   1. System sensor WFD water flow detector. Potter, Viking, and Tyco are acceptable manufacturers.

C. Supervisory Switches:
   System sensor OSY2 Model tamper detector. Potter, Viking, and Tyco are acceptable manufacturers.

D. Test and Drain Assembly:
   1. Viking Model A-1 complete with sight glass and ½" orifice for test purpose. Pipe discharge to drain riser on to exterior and spill on splash block.

      Tyco, Victaulic, and Reliable are acceptable manufacturers.

E. Alarm Check Valve:
   Viking J-1 Easy Riser Alarm Check Valve with Vertical Trim. Install complete with Trim Kit. Valve to have 300psi working Pressure. Viking, and Tyco are acceptable manufacturers.

2.5 FIRE STOP SYSTEMS

A. All wall and floor penetrations are to be closed. Refer to the Arch. Life Safety Plans and close all openings with a U.L. listed assembly compatible with the rating of the wall or floor being penetrated.

B. Non-rated walls – sheet rock joint compound may be used to seal opening.

C. For piping passing through listed sheet rock walls or partitions:

   1. Uninsulated pipe passing through 2 hour walls or partitions – minimum 5/8" depth of Hilti FS 605 filling annular space between wall and pipe on both sides of wall. U.L. Listing #WL1056.

2. Uninsulated pipe passing through 2 hour walls or partitions – minimum 1-1/4" depth of Hilti FS 601 filling annular space between pipe and wall on both sides of wall, U.L. Listing #WL1054.

D. For piping passing through concrete floors, concrete walls or concrete block walls.

1. Uninsulated Schedule 40 steel pipe; fill annular space between pipe and opening with Hilti #FS 605. U.L. Listing #CJ1184.

PART 3 - EXECUTION

3.1 PREPARATION

A. Install piping in accordance with NFPA 13 for sprinkler systems, NFPA 24 for service mains.

B. Connect to site fire service installed under another section. Verify the site with civil drawings for the exact size and location of the service prior to beginning work.

C. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

D. Install piping to conserve building space, to not interfere with use of space and other work.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Inserts:

1. Provide inserts for placement in concrete formwork.

2. Provide inserts for suspending hangers form reinforcement concrete slabs and sides of reinforced concrete beams.

3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

H. Pipe Hanger and Supports:

1. Install in accordance with NFPA 13 and NFPA 14.

2. Hangers on branch lines to comply with NFPA 13, 9.2.3.

3. Hangers on mains to comply with NFPA 13, 9.2.4.

4. All hangers to be a maximum of 12 inches from the end of a branch line or an arm-over for a drop.

5. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.

6. Where several pipes can be installed in parallel and at same elevation, provide multiple trapeze hangers may be used.

7. Provide copper plated hangers and supports for copper piping.

8. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.cast inserts. The Contractor shall provide, layout, and install these inserts prior to placement of concrete.

I. Slope piping and arrange systems to drain at low points.

J. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coast of zinc rich primer to welding.

K. Do not penetrate building structural members unless indicated.

L. Provide sleeves when penetrating floors and wall. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.

M. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.

N. Die cut threaded joints with full cut standard taper pipe threads and connect with Teflon tape or Teflon pipe compound applied to male threads.

O. Install valves with stems upright or horizontal, not inverted.

P. Provide valves for shut-off or isolating service and where shown on plans.

Q. Provide drain valves at main shut-off valves, low points of piping and apparatus.

R. Install piping in attic directly on top of joists. Install plastic sheeting over top of pipe and secure joists. Insulation to be installed over pipe and plastic sheeting.

END OF SECTION 15455

SECTION 15000- TABLE OF CONTENTS HVAC

END OF TABLE OF CONTENTS - HVAC

SECTION 15010 – GENERAL PROVISIONS-HVAC

PART 1 - GENERAL

1.01 SCOPE

A. HVAC means Heating, Ventilation and Air Conditioning.

B. Provisions of this Section apply to all HVAC and Control work.

C. Include the provisions of General, Supplementary and Special Conditions and provisions of the Specifications shall apply to and form a part of this Section.

D. Provide all labor, materials, equipment, and services necessary for the completion of all HVAC work shown or specified, except work specifically specified to be done or furnished under other sections of the Specifications. Include performing all operations in connection with the complete HVAC installation in strict accordance with the specification and applicable drawings subject to the terms and conditions of the Contract.

E. Give required notices, file drawings, obtain and pay for permits, deposits and fees necessary for the installation of the HVAC work. Obtain and pay for inspections required by laws, ordinances, rules, regulations or public authority having jurisdiction. Obtain and pay for certificates of such inspections, and file such certificates with Owner.

F. "Provide" means to furnish and install, complete and ready for operation.

G. All equipment shall be U.L. or E.T.L. Listed as an assembly.

1.02 DRAWINGS

A. HVAC Drawings are diagrammatic and subject to requirements of Architectural Drawings. HVAC Drawings indicate generally the location of components and are not intended to show all fittings or all details of the work. Coordinate with Architectural, Structural, Electrical, Plumbing and other Building Drawings.

B. Follow the Drawings closely, check dimensions with Architectural Drawings and field conditions. DO NOT scale HVAC Drawings for location of system components.

C. Make no changes without Architect's written permission. In case of doubt, obtain Architect's decision before proceeding with work. Failure to follow this instruction shall make the Contractor liable for damage to other work and responsible for removing and repairing defective or mislocated work.

D. Do not scale Drawings to locate ceiling diffusers. Coordinate with lighting, ceiling grids and/or reflected ceiling plans.

1.03 APPLICABLE CODES AND STANDARDS

A. Comply with the current editions of the following Codes and Standards:

1. ANSI/ASHRAE 15 - Code for Building Services Piping.

2. ANSI B9.1 - Safety Code for Mechanical Refrigeration.

3. NFPA 70 - National Electrical Code.

4. NFPA 90A - Air Conditioning and Ventilating Systems.

5. NFPA 91 - Blower and Exhaust Systems.

6. NFPA 101 - Life Safety Code.

7. Other Standard as referenced in other Sections of Divisions 15.

8. Local Building Code (International Building Code if no local Building Code in effect).

9. Local Plumbing Code (International Plumbing Code if no local Plumbing Code in effect).

10. Local Gas Code (International Gas Code if no local Gas Code in effect).

11. Local Mechanical Code (International Mechanical Code if no local Code in effect).

1.04 QUALIFICATIONS OF SUBCONTRACTOR

A. The HVAC Contractor shall meet the following qualifications:

1. The HVAC Contractor must be approved by the Architect.

2. The HVAC Contractor shall have been in business as a HVAC Contractor for at least three (3) years prior to Bid Date.

3. The HVAC Contractor shall have a satisfactory experience record with HVAC installations of character and scope comparable with this project and have completed five projects of the same cost (or more) as the cost of this project, and for at least three (3) years prior to the Bid Date shall have had an established service department capable of providing service inspection or full maintenance contracts.

4. Contractor must have bonding capacity for project of this size and must bond the project.

1.05 CONFLICTS AND INTERFERENCES

A. If systems interfere or conflict, the Architect shall decide which equipment to relocate regardless of which was first installed.

1.06 WORKMANSHIP

A. Do all work in a neat and first-class manner. Remove and replace work not done in such manner as directed by the Architect.

1.07 COOPERATION

A. Cooperate with all other crafts. Perform work in a timely manner. Do not delay the execution of other work.

1.08 VISITING SITE

A. Visit site and become familiar with location and various conditions affecting work. No additional allowance will be granted because of lack of knowledge of such conditions.

PART 2 - PRODUCTS

2.01 MATERIALS, SUBSTITUTIONS AND SUBMITTALS

A. Unless otherwise noted, provide new, standard, first-grade materials throughout. Equipment and materials furnished shall be fabricated by manufacturer regularly engaged in their production and shall be the standard and current model for which replacement parts are available. HVAC equipment shall be substantially the same equipment of a given manufacturer which has been in successful commercial use and operation for at least three (3) years.

B. Where materials or products are specified by manufacturer's name, brand, trade name, or catalog reference, such named materials or products shall be the basis of the Bid, without substitution, and shall be furnished under the Contract unless requests for substitutions are approved as noted below. Where two or more brands are named the choice of these shall be optional with the Contractor.

C. Substitutions will be considered only if written request for approval has been received by the Architect ten (10) days prior to the date established for receipt of Proposals. Each request shall include the name of the material or equipment for which substitution is proposed, specification section/paragraph number and a complete description of the proposed substitute including drawings, cuts, performance and test data, samples and any other information necessary for evaluation. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the substitute may require shall be included. The burden of proof of the merit of the proposed substitute is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution is final.

D. If the Architect approves any proposed substitution prior to receipt of Proposals, approval will be set forth in an Addendum. Do not rely upon approvals made in any other manner. Prior approval to be secured for "equal" or "approved equal" manufacturer.

E. No substitutions will be considered after the Contract has been executed, except as described in the General Conditions.

F. Submittal data and shop drawings, except controls, shall be submitted at one time, partial submittals will not be considered. Provide submittal in three (3) ring binders with tab sheets for each major item of equipment. Before ordering materials and equipment, submit to Architect and obtain his approval of a detailed list showing each item which is to be furnished by make, trade name, catalog number, or the like; together with manufacturer's specifications, certified prints, and other data sufficient for making comparisons with items specified. When approved, such schedule shall be of equal force with these specifications in that no variation there from shall be allowed except with Architect's written approval. Number of Shop Drawings and procedure shall be as directed by the Architect.

G. Architect and / or Engineer's approval of submittal data does not relieve the contractor of his responsibility to comply with the contract documents.

H. It is the responsibility of the Mechanical contractor to coordinate all Electrical requirements of the submitted equipment with the Electrical contractor. Any increase in cost due to a variance between the contract documents and the submitted equipment shall be the responsibility of the Mechanical Contractor.

I. All pressure vessels shall be constructed and tested in accordance with applicable ASME Codes and shall bear ASME stamps. Certificates of inspection and approval shall be submitted to Architect.

J. Similar items of equipment shall be the product of the same Manufacturer.

K. See section, "ALTERNATES" in other section of the Specifications and Bid accordingly.

2.02 SHOP DRAWINGS

A. Before starting work, submit and obtain approval of detailed drawings of the following, fully dimensioned (including elevations of ductwork and piping) and drawn not less than 1/4"= 1'-0" scale. Submit one (1) set of paper or bond.

1. Ductwork (do not scale diffuser locations, coordinate with ceiling grids and lighting layout). See Section 15860 "DUCT ACCESSORIES".

2. Plenum casings.

3. Complete mechanical equipment and fan room plans showing location of equipment, conduit stubs for motors, floor drains, and equipment pads and foundations.

4. Equipment piping.

B. Submit complete control and power wiring diagrams for approval before installing controls. See Section 15900 "CONTROLS".

2.03 RECORD DRAWINGS

A. When work starts, obtain white prints of the HVAC Drawings. All corrections, variations, and deviations, including those required by change orders, if any, must be recorded in colored ink or colored pencil at the end of each working day on these drawings. The marked prints shall be available at all times for the Architect's inspection.

B. Prior to examining the request for final payment or making any response thereto, the Architect shall receive from the Contractor one (1) complete set of the white prints, marked as stated above, indicating the actual completed installation of the work included under this Contract.

C. The Architect will forward the marked white prints to the Consulting Engineers for review. They will then be returned by the Architect to the Contractor for use in preparing record drawings.

D. When work is completed Contractor shall purchase from the Architect (At Architects' printing cost) one (1) set of mylar reproducible prints of HVAC Drawings for use in preparing record drawings. Contractor shall transfer the information from the marked white prints to the mylar record drawings, removing all superseded data in order to show the actual completed conditions.

1. Accurately shown location, size and elevation of new exterior piping work and its relationship to any existing piping and utilities, obstructions, etc., contiguous to the area of work.

2. Block out areas modified by change-order and identify them by change-order number.

E. Ductwork and Control Drawings may be a set of mylar reproducible shop drawings, up-dated to show actual conditions at completion of work.

2.04 MOTORS, STARTERS AND ELECTRICAL EQUIPMENT:

A. Provide electrical equipment compatible with the current shown on electrical drawings. Verify current characteristics before ordering equipment.

B. Should the Contractor with the Architect's approval make changes in electrical equipment from those shown on the Electrical Drawings, he shall be responsible for the coordination and cost of required changes.

C. Provide factory installed fuses in all equipment requiring fusing for branch circuit protection.

D. Motors:

1. 1750 RPM open drip-proof construction unless otherwise shown or specified. Integral horsepower three phase motors shall be of premium energy-efficient design with apparent efficiency (power factor X efficiency) not less than ASHRAE 90.1.

2. All motors served by variable frequency drives (VFD's) shall be inverter duty rated.

3. Unless shown otherwise motors less than 1/2 HP shall be single phase, motors 1/2 HP and larger shall be three phase.

4. Allis-Chalmer, General Electric, Goulds, Louis Allis, and Westinghouse.

E. Do not run motors until correct overload elements are installed in starters. Trading overload elements for elements of correct size for motors actually furnished shall be included in this Section.

F. Starters shall be in motor control centers, furnished mounted on packaged equipment or furnished in this section and installed under "ELECTRICAL SECTION" as indicated and/or shown on the Electrical Drawings. All starters furnished with fused control circuit transformers.

G. Starters shall be equipped with melting alloy terminal overload protection, in a 3 phase. Starters, unless indicated otherwise, shall be across-the-line type with overload and low voltage protection. Starting equipment shall comply with local utility company requirements.

H. Starters to be Square "D", Allen-Bradley, Cutler-Hammer or approved equal.

I. For single phase motors provide manual starters equal to Square "D" Class 2510. When installed in equipment rooms provide surface mounted enclosure, and when installed in finished walls outside equipment rooms provide flush mounted enclosure, key operated.

J. For three phase motors provide magnetic line voltage starters with NEMA I enclosures and melting alloy overload elements.

K. Provide non-fused combination magnetic line voltage starters with NEMA I enclosures and melting alloy overload protection.

L. Provide H-O-A switches, fused control circuit transformers, auxiliary contacts, etc., as shown on control diagrams or required by control sequences and/or arrange for these items to be furnished with the starters or motor control centers specified in Electrical Work.

M. All starters shall be by the same manufacturer.

N. Provide thermal overload with equipment for motors 1/2 HP and less at 120/1/60.

2.05 SLEEVES

A. For pipe through floors inside rated chases or through non-fire-rated walls: 20 gauge galvanized steel, 1/2" larger than pipe or covering.

B. For uninsulated pipe through fire rated walls or partitions or floors outside chases: Pipe Shields, Inc., Model WFB or approved equal at walls, Model DFB at floors.

C. For insulated pipe passing through fire rated partitions or walls or floors outside chases: Pipe Shields, Inc., Model WFB-CS for hot lines, VFB-CS-CW for cold lines. Insulation: Calcium silicate for hot lines and foamglass for cold lines, thickness specified for adjacent pipe covering.

D. For pipe through concrete beams: Schedule 40 black steel pipe, 1/2" larger than pipe or covering. Pipe covering passing through sleeve: calcium silicate in a 24 gauge galvanized steel shield similar to Pipe Shields, Inc. thermal hanger shield. Caulk space between bare pipe insulation jacket and beam with fire retardant rope at both ends of the sleeve and seal with 3M Brand fire barrier caulk CD 25 or Putty 303, thickness and application in strict accord with manufacturer's recommendations, minimum thickness 1".

E. At Contractor's option, instead of the factory fabricated sleeves specified above for pipe passing through floors and fire rated walls and partitions substitute 20 gauge galvanized steel sleeve 1/2" larger in diameter than pipe or pipe covering and seal one end of sleeve (both ends if both ends are exposed) with 3M Branch Fire Barrier Caulk CP25 or Putty 303, thickness and application in strict accord with manufacturer's recommendations, minimum thickness 1". Where pipe is insulated, insulation shall be continuous thru sleeve, calcium silicate for hot lines and foamglass for cold lines. In exposed areas, after product has dried it shall be sanded smooth for painting under painting section.

F. Set sleeves before concrete is poured or masonry is erected. In existing construction, grout sleeves firmly in place.

G. Sleeves for ducts: See Fire Dampers (See Section 15860 "DUCT ACCESSORIES").

H. Extend sleeves 1-1/2" above finish floor and waterproof.

I. Where exposed ducts pass through walls and partitions, provide 4" wide 20 gauge galvanized steel closure plates except at grilles and registers. Fit closure plates snugly to duct and secure to wall. Grout around ducts and sound absorbers at equipment room walls.

J. Where exposed pipes pass through walls and partitions in finished spaces, provide chrome plated F & C plates or escutcheons.

2.06 ACCESS DOORS

A. Doors in non-fire rated walls and ceilings: 17-gauge steel with hinges and screwdriver latches, Bilco, Milcor, Miami-Carey, or equal. Doors in fire rated walls and ceilings: UL labeled with fire rating equal to fire rating of wall or ceiling. Provide door styles compatible with adjoining surfaces as selected by Architect. Size doors to permit removal of equipment and/or maintenance, minimum size 18" X 18".

B. Mark lay-in ceilings with paper brads at maintenance access points. Bend ends of brads over above ceiling tile.

PART 3 - EXECUTION

3.01 PROTECTION OF ROTATING PARTS

A. Equip exposed belt drives with belt guards with holes for measuring speeds of driven shafts.

B. Provide exposed couplings with coupling guards.

C. Equip propeller fans with guards.

D. Equip inlets and outlets of open centrifugal fans with 1-1/2" #10 Diamond mesh galvanized steel screens.

E. All motors or other equipment exposed to weather shall be provided with weatherproof covers.

3.02 PROTECTION OF EQUIPMENT

A. During construction, protect mechanical equipment from damage or deterioration.

B. When installation is complete, clean equipment and make ready for painting.

C. During construction all ductwork, piping, and equipment shall be stored in a clean/dry location. Any ductwork or piping stored outside that is not protected shall be removed from the job site. Installed ductwork and piping shall have open ends covered at the end of each work day to prevent dust, dirt, and water from entering the ductwork and piping.

3.03 INSTALLATION OF EQUIPMENT

A. Install equipment to provide normal service access to all components.

B. Provide sufficient space for removing components, install equipment to provide such clearance.

C. Install equipment in accordance with manufacturer's instructions. If manufacturer's instructions conflict with contract documents, obtain Architect's decision before proceeding.

D. All equipment shall be firmly fastened in place:

1. Roof curbs shall be secured to deck and structure and curb mounted items shall be secured to curbs.

2. Pad mounted equipment shall be secured to pads using poured in place anchor bolts or cinch anchors.

3. Vibration isolators shall be secured to floors, pads or structure and equipment shall be bolted to the isolators.

3.04 EQUIPMENT SUPPORTS

A. Provide supports for ductwork, piping and equipment. Hot dip galvanize after fabrication all grillage, supports, etc., located outdoors.

B. Set all floor-mounted equipment, other than condensate pumps, on concrete pads or rails (as indicated of height shown, but not less than 4" high). Coordinate pad height with condensate drain trap requirements. Chamfer rails and pads 1". Where shown, provide reinforced floating pads mounted on vibration isolators. Form, reinforce and pour any pads and rails required but not shown on Structural and Architectural Drawings.

3.05 CUTTING AND PATCHING

A. Set sleeves and inserts and lay-out and form openings in walls, beams, girders and structural floors in this Section.

B. Cut, patch and repair as required to accomplish HVAC Work and finish to match adjacent work. Architect's approval required before cutting any part where strength or appearance of finished work is involved.

3.06 INCIDENTAL WORK

A. Provide all motors incidental to the Mechanical Systems. Wiring of motors, switches and starters is included in "ELECTRICAL SECTIONS".

B. Do all control wiring required for Mechanical work.

C. Provide motor starters as specified above.

D. Submit refrigerant piping diagrams as prepared by the HVAC Contractor and/or refrigeration equipment manufacturer for approval.

E. Final water connections to services are included in this Section.

F. Permanent drain connections for AC units, etc., and auto air vents to nearest floor drain are included in this Section.

G. Door louvers are not included in this Section.

H. Items obviously omitted from drawings and/or specifications shall be called to attention of the Architect prior to submitting Bid, after award of Contract any changes or rearrangements necessary to complete Contract shall be at no additional cost to Owner.

I. All return air and exhaust air grilles shall be covered with filter media if they are started and operated during construction.

3.07 FLASHING

A. General: Furnish all fans curbs, pitch cups, metal base flashing and counter flashing required for HVAC Work. Installation of above items is specified in "ROOFING SECTION" with coordination by HVAC Contractor.

B. Fan curbs for power roof ventilators are specified with the fans.

C. Pitch Cups: 20 gauge galvanized steel, at least 8" deep, bases mitered and soldered and extending at least 4" horizontally.

D. Metal Base Flashing: Galvanized steel for ferrous items, and stainless steel for stainless steel duct and aluminum for aluminum duct. Minimum thickness 22 gauge (0.034") galvanized steel, 20 gauge (0.038") stainless steel, 0.032" aluminum. Bases mitered and soldered extending out at least 4" horizontally and 8" vertically.

E. Metal Counter Flashing: Of material and gauges specified for base flashing, lapping base flashing at least 3".

3.08 EXCAVATION AND BACKFILLING

A. Include all excavation and backfilling required to bring the work to line and grade shown, including excavation of rock and all other materials which may be encountered.

B. Excavate trenches wide enough for proper installation of work. Grade trench bottoms evenly. Provide bell holes as necessary to insure uniform bearing for pipes. Excavate minimum 6" below pipe. Refill cuts below required pipe grade with sand or compacted gravel. Support pipe continuously along its entire length. Do not use piers to support piping.

C. Backfill after inspection by Architect and authorities having jurisdiction. Backfill compacted areas with "Engineered Fill", sand or fine gravel in accordance with requirements of "Sitework". Backfill paved areas with sand or fine gravel compacted to meet requirements of Paving Section. Backfill shall be free of rock, wood, steel, brick, etc. Do not disturb pipe. Restore or repair pavements and the like after backfilling, matching adjacent work.

3.09 HVAC INSTALLATION OF AND CONNECTIONS TO ITEMS FURNISHED BY OTHERS OR SPECIFIED IN OTHER SECTIONS

A. Clothes Dryers: Provide vents.

B. Duct Mounted Smoke Detectors: Install in duct.

C. Domestic Water Heaters: Provide gas flues and combustion air vents.

3.10 PAINTING

A. Refinish equipment damaged during construction to new condition.

B. Paint all non-potable water pipe and insulation yellow in accordance with Plumbing Code using paint of type specified in Painting Section.

C. Paint un-insulated duct surfaces visible through grilles and registers flat black.

D. Other painting is specified in "PAINTING SECTION, Finishes Division".

3.11 PIPE IDENTIFICATIONS

A. Identify all piping exposed to view or accessible through removable ceilings or access panels with plastic snap-on pipe line markers. Color code markers in accordance with ANSI A13.1. Show pipe contents and direction of flow. Markers on lines 8" OD and smaller shall be taped in place; on lines over 8" OD secure with spring clips.

B. Submit samples of all labels, tags, stencils, chains, etc., for approval.

C. Protect all factory identification tags, nameplates, model and serial numbers, stenciling, etc., during construction and replace if damaged.

D. Label Spacing and Extent:

1. On straight run of pipes; Above suspended ceilings space labels approximately 10 feet on center; elsewhere, 20 feet on center.

2. Wherever a pipe enters or leaves a room or building.

3. At change of direction.

4. At main valves and control valves (not equipment valves).

5. On risers, just above and below floors.

3.12 EQUIPMENT IDENTIFICATIONS

A. Provide 2" X 3" or larger laminated plastic nameplates with 1/2" numbers and letters in colors specified below. Screw tags to equipment in obvious locations. Engrave equipment designation and numbers as shown on plans and drawings on upper half of tags, leaving lower half of tag for future engraving by Owner.

B. Provide similar nameplates for motor starters furnished under this section.

C. Secure nameplates with acorn head screws.

D. Colors:

1. Equipment connected to utility power only - black letters on white nameplates.

2. Equipment connected to emergency power - red letters on white nameplates.

E. In existing building replace all existing nameplates which do not comply with above colors.

3.13 EXHAUST FAN IDENTIFICATIONS

A. 2" X 3" or larger laminated plastic nameplates with red letters and numbers on white background, identifying type of fans, number according to plans, and rooms served. Engrave on upper half of tag, leaving lower half for engraving by Owner. Fasten with acorn head screws.

3.14 ACCESS DOORS

A. Provide access doors for valves, fire dampers, dampers, controls, air vents, and other items located above non-lift-out ceilings or behind partitions or walls.

3.15 USE OF HVAC SYSTEM DURING CONSTRUCTION

A. Ducted HVAC systems may be used during construction as long as the following conditions are met:

1. All AC units shall have filters installed in the AC units that are equal to the filters that are scheduled for each piece of equipment. The contractor shall be responsible for changing the filters in all AC units during construction at a minimum of every 30 days starting from the day the AC units are started. At the completion of the project, the contractor shall replace all filters.

2. All return air and outside air openings shall be protected with temporary filter media. The temporary filter media shall be changed by the contractor. Temporary filter media is required to protect the installed ductwork. During or after construction, if any ductwork is observed without temporary filter media, the contractor shall be solely responsible for cleaning the entire ductwork system and AC unit. Temporary filter media shall be changed bi-weekly at a minimum.

3. All AC units shall have all correct motor overload elements installed and all safeties shall be wired and operational prior to temporary use of the AC unit.

4. Temporary controls and temporary control sequences may be utilized by the contractor until the permanent controls and control sequences are installed. Temporary control methods shall be the sole responsibility of the contractor.

5. All AC units required to have factory start-up shall have factory start-up completed prior to use.

6. The building envelope for the area served by the AC units shall be substantially complete prior to using the AC units during construction.

B. Ductless split systems shall NOT be used during construction. Protect all indoor sections of ductless split systems during construction to prevent dust, dirt, or water from entering the unit.

3.16 WARRANTY AND INSTRUCTIONS

A. See General Conditions - One-Year Warranty.

B. Contractor shall and hereby does warrant all materials, workmanship and equipment furnished and installed by him to be free from defects for a period of one (1) year after date of substantial completion of the Contract. Should any defects in materials, workmanship, or equipment be made known to Contractor within the one (1) year warranty period, Contractor shall replace such materials, workmanship, or equipment without charge.

C. All centrifugal, reciprocating, screw or scroll type refrigeration compressors shall bear five (5) year non-pro-rated parts warranty.

D. All gas fired air furnaces shall bear ten (10) year prorated heat exchanger warranties.

E. After completion of the work, Contractor shall operate the equipment which he installs for a period of ten (10) working days, as a test of satisfactory operating conditions. During this time, Contractor shall instruct the Owner's operating personnel in the correct operation of the equipment. Furnish necessary oral and written operating instructions to the Owner's representative.

F. Provide five (5) sets of manufacturer's operating and maintenance manuals and parts lists including nearest manufacturer's sales and service representative by name, address and phone for all equipment and materials furnished. Provide a maintenance schedule listing routine maintenance operations and suggested frequency. Include all warranty dates on equipment and guarantees. Include names, address and phone of any subcontractor and work performed. Bind above items in loose leaf three (3) ring binders with tab for each class of equipment.

G. During the period of tests, adjust all controls, regulators, etc., to comply with these Specifications.

H. Supply initial charges of refrigerant, refrigeration lubricating oil; and anti-freeze necessary for the correct operation of the equipment. Maintain these charges during the guarantee period, with no additional cost to the Owner, unless loss of charge is the fault of the Owner.

I. Make available to the Owner, without additional cost, service and adjustment of the equipment for the guarantee period.

1. Service shall include:

a. On call nuisance issues.

b. Replenishing refrigerant and antifreeze if loss occurs due to system failure.

2. Service shall not include:

a. Routine maintenance of the equipment unless specified in specific equipment specification section(s).

3.17 PROJECT CLOSE-OUT DOCUMENTS

A. Prior to the issuance of a certificate for final payment, submit to Architect and obtain his

approval of the following:

1. A letter signed by the subcontractors for HVAC, Electrical, and Temperature Control work stating that they have jointly checked each power circuit and control circuit and mutually agrees that controls and power circuits will function properly.

2. Record drawings - sheet metal work (reproducible).

3. Air balance report (3).

4. Equipment Submittal Data (3).

5. Equipment operating and maintenance manuals (3).

6. Maintenance schedule (3).

7. Equipment warranty dates and guarantees (3).

8. List of Owner's Personnel who have received maintenance instructions.

END OF SECTION 15010

SECTION 15020 – TESTING, BALANCING AND ADJUSTING (TBA)

PART 1 - GENERAL

1.01 SCOPE

A. Provisions of this section apply to all HVAC work.

B. All tests shall be witnessed by the Architect in addition to authorities having jurisdiction. A minimum of 48 hour notice is required prior to performance of test.

C. Provide complete report to Engineer for approval TEN (10) working days prior to Engineer's final site visit.

1.02 QUALIFICATIONS

A. All TBA work shall be performed by an independent Test and Balance Agency specializing in Testing, Balancing and Adjusting of HVAC Systems.

B. All TBA work shall be under supervision of a qualified registered professional engineer regularly engaged in the TBA Agency.

C. TBA Agency shall be an AABC or NEEB Member and/or shall obtain written approval from the Architect prior to Bidding.

1.03 APPROVAL

A. Application for approval of the TBA agency shall be submitted prior to Bid.

B. Submittal information regarding the TBA agency to include:

1. List of at least five (5) projects successfully completed of similar size and scope.

2. Copy of reporting forms to be used for this project indicating scope of TBA work.

3. Name of registered engineer in charge with resume of qualifications. List of personnel that will perform TBA work on project and qualifications.

4. List of instruments to be used with dates of latest calibrations.

5. List of memberships in AABC, NEBB or other similar organizations.

PART 2 - PRODUCTS

2.01 INSTRUMENTS

A. All instruments used for the TBA work shall be calibrated within six (6) months and checked for accuracy prior to start of work.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. Prior to any work beginning perform, a pre-demolition test of all existing systems being affected by the renovation and/or the addition. Submit Test and Deficiency List as indicated below.

B. After HVAC system has been installed, Test, Balance and Adjust System for proper operation, air distribution, flow rates, temperatures and humidities. Correct any noise and/or vibration conditions.

C. Include a "Deficiency List" with the TBA air and water balance report. Deficiency list shall include TBA items which are not in accordance with Contract Documents.

D. Perform all tests as required by local codes. Contractor shall furnish testing equipment.

E. If local Codes are more stringent, local Codes shall govern.

3.02 AIR SYSTEM

A. When system has been completed, remove all trash and dirt, set grille bars and diffuser patterns for required throws and adjust and balance air duct systems so air quantities at outlets are as directed and distribution from each supply outlet is free from drafts and excessive noise, and uniform over the face of each outlet. Do all testing and balancing with filters blanked to provide pressure drops midway between clean condition and manufacturer's recommended change-out condition. Balance air quantities to within 10% of indicated air quantities.

B. Make adjustments so dampers and volume adjusters close to air outlets will have the least pressure drop consistent with volume requirements. Obtain additional pressure drop required for balancing of shorter runs by adjusting dampers at branch duct take-offs. Adjustable fan drives shall be used for making final adjustments of total air quantities. Change sheaves and belts as required to adjust AC units to proper airflow.

C. Direct reading velocity meters may be used for comparative adjustment of individual outlets, but measure air quantities in ducts having velocities of 1000 feet per minute or more with pitot tubes. Cap pitot tube openings in low pressure ducts with plastic plugs. Cap pitot tube openings in medium and high pressure ducts and kitchen and laboratory exhaust ducts with Duro-Dyne test ports.

D. Permanently mark settings of dampers and other volume adjusting devices so they can be restored if disturbed.

E. When air balancing has been completed, submit to Architect an air balance log, including design and actual air quantities, pressures, etc., in each branch duct and at each grille, register, and outlet. Individual outlet air rates are required for boots on boot-box systems.

F. Include for each system the following information:

1. Fan rpm, motor amps, motor nameplate amps, and amp rating of starter heater.

2. Total air quantity supplied by each system and/or fan.

3. Total outside air quantity supplied by each system.

4. Provide velocity pressure across each duct mounted smoke detector and list manufacturer's required velocity pressure range.

5. Air flow at all grilles.

3.03 COILS

A. Provide the following:

1. Entering and leaving air temperatures.

2. Outside air temperature at time of test.

3. Air pressure drop.

3.04 START-UP AND SERVICE

A. At the beginning of the first heating season, adjust and balance operating phases and repeat at the beginning of the first cooling season or vice-versa, as the case may be, all without charge.

B. The Contractor and Factory Representative of the boilers, chillers, AC units and major HVAC equipment shall place every item of such equipment into satisfactory operation with all automatic and safety devices. Further, all adjustment service required shall be performed during the warranty period. Adjustment services does not include lubricating fans or motors and does not include changing filters or adjusting belts.

C. In addition, submit equipment manufacturers' start-up reports for items listed above. See "Project Close-Out".

END OF SECTION 15020

SECTION 15050 – MATERIALS AND METHODS-HVAC

PART 1 - GENERAL

1.01 SCOPE

A. Include Section 15010, "GENERAL PROVISIONS - HVAC", with this Section.

PART 2 - PRODUCTS

2.01 MATERIALS

A. All pipe, fittings and valves shall be manufactured in the United States of America.

2.02 HVAC DRAIN PIPING

A. Standard weight galvanized steel pipe ASTM A-120 with galvanized malleable iron fittings, or type "L" hard copper with wrought copper sweat fittings or Schedule 40 PVC, at Contractor's option.

B. Provide drain traps for AC Unit drain pans. Size traps as required to drain under operating conditions.

2.03 REFRIGERATION PIPING

A. ACR hard drawn copper tubing with wrought copper sweat fittings. Joints: Silfossed with continuous flow of dry nitrogen through lines.

B. Size suction and discharge lines so as to insure oil return at minimum loading.

C. Small lines 5/8" OD and smaller may be soft copper with flare fittings, provided that all joints are exposed for visual inspection.

D. Refrigerant piping shall be sized and installed as recommended by the equipment manufacturer. Provide lift traps or double suction risers as required for oil return.

2.04 PIPE HANGERS

A. General: Pipe hangers, Grinnell, PHD, Michigan Hanger, or Elcen. Grinnell figure numbers are given for reference. Provide copper clad or plastic coated hangers on bare copper lines. Provide stainless steel or plastic coated hangers in Pool areas subject to chlorine atmosphere.

B. Pipe hangers for lines 3" and smaller (other than steam and condensate lines), adjustable wrought ring hangers, Grinnell Fig. 97 or wrought clevis hangers, Grinnell Fig. 260.

C. Pipe hangers for lines 4" and larger (other than steam and condensate lines), adjustable wrought ring hangers, Grinnell Fig. 260.

D. Parallel piping graded in same direction may be grouped on trapezes. Trapezes for line 4" and smaller, Unistrut P2000 channel, or equal, with rods sized as specified below for largest pipe on trapeze. Guide lines on (but not anchor to) trapezes using Unistrut Series P1100 clamps. Trapezes shall not exceed 3' in length. Space lines to allow at

least 3" clear between adjacent pipe or pipe covering and between pipes or pipe covering and rods. Space trapezes as specified for pipe hangers based upon smallest size of pipe on trapeze.

E. Beam Clamps: Grinnell Fig. 229.

F. Inserts for hangers in concrete structures: Underwriter's listed cast iron inserts. Grinnell Fig. 282.

G. For fasteners in existing concrete structures use drilled in expansion anchors with load rating at least 150% of pipe hanger rating (power driven anchors are not acceptable).

H. Size rods for pipe hangers not smaller than the following: 3/8" rods for pipe up to 2", 1/2" for 2-1/2" and 3" pipe, 5/8" rods for 4" and 5" pipe, 3/4" rods for 6" pipe, and 7/8" rods for 8" and 10" and 12" pipe, 1" rods for 14" and 16" pipe and 1-1/8" rods for 18" pipe.

I. Space pipe hangers at maximum: Pipe hanger spacing for screwed, solder joint and welded piping: 1/2", 6 ft.; 3/4" to 1-1/4", 8 ft.; 1-1/2" to 2-1/2", 10 ft.; 3", 12 ft.; 4", 14 ft.; 5", 12 ft. 6", 10 ft., 8" and over, 6 ft. Polypropylene and PVC plastic pipe 4 ft. horizontally maximum or as directed by manufacturer if closer, and 10 ft. vertically. Install additional hangers at change of direction and valve clusters.

J. Install pipe hangers on insulated pipe (other than steam and condensate lines) over pipe covering. Provide factory fabricated insulated pipe shields equal to Pipe Shields, Inc. "Thermal Hanger Shields" at hangers. Provide shield insulation of waterproofed calcium silicate for hot water piping and foamglass for chilled water piping, same thickness as adjacent pipe covering. At Contractor's option, pipe shields may be field fabricated using waterproof calcium silicate or foam glass insulation with ASJ and 20 gauge galvanized steel protector. Shield length: 1.5 times nominal pipe size but not less than 4".

K. Wrap bare copper refrigerant lines with sheet lead at hangers.

2.05 THERMOMETERS AND GAUGES

A. Mercury in glass red reading separable socket industrial thermometers with die cast metal or high impact plastic casings of appropriate pattern for each installation, 9" scale lengths and ranges shown, Palmer, Trerice, Weksler, Marsh or equal. Install thermometers in brass or stainless steel wells. Equip thermometers installed in insulated lines with 1" extension stems or long enough to permit unions to clear insulation whichever is greater.

B. Where shown install brass thermometer wells with screwed caps. Install wells at an angle to retain oil. Size well to fit thermometers specified.

C. Enlarge pipe 2" and smaller to 2-1/2" at thermometers and thermometer wells.

D. Install 4-1/2" dial pressure gauges where shown. Gauges shall have bronze or stainless steel bourbon tubes, 316 stainless steel or brass movement, non-ferrous or phenolic solid front cases, and accuracy not less than 1% of full scale over the entire range. Gauges shall be Ashcroft, Trerice, Weksler, U.S., Marsh or equal. Gauge with minimum bourbon tube diameter of 3". Provide brass or stainless bar stock needle valves for all pressure gauges. Provide siphons for steam gages.

E. Where shown, provide temperature and pressure measurement plugs and caps, equal to

Peteron Equipment Co., Inc. "Pete's plug with Nordel seats and seals", flow design or approved equal. Provide one Pressure and Temperature Kit consisting of 0-100 psi pressure gauge with adapters, two (2) thermometers (25E - 125E F and 0E - 220E F), all in carrying cases.

PART 3 - EXECUTION

3.01 PIPE INSTALLATION

A. Cut pipe square and ream full size after cutting. Clean pipe. Make threaded joints with Teflon tape. Do not spring pipe into place.

B. Provide welding material and labor in accordance with the welding procedures of the Heating, Piping, and Air Conditioning Contractors' National Association or other approved procedure conforming to the requirements of ANSI B31.9 "Building Service Piping". Employ only welders fully qualified in the above specified procedure and currently certified by recognized testing authority. Use either electric arc or oxactylene welding. Provide full perimeter wells at both face end and collar end of each slip-on flange.

C. Install piping to allow for expansion. Make connections to all equipment to eliminate undue strains in piping and equipment. Furnish necessary fittings and bends to avoid spring of pipes during assembly.

D. Pitch air conditioning unit drain lines down in direction of flow 1" in 20'.

E. Install chrome plated floor and ceiling plates on pipe passing through finished surfaces in finished spaces.

F. Install 3/4" ball or gate valve drains with hose adapters at low points of water piping and at bases of all risers or where shown provide large drains.

G. Make connections to equipment using screwed unions in sizes 2" and smaller and flanged unions in sizes 2-1/2" and larger. Install unions in all piping connections to each piece of equipment. Provide rubber grommets at pipe penetrations to equipment casings.

H. Wherever ferrous pipes or tanks and copper tubing connect, provide dielectric insulation unions or couplings, equal to EPCO.

I. Near heating and air conditioning equipment requiring water valved and capped water outlets of sizes shown, for connection to equipment, including reduced pressure principal backflow preventers shall be provided. Make final connections under HVAC work. Note that all piping and insulation downstream of backflow preventer must be painted yellow.

J. Run piping concealed, except where specifically shown or specified exposed. Plumb all vertical lines and run mains parallel to building walls unless specifically shown otherwise. All piping shall be ran as high as practical and not on the floor unless otherwise indicated.

3.02 REFRIGERATION SYSTEM

A. Split Systems: When system is complete, but before the pipe covering has been installed, test components with dry nitrogen and make tight at equipment manufacturer's

recommended test pressures. Then evacuate the system to 26" Hg. vacuum which the system shall hold for 24 hours. After passing the above tests, charge and leak test under operating conditions using electronic leak detector.

B. Split and Packaged Systems: Check operation of refrigeration cycle and report head pressure, suction pressure and oil pressure.

END OF SECTION 15050

SECTION 15080 – PIPING SPECIALTIES-HVAC

PART 1 - GENERAL

1.01 SCOPE

A. Provisions of this section apply to all HVAC work.

PART 2 - PRODUCTS

2.01 SPECIALTIES - REFRIGERANT

A. Install molded desiccant core filter dryer in each liquid line. Provide throw away dryers for lines 1/2" and smaller. Provide replaceable core dryers for lines 5/8" and larger. Dryers shall be Sporlan "Catchall".

B. Install moisture indicating sight glass in each liquid line.

C. Service valves: Wing cap valves, Henry, or approved equal.

D. Expansion valves: Thermostatic valves with external equalizers, Sporlan, or approved equal.

E. Install solenoid valve in each liquid and hot gas bypass line. Hot gas solenoid valve shall be equipped with a high temperature coil.

F. Install suction line accumulators in all outdoor heat pumps and condensing units where refrigerant lines exceed 85' in length, or where recommended by manufacturer.

G. Refrigerant circuit access ports located outdoors shall be fitted with locking-type, tamper-resistant caps. Provide owner with any tools necessary to un-lock the caps.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Specialties shall be installed in accordance with manufacturer's recommendations.

B. See Details for mounting instructions and accessories.

END OF SECTION 15080

SECTION 15180 – INSULATION-HVAC

PART 1 - GENERAL

1.01 SCOPE

A. Include Section 15010 "GENERAL PROVISIONS - HVAC", with this Section.

B. Repair existing insulation at points of connection to existing work.

C. "Exposed" is defined as: Exposed to view when construction is complete. Items which are not "exposed" are "concealed".

D. "Attic" is defined as any ceiling space that is adjacent to the roof.

E. Insulate all items subject to sweating or loss of heat.

F. All insulation shall be installed by licensed applicator and applied in accordance with the Manufacturer's Recommendations.

1.02 INSULATION REQUIREMENTS

A. Comply with NFPA 90A.

B. Pipe hanger shields are specified in Section 15050 "MATERIALS AND METHODS - HVAC".

C. Use insulation and adhesives with Underwriter's Laboratories flame spread rating not over 25 without evidence of continued progressive combustion, and smoke developed rating not exceeding 50 for all other pipe, duct and equipment insulation.

PART 2 - PRODUCTS

2.01 FOAM PLASTIC PIPE COVERING

A. Fire retardant foamed plastic pipe covering, maximum K factory at 75EF mean temperature not exceeding 0.27 BTU/(hr) (sq. ft.) (EF/in). Armstrong "Armaflex II", or approved equal.

B. Pipe covering may be seamless insulation slipped over piping before erection or may be slit longitudinally and installed over erected piping.

C. Make fitting covers from segments of pipe covering.

D. Cement all joints and seams in accordance with manufacturer's instruction using Armstrong 520 adhesive.

E. Fit pipe hangers over insulation (See PIPE HANGERS). Use hanger shields as specified under pipe hangers.

F. Thermal performance shall be as follows:

1. 1" thick: R=4.2.
2. 2" thick: R=8.0.

2.02 ALUMINUM JACKET PIPING COVER

A. 0.010" thick corrugated aluminum jacket with laminated polyethylene and draft paper adhered liner.

B. Securely rivet jacket in place and band with flat aluminum bands 18" o.c.

C. Finish fittings on aluminum jacketed lines with 1/8" thick (dry) coat of vinyl acrylic mastic reinforced with glass cloth.

2.03 DUCT INSULATION, INTERNAL

A. Glass fiber acoustical/thermal insulation complying with NFPA 90A and UL 181 and having an erosion resistant anti-microbial membrane equal to Johns Manville, Linacoustic □RC□ on the air side. Edge coating shall be factory applied to the edges of the liner core. Shop fabrication cuts and field cuts or tears shall be coated with Superseal Duct Butter. NRC (1" thick) not less than 0.70, minimum density 3 lb/cu. ft., and maximum friction correction factor at 2000 fpm average velocity 1.15 (per TIMA test method AHS-1S2-76U). Thermal performance shall be as follows:

1. 1" thick: R=4.2.

2. 1 1/2" thick: R=6.3.

3. 2" thick: R=8.0.

2.04 DUCT INSULATION, EXTERNAL FOR CONCEALED

A. Formaldehyde free flexible glass fiber insulation with foil-scrim-craft (FSK) facing equal to Johnson Manville Micro-Lite □XG□. Flame spread classification, 25 or less, smoke developed rating not exceeding 50. Minimum density, 3/4 lb./cu. ft., 3" thickness, installed R=8.3 minimum.

2.05 DUCT INSULATION, EXTERNAL FOR EXPOSED INDOOR DUCTS

A. 6 lb/cu. ft. fiberglass board with FSK facing and thermal conductivity not exceeding 0.22 BTU/(hr) (sq. ft.) (EF/in.) at 75EF mean temperature.

PART 3 - EXECUTION

3.01 HVAC PIPING INSULATION

A. Refrigerant Suction Lines and Hot Gas Bypass Lines: "Foam Plastic Pipe Covering", 1" thick. Jacket piping located outdoors or exposed to view with aluminum jacket.

B. AC Unit Drain Lines: "Foam Plastic Covering", 3/4" thick. Jacket piping exposed to view with aluminum jacket.

3.02 AIR TERMINAL DEVICES

A. Ceiling Mounted Supply Diffusers: 3" thick duct insulation on back of diffuser, external for concealed.

B. Fire Dampers for Internally Lined Ducts and Externally Insulated Ducts: 3" thick duct insulation on all sides, external for concealed.

3.03 DUCT INSULATION INTERNAL (AND EXTERNAL WHERE INDICATED)

A. Apply in accordance with SMACNA "Duct Liner Application Standard" over full coverage adhesive. Coat all edges with adhesive and seal all punctures or tears with mastic before installing ducts. Cut liner to assure overlapped and compressed longitudinal corner joints. Fasteners shall be sized appropriately for thickness of liner utilized. Provide mechanical fasteners and metal nosings as noted below:

1. For all velocities, provide metal nosings on upstream edge of liner at connections to equipment: Fans, coils, dampers, AC Units, sound absorbers, etc.

2. For velocities up to 2,000 feet per minute: Start fasteners within 3" of the upstream transverse edges of the liner and 3" from the longitudinal joints and space them a maximum of 12"o.c. around the perimeter of the duct, except that they may be a maximum of 12" from a corner break. Elsewhere locate fasteners a maximum of 18" o.c., except that they shall be placed not more than 6" from a longitudinal joint of the liner nor more than 12" from a corner break.

3. For velocities from 2,001 to 4,000 feet per minute: Start fasteners within 3" of the upstream transverse edges of the liner and 3" from the longitudinal joints and space them a maximum of 6" o.c. around the perimeter of the duct, except that they may be a maximum of 6" from a corner break. Elsewhere locate fasteners a maximum of 16" o.c., except that they shall be placed not more than 6" from a longitudinal joints of the liner nor more than 12" from a corner break. In addition to the adhesive edge coating of transverse joints, coat and longitudinal joints with adhesive.

4. For velocities from 4,001 to 6,000 feet per minute: Same as 2 above except that metal nosing shall be installed to secure liner at all upstream transverse edges.

5. Where ducts are listed to be lined and wrapped, install wrap per section below "Duct Insulation, External, for Concealed Ducts"

B. Thickness and Extent:

1. Return Ductwork: 1" thick

3.04 DUCT INSULATION, EXTERNAL, FOR CONCEALED DUCTS

A. Adhere insulation to duct surface with approved adhesive applied in strips above 6" wide on approximately 12" centers. Flare door staples may be used for securing the insulation until the adhesive sets. Lap jacket and vapor seal all joints and seams with suitable mastic.

B. On rectangular and flat oval ducts 30" wide and wider, additionally support insulation with weld pins and speed clips 18" on centers. Seal weld pins with mastic and FSK tape.

C. Thickness and Extent:

1. Supply and outside air ductwork: 3" thick.

NOTE: Conical and straight spin-ins on both lined and unlined ducts shall be insulated. Insulation shall be slit at damper rods, at spin-ins and sealed vapor tight.

3.04 DUCT INSULATION, EXTERNAL, FOR EXPOSED DUCTS

A. Insulated all exposed supply ducts located in plenums and not specified to be lined with 2" thick 6 #/cu. ft., R=8.7 fiberglass board with FSK jacket. Secure board with weld pins and speed clips 12" on centers. Seal clip indentations with mastic. Seal all joints and seams with mastic.

B. Cover all angles, seams and joint reinforcing with insulation and seal vapor tight.

3.05 INSULATION WETTED DURING CONSTRUCTION

A. Contractor shall replace any and all insulation wetted during construction at his own expense.

END OF SECTION 15180

1.0 - GENERAL

1.1 DESCRIPTION OF WORK:

A. This section describes the design, performance and installation of an air purification system intended for use as part of another manufacturer's air handling unit or mounted on the duct as shown on the plans, details and equipment schedules.

1.2 REFERENCED CODES & STANDARDS:

A. The following codes and standards are referenced through out. The edition to be used is that currently enforced by the authority having jurisdiction (AHJ) or in absence of such direction that referenced by the current enforceable IBC code or as indicated by the contract documents, except where specifically referenced by this section of the specifications.

1. ASHRAE Standards 62 & 52

2. National Electric Code NFPA 70

3. UL 867 including ozone chamber test required as of December 21, 2007

1.3 RELATED WORK:

A. Testing, Adjusting and Balancing

B. Facility Access and Protection

C. Ductwork

D. Filters

E. Water and Refrigerant Piping

F. Electrical Wiring

G. Control Wiring

1.4 QUALITY ASSURANCE:

A. Basis of design is Top Product Innovations. Global Plasma Solutions and Phenomenal Aire shall be considered equal subject to meeting all specifications herein.

B. The Air Purification System shall be a product of an established manufacturer within the USA.

C. A qualified representative from the manufacturer shall be available to inspect the installation of the air purification system to ensure installation in accordance with manufacturer's recommendation.

D. Technologies that do not address gas disassociation such as UV Lights, Powered Particulate Filters and/or polarized media filters shall not be considered. Uni-polar ion generators shall not be acceptable. “Plasma” particulate filters shall not be acceptable.

E. Projects designed using ASHRAE Standard 62, IAQ Procedure shall require the manufacturer to provide Indoor Air Quality calculations using the formulas within ASHRAE Standard 62.1-2013 to validate acceptable indoor air quality at the quantity of outside air scheduled with the technology submitted.

F. The Air Purification System have been tested by UL or Intertek/ETL to prove conformance to UL 867-2007 including the ozone chamber testing and peak ozone test for electronic devices. Manufacturers that achieved UL 867 prior to December 21, 2007 and have not been tested in accordance with the newest UL 867 standard with the ozone amendment shall not be acceptable. All manufacturers shall submit their independent UL 867 test data with ozone results to the engineer during the submittal process. All manufacturers shall submit a copy with their quotation. Contractors shall not accept any proposal without the proper ozone testing documentation.

G. The maximum allowable ozone concentration per the UL 867-2007 chamber test shall be 0.007 PPM. The maximum peak ozone concentration per the UL 867-2007 peak test as measured 2 inches away from the electronic air cleaner’s output shall be no more than 0.0042 PPM. Manufacturers with ozone output exceeding these ozone values shall not be acceptable.

1.5 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data for ion generators including:

1. Schedule of plasma generators indicating unit designation, number of each type required for each unit/application.

2. Data sheet for each type of plasma generator, and accessory furnished; indicating construction, sizes, and mounting details.

3. Performance data for each type of plasma device furnished.

4. Indoor Air Quality calculations using the formulas within ASHRAE Standard 62.1-2013 to validate acceptable indoor air quality at the quantity of outside air scheduled (when projects are designed with outside air reduction).

5. Product drawings detailing all physical, electrical and control requirements.

6. Copy of UL 867 independent ozone test.

B. Operating & Maintenance Data: Submit O&M data and recommended spare parts lists.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Deliver in factory fabricated shipping containers. Identify on outside of container type of product and location to be installed. Avoid crushing or bending.

B. Store in original cartons and protect from weather and construction work traffic.

C. Store indoors and in accordance with the manufacturers' recommendation for storage.

1.7 WARRANTY:

A. Equipment shall be warranted by the manufacturer against defects in material and workmanship for a period of twenty-four months after shipment, whichever occurs first. Labor to replace equipment under warranty shall be provided by the owner or installing contractor.

2.0 - PRODUCTS

2.1 GENERAL:

A. The air purification system(s) shall be of the size, type, arrangement and capacity indicated and required by the unit furnished and shall be of the manufacturer specified.

B. Basis of Design: Top Product Innovations Type C unit

C. All other Suppliers of comparable products requesting prior approval shall:

1. Submit for prior approval in accordance with the requirements of Section 15010.

2. In addition, manufacturers submitting for prior approval for Bi-Polar Ionization must as part of the prior approval request provide their ASHRAE 62.1-2013 calculations that prove conformance to the ASHRAE Standard with the reduction of outside air to the scheduled values. A letter on the manufacturer's letterhead requesting prior approval must accompany the request for prior approval stating their calculations are ASHRAE compliant. A third party validation study performed on a previous installation of the same application shall also be included.

3. Submit independent test data from ETL or UL showing ozone levels produced during the UL 867 ozone chamber test. Manufacturers without this test data shall not be acceptable.

2.2 BI-POLAR IONIZATION DESIGN & PERFORMANCE CRITERIA"

A. Each piece of air handling equipment, so designated on the plans, details, equipment schedules and/or specifications shall contain a Plasma Generator with Bi-polar Ionization output as described here within.

B. The Bi-polar Ionization system shall be capable of:

1. Effectively killing microorganisms downstream of the bi-polar ionization equipment (mold, bacteria, virus, etc.).

2. Controlling gas phase contaminants generated from human occupants, building structure and furnishings.

3. Capable of reducing static space charges.

4. Increasing the interior ion levels, both positive and negative, to a minimum of 800 ions/cm³ measured 5 feet from the floor.

C. The bi-polar ionization system shall operate in a manner such that equal amounts of positive and negative ions are produced. Uni-polar ion devices shall not be acceptable.

1. Air exchange rates may vary through the full operating range of a constant volume or VAV system. The quantity of air exchange shall not be increased due to requirements of the air purification system.

2. Velocity Profile: The air purification device shall not have maximum velocity profile.

D. Humidity: Plasma Generators shall not require preheat protection when the relative humidity of the entering air exceeds 85%. Relative humidity from 0 - 100%, condensing, shall not cause damage, deterioration or dangerous conditions within the air purification system. Air purification system shall be capable of wash down duty.

E. Equipment Requirements:

F. Electrode Specifications (Bi-polar Ionization):

a. Each Plasma Generator with Bi-polar Ionization output shall include the required number of electrodes and power generators sized to the air handling equipment capacity. Unit shall be capable of treating 6,000 CFM (C6.0) or 10,000 CFM (C10.0). Bi-polar ionization tubes manufactured of glass and steel mesh shall not be acceptable due to replacement requirements, maintenance, performance output reduction over time, ozone production and corrosion.

b. Electrodes shall be energized when the main unit disconnect is turned on and the fan is operating. Electrodes shall be made from carbon fiber to prevent oxidation over time.

c. Electrode pair shall provide a minimum of 140 million ions per cubic centimeter (C6.0) or 200 million ions per cubic centimeter (C10.0), both positive and negative ions in equal quantities. Devices providing less than the rated ion densities shall not be acceptable.

G. Air Handler Mounted Units:

H. Where so indicated on the plans and/or schedules Plasma Generator(s) shall be supplied and installed. The mechanical contractor shall mount the Plasma Generator and wire it to the AHU control power (24VAC) as instructed by the Air Purification Manufacturer's instructions or line voltage subject to power available. Each unit shall be designed with an integral illuminated LED and dry contacts to prove ion output is operating properly. The dry contacts shall close to prove the ion generator is working properly and may be daisy chained in series such that

only one dry contact per AHU is required to interface to the BAS or the optional DDC controller. Dry contacts proving power has been applied in lieu of the ion output is actually operating, are not acceptable.

I. Plenum/Duct Mounted Units: Where so indicated on the plans and/or schedules, Plasma Generators(s) shall be supplied and installed. The generator shall be installed through the duct wall and into the air stream with the external power head in a convenient location for visual indication of power, removal and servicing, by the mechanical contractor. The dry contacts shall close to prove the ion generator is working properly and may be daisy chained in series such that only one dry contact per duct is required to interface to the BAS or the optional DDC controller.

J. Ionization Requirements:

1. Plasma Generators with Bi-polar ionization output shall be capable of controlling gas phase contaminants and shall be provided for all equipment listed above.

   a. The Bi-polar ionization system shall consist of Bi-Polar Plasma Generator and power supply. The Bi-polar system shall be installed where indicated on the plans or specified to be installed and powered by 24VAC.

   b. Ionization Output: The ionization output shall be controlled such that an equal number of positive and negative ions are produced. Imbalanced levels shall not be acceptable.

   c. Ionization output from each electrode shall be a minimum of 140 million ions/cc (C6.0) and 200 million ions/cc (C10.0) when tested at 1” from the ionization generator.

   d. All manufacturers shall provide documentation by an independent NELEC accredited laboratory that proves the product has minimum kill rates for the following pathogens given the allotted time and in a space condition:

      1) MRSA - >96% in 30 minutes or less
      2) E.coli - > 99% in 15 minutes or less
      3) TB - > 69% in 60 minutes or less
      4) C. diff - >86% in 30 minutes or less

      Manufacturers not providing the equivalent space kill rates shall not be acceptable. All manufactures requesting prior approval shall provide to the engineer independent test data from a NELEC accredited independent lab confirming kill rates and time meeting the minimum requirements stated in section 2.2 B, points 6A, 6B and 6C. Products tested only on Petri dishes to prove kill rates shall not be acceptable.

2. Ozone Generation: The operation of the electrodes or Bi-polar ionization units shall conform to UL 867-2007 with respect to ozone generation. There shall be no ozone generation during any operating condition, with or without airflow.

K. Electrical Requirements:

1. Wiring, conduit and junction boxes shall be installed within housing plenums in accordance with NEC NFPA 70. The contractor shall coordinate electrical requirements with air purification manufacturer during submittals.

L. Control Requirements:

1. All Plasma Generators shall have internal short circuit protection, overload protection, and automatic fault reset.

2. Integral airflow sensing shall modulate the Plasma output as the air flow varies or stops. A mechanical air flow switch shall not be acceptable as a means to activate the Plasma device due to high failure rates and possible pressure reversal.

3. The installing contractor shall mount and wire the Plasma device within the air handling unit specified or as shown or the plans. The contractor shall follow all manufacturer IOM instructions during installation.

4. All Plasma devices shall have a means to interface with the BAS system. Dry contacts shall be provided to prove there are ions being produced. Systems providing indication that power is applied to the Plasma device, but not directly sensing the power at the ion output, shall not be acceptable.

5. Plasma systems that use multiple modules with ion output alarm wires wired to the same terminal such that all ion modules must fail to show an alarm status shall not be acceptable.

3.0 - EXECUTION

3.1 GENERAL:

A. The Contractor shall be responsible for maintaining all air systems until the owner accepts the building (Owner Acceptance).

3.2 ASSEMBLY & ERECTION: PLASMA GENERATOR WITH BI-POLAR IONIZATION:

A. All equipment shall be assembled and installed in a workman like manner to the satisfaction of the owner, architect, and engineer.

B. Any material damaged by handling, water or moisture shall be replaced, by the mechanical contractor, at no cost to the owner.

C. All equipment shall be protected from dust and damage on a daily basis throughout construction.

3.3 TESTING:

A. Provide the manufacturers recommended electrical tests.

END OF SECTION

1.0 GENERAL:

1.0 SCOPE:

A. Provisions of this Section apply to all HVAC work.

2.0 PRODUCTS:

2.1 VENTS FOR GAS FIRED EQUIPMENT:

A. ***Round*** double wall gas vent UL listed for installation with 1" clearance from combustible materials.

B. Inner wall shall be aluminum and outer wall galvanized steel.

C. Equipment vents with all necessary fitting and accessories including roof flashing, counter flashing, wall sleeves, firestop spacers, tees, elbows, and (Breidert) weather cap. Support vents in accordance with manufacturer's instructions.

D. Provide tee for connection of vent from domestic water heater.

E. Vent shall be full size of appliance draft or of size required by code whichever is larger.

2.2 CONCENTRIC THRU WALL FURNACE VENT AND COMBUSTION AIR:

A. To be furnished by Furnace Manufacturer, in accordance with A.G.A. and shall be U.L. Listed.

B. Provide combination air intake/flue pipe and horizontal vent cap.

3.0 EXECUTION:

3.1 INSTALLATION:

A. Equipment shall be installed in accordance with manufacturer's recommendations.

B. See Details for mounting instructions and accessories.

END OF SECTION

1.0 - GENERAL

1.1 Scope

A. Provisions of this Section shall apply to all HVAC work.

2.0 – PRODUCTS

2.1 CONDENSING UNITS - AIR COOLED:

A. Include one (or more) reciprocating compressor(s), condenser and condenser fan, all enclosed in a single casing. Provide separate refrigerant circuit for each compressor.

B. Casing: Aluminum or galvanized steel designed for outdoor installation. Galvanized steel casings shall be furnished with enamel over bonderizing. Equip casings with access panels, condenser inlet guards and fan outlet guards. Provide padlock connections for power and control access panels.

C. Compressors: Scroll type.

D. Condenser: Aluminum fins securely bonded to seamless copper tubes. Condenser Fans: Direct driven propeller fans, resiliently mounted, with weather protected fan motors.

E. Provide (liquid receiver if condenser coil will not contain entire system charge where 80% full at 100°F.) suction and discharge service valves and liquid stop valve.

F. Controls: Factory wired and located in a readily accessible location. Provide (2 step) line voltage contactor and both temperature and current sensitive overload devices for compressor motor, cycle timer to limit compressor starts to 5 or 6 minute intervals, oil pressure switch, high and low pressure switches and crankcase heater. Provide low-ambient-start devices and flooding or variable air volume head pressure controls for stable starting and operation in ambient temperature of 10°F. Fan cycling head pressure controls are not acceptable.

G. Provide five (5) years non-prorated compressor parts warranty.

H. Manufactured by Trane, Daikin, Carrier or approved equal.

3.0 – EXECUTION

3.1 INSTALLATION:

A. Units shall be installed in accordance with manufacturer's recommendations.

B. See Details for mounting instructions and accessories.

END OF SECTION

SECTION 15760 – SPLIT SYSTEM UNITS-HVAC

PART 1 - GENERAL

1.01 SCOPE

A. Provisions of this Section shall apply to all HVAC work.

PART 2 - PRODUCTS

2.01 OUTDOOR UNITS

A. Outdoor units: A single reciprocating compressors, heat transfer coil, fans and inter-connecting piping and controls all enclosed in a single casing. For multiple compressor units provide separate refrigerant circuits.

B. Casings: Designed for outdoor installation, constructed of not lighter than 20 gauge galvanized steel with baked enamel finish over bonderizing. Provide access panels, condenser inlet guards and fan outlet guards.

C. Compressors: Welded or bolted hermetic, spring isolated, with reversible oil pumps.

D. Coils: Aluminum fins securely bonded to seamless copper tubes.

E. Fans: Direct driven propeller fans with weather protection for fan motors.

F. Provide suction and discharge service valves, liquid stop valve and expansion valves.

G. Controls: Factory wired and located in a readily accessible location. Compressor motor shall have line voltage (multi-step) contactor and both temperature and current sensitive overload devices. Include high and low pressure switches, crank case heater, defrost thermostat, and defrost timer.

H. Mount outdoor units on poured in place pad.

I. Provide five (5) year non-pro-rated compressor parts warranty.

J. Condensing units shall be manufactured by Carrier, Trane, York/Johnson Controls or approved equal.

2.02 INDOOR UNITS

A. Provide external 2" filter rack with hinges and thumb latches.

B. Each unit shall be a heating and cooling unit bearing AGA approval for natural gas. All operating components shall be assembled together in a single casing.

C. Casing shall be constructed of galvanized steel not lighter than 18 gauge with epoxy primer and baked enamel finish. Portion of casing in contact with return or supply air shall have 1" thick fiberglass insulation. Casing shall be mounted as shown on drawings.

D. Cooling cycle components shall include direct expansion cooling coil with aluminum fins and seamless copper tubes and condensate drain pan with corrosion resistant coating.

E. Motor shall be premium efficiency, direct drive 4-speed. Provide slide out blower assembly, blower door safety switch and adjustable fan and limit control.

F. Provide aluminized steel heat exchanger with 10 year prorated parts warranty. Provide multi-port in hot burners, shot surface ignitor and noncorrosive vent components. Provide power vent blower for discharge of gas fumes with differential proving switch.

G. Provide alternate bottom/left/right return air connections.

H. Filter section with 1" thick throwaway filters and latched access doors shall be provided.

I. Provide left/right gas connection with gas cook, gas pressure regulator and solenoid.

J. Furnaces shall be manufactured by Carrier, Trane, York/Johnson Controls or approved equal.

2.03 HEAT PUMP - (MINI-SPLIT)

A. The Heat Pump system shall be a Mitsubishi Electric or approved equal split system with Variable Speed Inverter Compressor technology. The system shall consist of a ceiling-suspended indoor section with wired, wall mounted controller and a horizontal discharge, single phase outdoor unit.

B. Quality Assurance

1. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and shall bear the ETL label.

2. All wiring shall be in accordance with the National Electrical Code (N.E.C.).

3. The units shall be rated in accordance with Air-conditioning Refrigeration Institute's (ARI) Standard 210 and bear the ARI Certification label.

4. The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001, which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

5. A dry air holding charge shall be provided in the indoor section.

6. The outdoor unit shall be pre-charged with R-410a refrigerant.

7. System efficiency shall meet or exceed 13.0 SEER.

C. Delivery, Storage and Handling

1. Unit shall be stored and handled according to the manufacturer's recommendations.

2. The wireless controller shall be shipped inside the carton with the indoor unit and able to withstand 105°F storage temperatures and 95% relative humidity without adverse effect.

D. Warranty

1. The units shall have a manufacturer's parts and defects warranty for a period one (1) year from date of installation. The compressor shall have a warranty of 6 years from date of installation. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty does not include labor.

2. Manufacturer shall have over 25 years of continuous experience in the U.S. market.

E. Performance

1. Each system shall perform in accordance to the ratings shown in the table below. Cooling performance shall be based on 80°F DB, 67°F WB (26.7°C DB, 19.4°C WB) for the indoor unit and 95°F DB, 75°F WB (35°C DB, 29.3°C WB) for the outdoor unit. Heating performance shall be based on 70°F DB, 60°F WB (21.1°C DB, 15.6°C WB) for the indoor unit and 47°F DB, 15°F WB (8.3°C DB, 6.1°C WB) for the outdoor unit.

F. Indoor Unit

1. The indoor unit shall be factory assembled, wired and tested. Contained within the unit shall be all factory wiring and internal piping, control circuit board and fan motor. The unit in conjunction with the wired, wall mounted controller shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be purged with dry nitrogen before shipment from the factory.

2. Unit Cabinet

The casing shall be ABS plastic and have a Munsell 0.70Y 8.59/0.97 finish. Cabinet shall be designed for suspension mounting and horizontal operation. The rear cabinet panel shall have provisions for a field installed filtered outside air intake connection.

3. Fan

The evaporator fan shall have three high performance, double inlet, forward curve sirocco fans driven by a single motor. The fans shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings. The indoor fan shall consist of four (4) speeds: Low, M1, M2, and Hi.

4. Vane

There shall be a motorized horizontal vane to automatically direct air flow in a horizontal and downward direction for uniform air distribution. The horizontal vane shall provide a choice of five (5) vertical airflow patterns selected by remote control: 100% horizontal flow, 80% horizontal flow (plus 20% downward airflow), 60% horizontal airflow (plus 40% downward airflow), 40% horizontal airflow (plus 60% downward airflow), and swing. The horizontal vane shall significantly decrease downward air resistance for lower noise levels, and shall close the outlet port when operation is stopped. There shall also be a set of vertical vanes to provide horizontal swing airflow movement selected by remote control.

5. Filter

Return air shall be filtered by means of an easily removable washable filter.

6. Coil

The evaporator coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing. The multi-angled heat exchanger shall have a modified fin shape that reduces air resistance for a smoother, quieter airflow. All tube joints shall be brazed with PhosCopper or silver alloy. The coils shall be pressure tested at the factory. A condensate pan and drain shall be provided under the coil.

7. Electrical

The electrical power of the unit shall be 208 volts or 230 volts, 1 phase, 60 hertz. The system shall be capable of satisfactory operation within voltage limits of 198 volts to 253 volts. The power to the indoor unit shall have an option of being supplied from the outdoor unit, using Mitsubishi Electric A-Control system or separate power source for indoor and outdoor units.

8. Control

a. The control system shall consist of two (2) microprocessors, one on each indoor and outdoor unit, interconnected by a single non-polar two-wire cable. Field wiring shall run directly from the indoor unit to the wall mounted controller with no splices.

b. For A-Control, a three (3) conductor 14 ga. AWG wire with ground shall provide power feed and bi-directional control transmission between the outdoor and indoor units.

c. Where separate power is supplied to the indoor and outdoor units, a two (2) 20 ga. AWG wire shall be run between the units to provide forbid-directional control communication..

d. The system shall be capable of automatic restart when power is restored after power interruption. The system shall have self-diagnostics ability, including total hours of compressor run time. Diagnostics codes for indoor and outdoor units shall be displayed on the wired controller panel.

e. The microprocessor located in the indoor unit shall have the capability of monitoring return air temperature and indoor coil temperature, receiving and processing commands from the wired controller, providing emergency operation and controlling the outdoor unit.

f. The indoor unit shall be connected to a wall mounted wired controller to perform input functions necessary to operate the system. The wired controller shall have a large multi-language DOT liquid crystal display (LCD) presenting contents in eight (8) different languages, including English, French, Chinese, German, Japanese, Spanish, Russian, and Italian.

g. There shall be a built-in weekly timer with up to eight pattern settings per day. The controller shall consist of an On/Off button, Increase/Decrease Set Temperature buttons, a Cool/Dry/Fan mode selector, a Timer Menu button, a Timer On/Off button, Set Time buttons, a Fan Speed selector, a Vane Position selector, a Louver Swing button, a Ventilation button, a Test Run button, and a Check Mode button. The controller shall have a built-in temperature sensor. Temperature shall be displayed in either Fahrenheit (°F) or Celsius (°C). Temperature changes shall be by increments of 1°F (1°C) with a range of 67°F to 87°F (19°C to 30°C).

h. The wired controller shall display operating conditions such as set temperature, room temperature, pipe temperatures (i.e. liquid, discharge, indoor and outdoor), compressor operating conditions (including running current, frequency, input voltage, On/Off status and operating time), LEV opening pulses, sub cooling and discharge super heat.

i. Normal operation of the wired controller shall provide individual system control in which one wired controller and one indoor unit are installed in the same room. The controller shall have the capability of controlling up to a maximum of sixteen systems at a maximum developed control cable distance of 1,500 feet (500 meters).

j. The control voltage from the wired controller to the indoor unit shall be 12 volts, DC. The control signal between the indoor and outdoor unit shall be pulse signal 24 volts DC. Up to two wired controllers shall be able to be used to control one unit.

k. Control system shall control the continued operation of the air sweep louvers, as well as provide On/Off and mode switching. The controller shall have the capability to provide sequential starting with up to fifty seconds delay.

G. Outdoor Unit

1. The outdoor unit shall be compatible with the three different types of indoor units (PKA - wall mounted, PCA - ceiling suspending, and PLA - four way ceiling cassette). The connected indoor unit must be of the same capacity as the outdoor unit.

2. Models PUY-A24NHA and PUY-A36NHA shall have the option to connect to two indoor units, within the same confined space, to improve air distribution (total capacity shall be equivalent to outdoor unit).

3. The outdoor unit shall be equipped with a control board that interfaces with the indoor unit to perform all necessary operation functions.

4. The outdoor unit shall be capable of operating at 0°F (-18°C) ambient temperature
without additional low ambient controls (optional wind baffle may be required).

5. The outdoor unit shall be able to operate with a maximum height difference of 100 feet (30 meters) between indoor and outdoor units.

6. System shall have a maximum refrigerant tubing length of 165 feet (50

meters) between indoor and outdoor units without the need for line size changes, traps or additional oil.

7. Models PUZ-A24NHA, PUZ-A30NHA and PUZ-A36NHA shall be pre-charged for a maximum of 70 feet (20 meters) of refrigerant tubing. Model PUZ-A42NHA shall be pre-charged for a maximum of 100 feet (30 meters) of refrigerant tubing. The outdoor unit shall be completely factory assembled, piped, and wired. Each unit must be test run at the factory.

8. Cabinet

   The casing shall be constructed from galvanized steel plate, coated with a finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection and have a munsell 3Y 7.8/1.1 finish. The fan grille shall be of ABS plastic.

9. Fan

   Models PUZ-A24NHA, PUZ-A30NHA, and PUZ-A36NHA shall be furnished with an AC fan motor. Model PUZ-A42NHA shall have two (2) DC fan motors. The fan motor shall be of aerodynamic design for quiet operation, and the fan motor bearings shall be permanently lubricated. The outdoor unit shall have horizontal discharge airflow. The fan shall be mounted in front of the coil, pulling air across it from the rear and dispelling it through the front. The fan shall be provided with a raised guard to prevent contact with moving parts.

10. Coil

    The L shaped condenser coil shall be of copper tubing with flat aluminum fins to reduce debris build up. The coil shall be protected with an integral metal guard. Refrigerant flow from the condenser shall be controlled by means of linear expansion valve (LEV) metering orifice. The LEV shall be control by a microprocessor controlled step motor.

11. Compressor

    The compressor for models PUY-A24NHA, PUY-A30NHA and PUY-A36NHA shall be a DC rotary compressor with Variable Compressor Speed Inverter Technology. The compressor for model PUY-A42NHA shall be a scroll compressor with variable speed technology. The compressor shall be driven by inverter circuit to control compressor speed. The compressor speed shall dynamically vary to match the room load for significantly increasing the efficiency of the system which results in vast energy savings. To prevent liquid from accumulating in the compressor during the off cycle, a minimal amount of current shall be intermittently applied to the compressor motor to maintain enough heat. The outdoor unit shall have an accumulator and high pressure safety switch. The compressor shall be mounted to avoid the transmission of vibration.

12. Electrical

    The electrical power of the unit shall be 208volts or 230 volts, 1 phase, 60 hertz. The unit shall be capable of satisfactory operation within voltage limits of 198 volts to 253 volts. The outdoor unit shall be controlled by the

microprocessor located in the indoor unit. The control signal between the indoor unit and the outdoor unit shall be pulse signal 24 volts DC. The unit shall have Pulse Amplitude Modulation circuit to utilize 98% of input power supply.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Heat pumps shall be installed in accordance with manufacturer's recommendations.

B. See details for mounting instructions and accessories.

END OF SECTION 15760

SECTION 15775 – ELECTRIC HEATERS

PART 1 - GENERAL

1.01 SCOPE

A. Provisions of this section apply to all HVAC work.

PART 2 - PRODUCTS

2.01 ELECTRIC WALL HEATERS:

A. UL listed recessed convection heaters with finned sheathed heating elements, resiliently mounted direct driven propeller fan with motor heat shield, circuit breaker, concealed thermostat, concealed "On-Off" switch, high limit controls, and junction box for connecting power wiring.

B. Cabinets: 16-gauge steel, with pencil proof welded steel bar grilles (bars 1/16" X 3/8" minimum). Equip cabinet with adjustable recessing frame. Finish: Baked enamel, over bonderizing. Architect will select the color from manufacturer's standard selections.

C. Electric Wall Heaters: 2 KW and larger, Markel 3400 Series, less than 2 KW, Markel Series 3420, or approved equal.

2.04 ELECTRIC UNIT HEATERS:

** A. UL listed electric heater having capacity shown with resiliently mounted direct driven propeller fan with guard, finned-sheathed heating elements, and enameled steel enclosure not lighter than 20 gauge. Heater shall be equipped with automatic reset high limit controls, power contactors and control transformer for **(120) (or) (24)** volt control, factory wired to terminal strips.

** B. For horizontal heaters provide adjustable horizontal louvers. For vertical heaters provide **(radial) (louver) (cone) (diffusers) (3 ring anemostats)**.

C. For each unit heater provide room thermostat to cycle contactor and fan.

D. Electric Unit Heater shall be manufactured by Chromalox, Markel, Berko, or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Unit shall be installed in accordance with manufacturer's recommendations.

B. See Details for mounting instructions and accessories.

END OF SECTION 15775

1.00 GENERAL:

1.01 SCOPE:

A. Provisions of this Section shall apply to all HVAC work.

2.00 PRODUCTS:

2.01 DIRECT VENT CONDENSING FURNACE & DX COIL:

A. Provide external 2" filter rack with hinges and thumb latches.

B. Each unit shall be a heating and cooling unit bearing AGA approval for natural gas. All operating components shall be assembled together in a single casing.

C. Casing shall be constructed of galvanized steel not lighter than 18 gauge with epoxy primer and baked enamel finish. Portion of casing in contact with return or supply air shall have 1" thick fiberglass insulation. Casing shall be mounted as shown on drawings.

D. Cooling cycle components shall include direct expansion cooling coil with aluminum fins and seamless copper tubes and condensate drain pan with corrosion resistant coating.

E. Motor shall be high efficiency, direct drive 4-speed. Provide slide out blower assembly, blower door safety switch and adjustable fan and limit control.

F. Provide aluminized steel heat exchanger with 10 year prorated parts warranty. Provide multi-port in hot burners, shot surface ignitor and noncorrosive vent components. Provide power vent blower for discharge of gas fumes with differential proving switch.

G. Provide alternate bottom/left/right return air connections.

H. Filter section with 1" thick throwaway filters and latched access doors shall be provided.

I. Provide left/right gas connection with gas cook, gas pressure regulator and solenoid.

J. Furnaces shall be manufactured by Trane, Carrier, or approved equal.

3.00 EXECUTION:

3.01 INSTALLATION:

A. Fans shall be installed in accordance with manufacturer's recommendations.

B. See details for mounting instructions and accessories.

END OF SECTION

SECTION 15820 – FANS

PART 1 - GENERAL

1.01 SCOPE

A. Provisions of this Section shall apply to all HVAC work.

PART 2 - PRODUCTS

2.01 FANS, CENTRIFUGAL IN-LINE

A. AMCA approved air and sound rated direct (or) belt driven fans (as scheduled) complete with V-belt drive sized for 50% overload, self aligning grease lubricated ball bearings, adjustable pitch motor pulleys, adjustable motor bases and statically and dynamically balanced backward curved blade wheels, all enclosed in a galvanized steel housing with inlet bell and outlet duct collars. (Fan wheel and motor assembly shall be hinged for access.)

B. Fans shall be manufactured by Greenheck, Cook, Acme, Penn, Twin City or approved equal.

2.02 FANS, CENTRIFUGAL CEILING EXHAUST

A. AMCA rated direct drive centrifugal fans for ceiling mounting, complete with removable ceiling grille, disconnect, fan mounted solid state speed control, flexible duct connection, integral backdraft damper and discharge outlet.

B. Fans shall be manufactured by Greenheck, Cook, Acme, Penn, Twin City, or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Fans shall be installed in accordance with manufacturer's recommendations.

B. See details for mounting instructions and accessories.

END OF SECTION 15820

SECTION 15840 - DUCTWORK

PART 1 - GENERAL

1.01 SCOPE

A. Include Section 15010, "GENERAL PROVISIONS - HVAC", with this section.

B. Provisions of this Section shall apply to all HVAC work.

1.02 SHOP DRAWINGS:

A. Ductwork shop drawings shall include details of duct constructions: seams, joints, gauges, reinforcing and hanger details for each pressure class and size range together with details of turning vanes, branch connections, dampers and access doors and elevations of all ductwork.

PART 2 - PRODUCTS

2.01 DUCTWORK - GENERAL:

A. Unless otherwise shown or specified construct ducts of galvanized steel sheet metal using gauges and recommended details as contained in the current edition of the SMACNA HVAC Duct Construction Standards. Ductwork shall include supply air, exhaust air, return air, and outdoor air ducts, together with all necessary fittings, splitters, dampers, quadrants, flexible connections, sleeves, hangers, support, braces, etc. Hang and install ducts in a neat and workmanlike manner from structural members (not roof deck) with adequate bracing and cross breaking to prevent breathing, rattling, and vibration.

B. No flexible ductwork on return, exhaust or outside air.

C. Install Duro-Dyne locking quadrants and Duro-Dyne end bearings on all splitters and manual volume dampers located above accessible ceiling and Young #1 regulator, C.P., and Duro-Dyne end bearings elsewhere.

D. Duct dimensions shown do not include allowance for internal insulation.

E. Duct Turns: Wherever possible, duct turns shall have a centerline radius equal to 1.5 times the duct width in the plane of the turn. Vane other duct turns to provide a dynamic loss co-efficient ("C") not greater than 0.2. No reducing ells or tees to be used.

F. Duct Sealing: Seal duct seams and joints as noted below. Seal entire circumference of all branch duct connections, tapping collars and spin-ins. Seal ducts using mastic sealant equal to United Duct Sealer.

1. Class "A" Seal: Seal all joints and seams and leak test as specified.

2. Class "B" Seal: Seal entire circumference of all transverse joints, seal all longitudinal joints.

3. Class "C" Seal: Seal entire circumference of all transverse joints.

4. Class "D" Seal: Seal corner of transverse joints.

2.02 DUCTWORK - LOW PRESSURE:

A. Ductwork: Low Pressure, Pressure and Seal Class shall include:

1. All supply air ductwork: 2” pressure, class “B” seal.

2. All return air ductwork: 2” pressure, class “B” seal.

3. All outside air ductwork: 2” pressure, class “B” seal.

4. General exhaust air ductwork: 2” pressure, class “B” seal.

B. Construct ducts in accordance with SMACNA Duct Construction Standards for pressure and seal classes noted.

2.05 DUCTWORK LOCATED OUTDOORS:

A. Construct ducts served by exhaust fans as specified for respective exhaust ducts, above. Seal all seams weather tight using glass cloth tape and carbolastic or United Duct Sealer.

2.06 FLEXIBLE DUCTS:

A. Flexible duct connectors: A two (2) element spiral construction composed of galvanized steel supporting spiral and coated woven textile fabric with metal or mineral base, UL listed as Class I Air Duct and Connector (UL 181) minimum R=6.0.

B. Flexible connectors shall not exceed 5 feet in length.

C. Make connections between flexible ducts and other equipment using galvanized steel draw bands with plated screws and buckles and United Duct seal for high and medium pressure ducts and nylon draw bands for low pressure ducts.

D. Factory insulate cold flexible ducts using insulation equivalent to that specified for cold ducts.

E. Flexible ducts: Thermoflex M-KC, Wiremold 57K, Technaflex 57K, or Flexmaster Type 4M. Submit sample for approval of any other manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Ductwork shall be installed in accordance with manufacturer's recommendations.

B. See details for mounting instructions and accessories.

END OF SECTION 15840

SECTION 15860 - DUCT ACCESSORIES

PART 1 - GENERAL

1.01 SCOPE

A. Provisions of this Section shall apply to all HVAC work.

PART 2 - PRODUCTS

2.01 SHEET METAL SPECIALTIES:

A. Make rectangular take-offs in low pressure supply, return and exhaust ducts using 45 degrees entry tap (SMACNA Duct Construction Standards Figure #2-8) with manual damper with end bearings and locking quadrant in branch. End bearings and quadrants shall have air tight duct connections and shaft seals: Ruskin, Duro-Dyne, or approved equal.

B. Manual balancing dampers: Comply with SMACNA Duct Construction Standards, Figure 2-14 and 2-15. Equip all dampers with locking quadrants and end bearings. End bearings and quadrants shall have air tight duct connections and shaft seal, Ruskin, Duro-Dyne, or approved equal.

C. When damper quadrants are located other than above lay-in ceilings.

1. Provide all necessary accessories for remote control of balancing dampers without requiring access doors. Substitute Young #1 regulators and an additional end bearing or Ventlock #688 regulators and an additional end bearing for the quadrant (regulators shall be chrome plated), or, Architect/Engineer option.

2. Provide access door for access to the quadrant (See sub-section 2.05 "ACCESS DOORS", hereinafter).

D. Provide "Stand-Offs" (hat sections) for damper quadrants, controls, etc., on externally insulated ducts.

E. Branch duct connections for connecting round low pressure branches to rectangular low pressure trunks: spin-in fittings with integral dampers with end bearings, stand-off and beaded collars. Seal Class of components penetrating duct shall be consistent with duct pressure class. Spin-in shall be Flexmaster - FLD. Submit sample for approval of other manufacturers for prior approval.

2.02 FIRE DAMPERS:

A. Install UL labeled 1-1/2 hour fire dampers wherever sheet metal ducts pass through chase walls, floors, outside fire chases, and elsewhere as shown or required by local Code. Install dampers per SMACNA "Fire Damper Guide" and UL 555.

1. Fire dampers shall be Type "B" "Venation Blind" dampers. Unless otherwise shown folded blades shall not obstruct duct. Dampers in floors shall be spring loaded.

2. Provide factory fabricated steel integral wall sleeve 3" longer than wall

thickness for each fire damper and install sleeve using bolts and angles as detailed in Figure #1 of SMACNA "Fire Damper Guide".

3. Provide rectangular, round and/or flat-oval collars. See Drawings for sizes and locations.

4. For aluminum ductwork provide stainless steel fire dampers.

B. Install ceiling fire dampers in all fire rated ceiling as shown in Figure #11 of SMACNA "Fire Damper Guide" at ceiling penetrations as noted. Fire rated diffuser assembly to be approved for the specific UL Classification of the ceiling assembly used.

C. Install access door in low pressure ducts at each fire damper. Install wall or ceiling access door for access to fire dampers not accessible through lift-out ceilings. See sub-section 2.05 "ACCESS DOORS", below.

D. Install three (3) hour fire dampers where sheet metal ducts pierce 4 hour fire walls. Three (3) hour fire damper shall consist of a three (3) hour UL labeled fire door pivoted in a 3" X 3" X 1/4" angle frame bolted through wall. Equip door frame with angle flange and latch. Install Fire Door as shown in Figure 25 and 26 of SMACNA "Fire Damper Guide".

2.03 AUTOMATIC DAMPERS:

A. Factory fabricated dampers with extruded aluminum airfoil blades and frame with full gasket stops for blades ends. Equip blades with air tight plastic or butyl rubber seals and bronze or nylon bearings. Provide jamb seals. Damper widths from 12" to 60" wide shall not leak any greater than 8 cfm sq. ft.at 4" w.g. and a maximum of 3 CFM sq. ft. at 1" w.g Ruskin CD50 or approved equal.

B. Automatic dampers located near fan outlets or in ducts having maximum velocities exceeding 1500 FPM shall have extruded aluminum air-foil blades and all linkages shall be located outside of airstream. Such dampers shall have leakage rates not exceeding 1% maximum design flow at 4" WG pressure differential.

2.04 SMOKE DETECTORS:

A. Smoke detectors shall be ionization detectors which detect product of combustion. Furnish, wire, and install smoke detectors under this Section. Provide remote visual/audio indicator mounted on the ceiling near the detector.

B. Locate smoke detectors so that indicating lights are visible and so that they will not be affected by moisture from coils or humidifiers.

2.05 ACCESS DOORS:

B. Access doors in low pressure ducts: Galvanized steel frame with gasket permanently secured to duct with a removable gasket access port held in place with screw driver or thumb operated latches. Door in insulated ducts: Double thickness with insulation. Doors in non-insulated ducts: A single thickness. Weld door frames to kitchen exhaust ducts. Size doors to permit removal of equipment or maintenance. Minimum size 12" X 12".

E. Mark access points in lift-out ceilings with brass paper brads. Bend points of brads over top of ceiling.

2.06 FLEXIBLE DUCT CONNECTIONS:

A. Install Neoprene coated glass cloth flexible connections at all duct connections to all fans and AC Units.

B. Install flexible connections in all ducts at building expansion joints.

2.07 ELECTRICAL GROUNDING:

A. Ground all fans.

B. Install braided copper jumpers around all flexible connections, taking care that jumpers do not bind flexes.

2.08 INTAKE AND RELIEF ROOF HOOD:

A. Factory fabricated spun aluminum ventilator with integral curb cap and birdscreen. Equip hood with galvanized steel curb with wood nailer. Minimum material gauges, hood 20 gauge, base 18 gauge, curb 18 gauge.

B. Gravity Roof Ventilators shall be manufactured by Greenheck, Cook or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Duct shall be installed in accordance with SMACNA Standards.

B. Equipment shall be installed in accordance with manufacturer’s recommendations.

C. See details for mounting instructions and accessories.

END OF SECTION 15860

SECTION 15870 - OUTLETS

PART 1 - GENERAL

1.01 SCOPE

A. Include section 15010 "GENERAL PROVISIONS" with this section.

B. Provisions of this Section shall apply to all HVAC work.

PART 2 - PRODUCTS

2.01 GRILLES, REGISTERS AND DIFFUSERS:

A. General: Air devices may be Titus, Price, Nailor, Krueger, or approved equal. Where fire dampers are required at grilles, provide steel grilles, not aluminum.

B. Rectangular Louver Face Ceiling Diffusers (S): One, two, three, four way or corner throw diffusers. Fixed pattern louver face diffusers, aluminum construction (Steel Construction where ceiling fire dampers are required) with off-white enamel finish, removable cores latched in place, and adjustable multi-blade scoops. Titus "TDC-AA".

C. Supply Registers (SR): Adjustable vertical deflection, adjustable horizontal deflection, removable core, opposed blade damper and multi-blade scoop and off white baked enamel finish. Titus "272FS".

D. Wall Return Grilles (WRG): Horizontal bars fixed at about 15° angle, close spacing and plaster frames. Off white baked enamel finish. Titus "350FL".

E. Wall Return Register (WRR): Horizontal bars fixed at about 15° angle, plaster frames and opposed blade damper. Off white baked enamel finish. Titus "350FL".

F. Ceiling Return Grilles (R), Ceiling Exhaust Grilles (E) and Transfer Air Grilles (T): All aluminum, 1/2" X 1/2" X 1/2" cube core and plaster frames as needed. Off-white baked enamel finish. Provide 24 x 24 panel so grille will fit in 24 x 24 ceiling grid. Titus "50F".

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Equipment shall be installed in accordance with SMACNA Standards and manufacturer's recommendations.

B. See details for mounting instructions and accessories.

END OF SECTION 15870

1.0 - GENERAL

1.1 SCOPE:

A. Provisions of this section apply to all HVAC work.

2.0 - PRODUCTS

2.1 FILTERS - AIR:

A. 30% Filters, 1" or 2" Thick (Maximum allowed by MFR): Throwaway deep pleated filters, maximum face velocity 350 fpm. Maximum initial pressure drop 0.1" WG, UL Class 1, 30% efficiency per ASHRAE Test Standard 52-76, minimum ratio of media area to face area 4.4:1. Turn system over to Owner with clean filters and provide one (1) set of spare filters. Farr 30/30 or approved equal.

3.0 - EXECUTION

3.1 INSTALLATION:

A. Filters shall be installed in accordance with manufacturer's recommendations.

B. See details for mounting instructions and accessories.

END OF SECTION

SECTION 15900 - CONTROLS

PART 1 - GENERAL

1.01 SCOPE

A. Include Section 15010 "GENERAL PROVISIONS", with this Section.

B. Provisions of this Section shall apply to all HVAC work.

PART 2 - PRODUCTS

2.01 CONTROL SYSTEMS

A. Furnish and install complete and ready for operation with control sequences specified below.

B. Products of a manufacturer maintaining complete service and parts facilities in Alabama continuously for the last three (3) years: Trane, Carrier, Johnson Controls, or approved equal.

C. Control equipment, except for items comprising an integral part of the water or refrigeration piping, shall be installed by trained mechanics employed by the Control Manufacturer.

D. Include the services of a full time control technician for calibrating and adjusting controls for the first 5 working days after Owner has occupied building.

E. Before installation, submit for approval five (5) copies of complete power and control wiring and piping diagrams.

F. Provide permanent nameplates for control switches and motor starters. Nameplates: engraved laminated plastic with letters legible under normal operating conditions. (White on black).

G. Permanently identify control devices other than room thermostats, so they may be identified on control diagrams. Provide engraved plastic nameplates for items mounted outside of or on faces of panels. Mark other instruments with indelible ink.

H. At controls contractor option, system may be wireless communication.

2.02 CONTROL WIRING:

A. Include control and interlock wiring and power wiring for control panel in this Section. Install in conduit in accordance with provisions of Electrical Work where exposed, concealed in walls or above ceilings other than lay-in type. Provide plenum rated cable above lay-in ceilings (for plenum or non-plenum).

B. Waterproof and firestop all conduit floor penetrations. Firestop conduit penetrations of fire rated walls partitions.

C. Wire all devices individually to terminal strips in control panels.

D. Furnish necessary relays and auxiliary contactors and other accessories required.

Provide interlock relays per NEC. Coordinate start-stop stations, auxiliary contacts, etc., with supplier of Starters, Variable Frequency Drive (VFD) and Motors Control Centers specified in Electrical Work.

2.03 CONTROL DEVICES:

A. Program Clocks / Timers:
Provide digital time clock with 365 day holiday capabilities with 24 single dates, 99 setpoints, separate scheduling for each day of the week, AM/PM format, one minute programming resolution, portable memory module, optional programmer for integration into a Windows based PC for program duplication and modifications, LCD display, daylight savings or standard time, automatic leap year correction, permanent schedule retention, 100 hours of backup, manual override, Nema 3 indoor/outdoor enclosure. Clock/Timer to be Tork or approved equal.

B. Damper Operators: Of sufficient power to close/open valves and dampers under operating conditions. Electric valve and damper motors shall have oil immersed gear trains and spring return to normal position. Valves and damper operators to have DDC Controls.

C. Provide stand-offs for control devices mounted on externally insulated ducts and equipment.

2.04 CONTROL POWER:

A. Direct Digital Control (DDC) All 120 Volt wiring shall be the responsibility of the Control Sub-Contractor from circuit furnished under Electrical Section.

B. Power wiring to all automatic dampers shall be included under this section.

2.05 CONTROL SEQUENCES:

A. As shown on Drawings.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Control diagrams on drawings and/or Control Sequences are intended to indicate, in general, control arrangements. Provide all instruments, relays, operators, switches, etc. required to accomplish control sequences whether or not such devices are actually shown.

END OF SECTION 15900

Jrm Engineering, LLC.
1521 Rainbow Drive
Gadsden, Alabama 35901
Phone: 256-413-7717

Project: A new City Hall and Municipal Office Facility for the City of Centre
Architect: Thomas M. McElrath, Architect
Jrm Engineering. Project Number: 4904-24

END TABLE OF CONTENTS

PART 1 - GENERAL REQUIREMENTS

1.1 RELATED DOCUMENTS

A. The following codes and standards are referenced in this document.

1. NFPA 70, National Electrical Code, 2020
2. ASHRAE 90.1, Energy Standard for Buildings, 2021
3. International Fire Code (IFC) 2021
4. International Building Code (IBC) 2021
5. Americans with Disabilities Act Accessibility Guidelines (ADAAG) 2010

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division1 Specification Sections, apply to this Section.

1.2 SCOPE OF WORK

A. Arrange with the local utility companies for providing such electrical services as shown on drawings or herein specified. Coordinate all requirements for the electrical services shown on the plans with the utility engineering and construction supervisors prior to bidding and/or roughing. NOTIFY THE ENGINEER IN WRITING OF DISCREAPANCIES BETWEEN PLANS AND UTILITY REQUIREMENTS FOR RESOLUTION PRIOR TO BIDDING.

B. All aid to construction charges for permanent power to be paid direct by owner. All aid to construction charges for temporary power to be included in bid price and to be paid by contractor.

C. Remove or relocate all electrical services located on or crossing through the Project property, either above or below grade, which would obstruct the construction of the Project or conflict in any manner with the completed Project or any Code pertaining thereto. See Civil Engineering Plans in addition to electrical site plan for work required. Although the design team has made every effort to correctly represent existing conditions on site, it is the contractor's responsibility to visit the site and determine the extent of the required demolition and new electrical work.

D. Furnish and install complete temporary electrical light and power system during construction period. The required temporary lighting required during finish work shall be sufficient so as to facilitate other trades (finishes). Coordinate lighting requirements where interior finishes are being applied with the general contractor and/or painting subcontractor.

E. Furnish and install complete electrical light and power systems.

F. Connect all meters, panelboards, circuit breakers, power outlets, convenience outlets, switches and/or other equipment forming part of the system.

G. Furnish and install complete system of outlet boxes, faceplates, conduit raceways, cables and terminal cabinets for IT and security systems system.

H. Connect all electrical equipment noted in this Section or noted on Drawings, whether furnished by Electrical Contractor or by others.

I. The electrical contractor shall review all sections of the contract documents (Plans and Specifications) and shall endeavor to determine whether all equipment requiring electrical power whether shown on the electrical plans or not. Notify the Electrical

Engineer in writing prior to the bid with any discrepancies with mechanical and/or plumbing plans. Include in bid price all required materials and labor required for a full functioning system/building.

J. Connect all mechanical and plumbing equipment as required to provide a full functioning system as specified by the Mechanical Engineer. Verify locations for all dampers (control dampers and fire/smoke dampers), circulating pumps, fans, boilers, water heaters and other loads with the mechanical and plumbing plans prior to bidding.

K. Install all starters as shown on plans or as called for in these Specifications. All starters shall be NEMA rated. All VF drives for mechanical equipment shall be furnished and installed by mechanical contractor with power feeder and final connections to the VF drive by the electrical contractor.

L. Furnish and install all disconnect switches.

M. Furnish and install power wiring and connection for starters and motors. Furnish and install all control wiring specifically shown on drawings or as required to make the system operational as designed.

N. Furnish and install generator set and transfer switch as shown on the plans. Provide and install control wiring, annunciators, connections, testing and startup for complete system.

O. Provide and install lighting control system for Bunk, Apparatus Room, Day room, entryway and secure corridor lighting as shown on the plans. Provide and install interface with alarm system to automatically turn lights ON to full bright in Bunks, Secure Corridor and Apparatus Room Lights. Provide and install dimming controls in bunk rooms as shown. Provide astronomic timeclock control for entryway lighting. Provide and install occupancy sensing with manual overrides for Secure Corridor. Provide manual, non-dimmed control of apparatus room lights.

P. Furnish and install Auxiliary Systems as shown on the Drawings and as required.

Q. Procure and pay for permits and certificates as required by local and state ordinances and Fire Underwriters Certificate of Inspection.

R. Submit to Architect, a certificate of Final Inspection from local inspection department.

S. Work noted “NIC” (Not in Contract) shall be excluded from the work to be done by this trade, as follows:

1. A complete System of Control Wiring for the Mechanical System (unless specifically shown on Drawings).

2. Motors in place by others, connection for correct rotation by this trade.

T. Division 26 will be responsible to support the commissioning requirements specified in section 01 91 13 and other sections referenced in 01 91 13.

1.3 DRAWINGS AND SPECIFICATIONS

A. Electrical work shown on drawings inclusive. Follow any supplementary drawings as though listed above.

B. Drawings and Specifications are complementary. Work called for by one is binding as if called for by both.

C. Drawings show general run of circuits and approximate location of equipment. Right is reserved to change location of equipment and devices and routing of conduits to a reasonable extent, without extra cost to Owner.

D. Refer conflicts between drawings and specifications describing electrical work and work under other Sections to Architect for remedial action.

E. Use dimensions in figures in preference to scaled dimensions. Do not scale drawings for exact sizes or locations.

F. Execution of Contract is evidence that Contractor has examined all drawings and specifications related to work, and is informed to extent and character of work. Later claims for labor and materials required due to difficulties encountered, which should have been foreseen had examination been made, will not be recognized.

1.4 PROJECT COORDINATION MEETINGS

A. Promptly after award of the Contract, and prior to commencing any project related activities. The Successful Electrical Contractor shall contact the Electrical Engineer to schedule an acceptable date and time for the initial project coordination meeting. This meeting will be held at the Electrical Engineer's office at the scheduled time to discuss any/all issues related to the electrical aspects of the Project. The Contractor, as well as the contractor's job foreman/superintendent for the project is required to attend this meeting. The contractor shall furnish a complete set of Plans and Specifications at this meeting.

1.5 EXISTING CONDITIONS

A. The Contractor shall visit the site and determine all conditions that affect this Contract. Contractor shall include in bid price cost of relocating any electrical or auxiliary lines and/or equipment as required whether shown or not. Failure to do so will not relieve Contractor of his/her responsibility under this contract.

1.6 TEMPORARY SYSTEMS

A. The Contractor shall be responsible for the furnishing and installation of all equipment and materials necessary for providing electrical power and lighting to the new building during construction. All temporary wiring shall be made in a safe and approved manner.

B. It shall be the responsibility of the electrical contractor to visit the site prior to submitting bid and thoroughly review all existing conditions affecting the temporary systems requirements.

C. The contractor shall provide temporary lighting levels as necessary where interior finishes are being applied. Coordinate with general contractor for required lighting.

1.7 CONTRACTOR QUALIFICATIONS

A. If the electrical contractor proposes to use any other subcontractor for the installation of any auxiliary system, etc., these Subcontractors shall be a factory authorized distributor of the specified system and shall also meet the above qualifications before bid is acceptable.

B. All electrical contractors whose submitting bids for this project shall be licensed as an electrical sub-contractor in accordance with the State of Alabama Licensing Board for General Contractors.

C. The Electrical Contractor shall be properly licensed (before the bid date) to bid and perform the project. This includes being a properly licensed general Contractor in the State of Alabama, such as having a State of Alabama General contractors License with the Major Classifications “Building Construction” (BC) and “Municipal & Utility” (MU), or a General Contractors License in “Specialty Construction” – Electrical (E), as applicable.

D. The Electrical Contractor shall use properly licensed journeymen, and apprentices that are professional craftsmen in the applicable field and provide documentation.

E. The Electrical Contractor shall possess and provide proof of insurance with coverage and limits meeting or exceeding those prescribed under the laws of the State of Alabama for Liability and Workers’ Compensation.

F. The Electrical Contractor and his/her sub-contractors shall have been in business (under the same name and principal control) for five (5) years prior to date of opening bids and shall have past experience in the types of work involved in this project, and be regularly engaged in all the applicable types of work. Documentation shall be provided on past projects with references for at least five projects or similar type, size and scope.

G. If the electrical contractor proposes to use any other subcontractor for the installation of any auxiliary system, etc., these Subcontractors shall be a factory-authorized distributor of the specified system and shall also meet the above qualifications before bid is acceptable.

H. The Electrical Contractor shall use State of Alabama licensed masters and journeymen electricians as job superintendents. The Electrical Contractors superintendent (Journeyman or Master Electrician) shall be on site when electrical work is being performed. The Electrical Contractor shall have on Journeyman or Master Electrical on site for every eight (8) apprentices.

1.8 QUALITY ASSURANCE

A. All work shall be in accordance with the NFPA 70 National Electrical Code NEC 2017 and the rules and regulations of the local bodies having jurisdiction.

B. The published standards and requirements of the National Electrical Manufacturers Association, the American National Standard Institute, the Institute of Electrical and Electronic Engineers, and the American Society of Testing Materials, are made a part of these specifications and shall apply wherever applicable.

C. Work under this Section shall be first class with emphasis on neatness and workmanship.

D. Install work using competent mechanics under supervision of foreman, all duly certified by local authorities. Installation subject to Architect’s constant observation, final approval, and acceptance. Architect may reject unsuitable work.

E. Furnish Architect written guarantee, stating that if workmanship and/or material executed under this Section is proven to be defective within one (1) year after final acceptance, such defects and other work damaged will be repaired and/or replaced.

F. Listing and Labeling: Provide products specified in this Section that are listed and labeled. The Terms "Listed and Labeled": As defined in the National Electrical Code, Article 100.

1.9 ON-SITE OBSERVATIONS AND DEMONSTRATION OF FUNCTIONALITY

A. Contractor shall notify Engineer at least three (3) days prior to covering any underground feeders, pouring slab, installing ceiling systems in order to allow time for on-site observations.

B. At all observations of work, open panel covers, junction box covers, pull box covers, device covers, and other equipment with removable plates for check. Provide sufficient personnel to expedite cover removal and replacement.

C. Contractor to assist Architect in demonstration of operation of new systems to satisfaction of Owner. Contractor to have manufacturer available for demonstration of systems where requested by Owner or as called for in other sections of this specification. Contractor shall notify Engineer and Architect two (2) weeks prior to demonstration of systems where manufacturer assistance is required.

D. Perform test required by Architect to indicate compliance with specifications, drawings and applicable codes. Provide instruments, labor and materials for tests.

1.10 PROTECTION OF PERSONS AND PROPERTY DURING CONSTRUCTION

A. Take all precautions to provide safety and protection to persons and protection of materials and property as necessary, including protection from injury from rotating or moving equipment, tools, hot surfaces, holes, shafts, falling objects, electrical energy and all other potential hazards. Erect sign, barricades, warning lights, instruct workmen and others who may be subject to construction hazards.

B. Protect items of equipment from stain, corrosion, scratches and any other damage or dirt, whether in storage at job site or installed. No damaged or dirty equipment, lenses or reflectors will be accepted.

1.11 CLEARANCE WITH UTILITIES

A. Before submitting a proposal, check with all authorities or utilities concerned as to points of connection with power and telephone lines, installation of transformers, location of service cut-in and metering, requirements as to any additional service equipment, and other details of the installation. If their requirements are at variance with these specifications or drawings and involve extra expense, these requirements shall be included in bid and the contract price shall include all costs necessary to meet those requirements without extra cost to the Owner after a contract is entered into.

1.12 CHANGES ORDERS AND ADDITONAL WORK

A. No change shall be made from the work as called for by these specifications and drawings except on written order of the Architect. Deviations from drawings and specifications shall be made in submittal form and shall include all information for approval including drawings where required. No change for extra work will be allowed unless such extra work has been duly authorized by a written order of the Architect stating the change to be made.

1.13 SEQUENCING AND SCHEDULING

A. Coordinate electrical equipment installation with other building components.

B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for electrical installations.

C. Coordinate installing required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

D. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning prior to closing in the building.

E. Coordinate connecting electrical service to components furnished under other Sections.

F. Coordinate connecting electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

G. Coordinate installing electrical identification after completion of finishing where identification is applied to field-finished surfaces.

H. Coordinate installing electrical identifying devices and markings prior to installing acoustical ceilings and similar finishes that conceal such items.

1.14 AS-BUILT DRAWINGS

A. Contractor to provide to owner at project completion the following:

1. Two (2) compact disc/DVD volumes with color pdf files showing any/all deviations to the contract documents.

2. One each set of electrical plans on reproducible media indicating any/all deviations to contract documents.

1.15 COORDINATION WITH OTHER TRADES

A. Review all specification sections and drawings including HVAC, plumbing and other equipment drawings and other divisions of the specifications for equipment requiring electrical service. Provide service to and make connections to all such equipment requiring electrical service.

B. Contractor to coordinate all aspects of mechanical equipment furnished and installed by others with approved equipment submittals prior to any roughing. It is the responsibility of this contractor to coordinate phase, voltage, minimum circuit amps and maximum over-current protective devices with approved submittals prior to roughing. Coordinate exact connection locations with the mechanical contractor prior to any roughing. Notify engineer in writing of discrepancies between the plans and the approved equipment data.

C. Contractor to coordinate all aspects of plumbing equipment furnished and installed by others with approved equipment submittals prior to any roughing. It is the responsibility of this contractor to coordinate phase, voltage, minimum circuit amps and maximum over-current protective devices with approved equipment submittals prior to roughing. Coordinate exact connection locations with plumbing contractor prior to any roughing. Notify engineer in writing of discrepancies between the plans and the approved equipment data.

D. Coordination Shop Drawings: Electrical contractor shall coordinate with other trades (structural, mechanical, plumbing, and fire protection) to determine the space required, and the routing and locations of their respective trades. Prepare shop drawings at ¼” = 1’-0” scale for all electrical rooms and rooms with electrical panels, main data frame room (MDF), intermediate data frame rooms (IDF), and corridors showing electrical, fire protection, mechanical, and plumbing work with elevations to equipment, conduit

routing, and clearances for equipment noted. Failure to coordinate does not constitute a change order when components will not fit within the allocated space and may result in installed equipment and materials being removed at the contractor's expense.

E. Electrical requirements, roughing locations, auxiliary conduit requirements, etc. for Door control equipment, SCBA equipment, Laundry equipment, and Kitchen equipment shall be coordinated with approved equipment submittals prior to any roughing. Notify engineer in writing of discrepancies between plans and submittals/requirements. Contractor shall provide any/all conduits and wiring required for a complete system as specified.

F. shall coordinate with other trades (structural, mechanical, plumbing, and fire protection) to determine the space required, and the routing and locations of their respective trades. Prepare shop drawings at ¼" = 1'-0" scale for all electrical rooms and rooms with electrical panels, main data frame room (MDF), intermediate data frame rooms (IDF), and corridors showing electrical, fire protection, mechanical, and plumbing work with elevations to equipment, conduit routing, and clearances for equipment noted. Failure to coordinate does not constitute a change order when components will not fit within the allocated space and may result in installed equipment and materials being removed at the contractor's expense.

PART 2 - ELECTRICAL PRODUCT REQUIREMENTS

2.1 SUBMITTALS AND MATERIALS DATA

A. For this project - all submittals under this division shall be provided in searchable PDF file format. All warranty materials and O&M manuals shall be provided in searchable PDF file format.

B. The approval of shop drawing shall not be interpreted as a complete check by the Engineer, but will indicate only that the general specifications for the equipment to be provided is satisfactory. Approval of such drawings does not relieve the contractor of responsibility of coordination of components, auxiliary equipment, accessories or special conditions required for satisfactory operation of the completed system.

C. All shop drawings for a specific item shall be made in one submittal. No submittals will be checked until all required submittals are received by the Engineer. All submittals must be approved prior to commencing any work on this project.

D. The electrical contractor shall check all suppliers' submittals regarding measurements, capacity, performance, and details to satisfy him/herself that they conform to the intent of the contract drawings and specifications. Shop drawings and submittals shall bear the stamp of approval of the Contractor as evidence that the drawings have been checked by him. Drawings submitted without this stamp of approval will not be considered and will be returned for contractor approval and stamp. A minimum of ten (10) working days shall be allowed for checking for submittals.

E. Any materials and equipment listed which are not in accordance with specification requirements may be rejected.

F. All submittals shall clearly identify the item submitted. Standard catalog sheets shall be marked, in ink to identify which item is to be considered. All drawings submitted must be by factory as field drawings will not be accepted.

2.2 ELECTRICAL PRODUCT SUBSTITUTIONS

A. Any proposed substitution of equipment or materials from that specified must be submitted in writing to the Engineer within ten (10) days prior to the bid date. The Engineer will respond in writing as to the acceptance/rejection of the proposed product. Faxed transmittals, e-mails and verbal requests will not be considered.

B. All proposed substitutions shall clearly identify the item submitted as well as the technical information that is called for in other portions of the Electrical Divisions of this Specification. Standard catalog sheets shall be marked, in ink to identify which item is to be considered. All drawings submitted must be by prepared by the factory as field/distributor-prepared drawings will not be accepted.

C. It is the contractor's sole responsibility to insure that any/ all costs associated with additional materials, labor, setup, programming and coordination required for, or associated with, the inclusion of any products/ systems specified as an equal or pre-approved equal to the product/ system specified in his/ her bid are included in the bid price. No change order will be accepted on the basis of additional work or materials required as a result of a product substitution.

PART 3 - EXECUTION

NOT APPLICABLE

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Building wires and cables rated 600 V and less.
   2. Connectors, splices, and terminations rated 600 V and less.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Alcan Products Corporation; Alcan Cable Division.
   2. Encore Wire Corporation.
   3. General Cable Technologies Corporation.
   4. Southwire Incorporated.

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2, Type XHHW-2, and Type SO.

2.2 CONNECTORS AND SPLICES

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following: AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. Ideal Industries, Inc.
4. O-Z/Gedney; a brand of the EGS Electrical Group.
5. 3M; Electrical Markets Division.
6. Tyco Electronics.

B.

C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper - Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, except VFC cable, which shall be extra flexible stranded.

3.2 CONDUCTOR INSULATION AND WIRING METHODS

A. Service Entrance: Type XHHW-2, single conductors in raceway (Southwire SIMPull or approved equal). Cross-linked polyethylene (XLP) insulation.

B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway (Southwire SIMPull or approved equal).

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway (Southwire SIMPull or approved equal).

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway (Southwire SIMPull or approved equal). Cross-linked polyethylene (XLP) insulation.

E. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-2-THWN-2, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-2-THWN-2, single conductors in raceway.

G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.

H. Branch Circuits Installed below Raised Flooring: Type THHN-2-THWN-2, single conductors in raceway.

I. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 26 05 29 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 26 05 53 " Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to IBC 711 and 712, latest revision."

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance conductors, all panelboard feeder conductors and conductors feeding the following critical equipment and services for compliance with requirements.
   a. Dimming Rack.
2. Perform each visual and mechanical inspection and **electrical** test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

B. Test and Inspection Reports: Prepare a written report to record the following:
   1. Procedures used.
   2. Results that comply with requirements.
   3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Grounding systems and equipment.

B. Section includes grounding systems and equipment.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
   1. Test wells.
   2. Ground rods.
   3. Grounding arrangements and connections for separately derived systems.
   4. Grounding for sensitive electronic equipment.
   5. Grounding equipment enclosures.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals to include the following:
   1. Instructions for periodic testing and inspection of grounding features at test wells ground rings grounding connections for separately derived systems based on NETA MTS.
      a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
      b. Include recommended testing intervals.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

C. Comply with NFPA 70, Section 250 (National Electrical Code) for grounding and bonding.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:
   1. Solid Conductors: ASTM B 3.
   2. Stranded Conductors: ASTM B 8.
   3. Tinned Conductors: ASTM B 33.
   4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
   5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
   6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
   7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 12 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

2.2 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
   1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch diameter by 10 feet in length.

B. Chemical-Enhanced Grounding Electrodes (where required to achieve specified grounding system resistance values): Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts.

1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches long.
2. Backfill Material: Electrode manufacturer's recommended material.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.
1. Bury at least 24 inches below grade.

C. Grounding Bus: Install in electrical and telephone/IT equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
1. Install bus on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down to specified height above floor; connect to horizontal bus.

D. Conductor Terminations and Connections:
1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

E. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.
   1. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
   2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4-by-12-inch grounding bus.
   3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

F. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
   1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
   2. For grounding electrode system, install at least three rods spaced at least two-rod lengths from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
   1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
   2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
   3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

G. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

H. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.
1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

3.4 LABELING

A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for instruction signs. The label or its text shall be green.

B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.
1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:
1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells , and at individual ground rods. Make tests at ground rods before any conductors are connected.
   a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
   b. Perform tests by fall-of-potential method according to IEEE 81.
4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:
   1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
   2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
   3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
   4. Power Distribution Units or panels serving Electronic Equipment: 3 ohm(s).

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Hangers and supports for electrical equipment and systems.
   2. Construction requirements for concrete bases.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Steel slotted support systems.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:
   1. Trapeze hangers. Include Product Data for components.
   2. Steel slotted channel systems. Include Product Data for components.
   3. Equipment supports.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.7 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

1.8 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Allied Tube & Conduit.
      b. Cooper B-Line, Inc.; a division of Cooper Industries.
      c. ERICO International Corporation.
      d. GS Metals Corp.
      e. Thomas & Betts Corporation.
      f. Unistrut; Tyco International, Ltd.
      g. Wesanco, Inc.
   2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
   3. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Cooper B-Line, Inc.; a division of Cooper Industries.
      2) Empire Tool and Manufacturing Co., Inc.
      3) Hilti Inc.
      4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      5) MKT Fastening, LLC.
2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Toggle Bolts: All-steel springhead type.
6. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements specified elsewhere "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
   1. Secure raceways and cables to these supports with two-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
   1. To Wood: Fasten with lag screws or through bolts.
   2. To New Concrete: Bolt to concrete inserts.
   3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
   4. To Existing Concrete: Expansion anchor fasteners.
   5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
   6. To Light Steel: Sheet metal screws.
   7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements specified elsewhere "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified elsewhere.

C. Anchor equipment to concrete base.
   1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   2. Install anchor bolts to elevations required for proper attachment to supported equipment.
   3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
   1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements specified elsewhere in these specifications for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Metal conduits, tubing, and fittings.
   2. Non-metal conduits, tubing, and fittings.
   3. Metal wireways and auxiliary gutters.
   4. Non-metal wireways and auxiliary gutters.
   5. Surface raceways.
   6. Boxes, enclosures, and cabinets.
   7. Hand holes and boxes for exterior underground cabling.

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. GRC: Galvanized rigid steel conduit.

C. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For all products specified in this section.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

C. Samples: For wireways and/or nonmetallic wireways and surface raceways and for each color and texture specified, 12 inches long.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
   1. Structural members in paths of conduit groups with common supports.
   2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Qualification Data: For professional engineer.

C. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit; a Tyco International Ltd. Co.
3. Anamet Electrical, Inc.
4. Electri-Flex Company.
5. O-Z/Gedney; a brand of EGS Electrical Group.
6. Picoma Industries, a subsidiary of Mueller Water Products, Inc.
7. Republic Conduit.
8. Robroy Industries.
9. Southwire Company.
10. Thomas & Betts Corporation.
11. Western Tube and Conduit Corporation.
12. Wheatland Tube Company; a division of John Maneely Company.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. ARC: Comply with ANSI C80.5 and UL 6A.

E. IMC: Comply with ANSI C80.6 and UL 1242.

F. EMT: Comply with ANSI C80.3 and UL 797.

G. FMC: Comply with UL 1; zinc-coated steel.

H. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:
   a. Material: Steel.
   b. Type: Setscrew or compression.
3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

J. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NON-METALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.
3. Arnco Corporation.
4. CANTEX Inc.
5. CertainTeed Corp.
6. Condux International, Inc.
7. Electri-Flex Company.
8. Kraloy.
9. Lamson & Sessions; Carlon Electrical Products.
10. Niedax-Kleinhuis USA, Inc.
11. RACO; a Hubbell company.
12. Thomas & Betts Corporation.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. LFNC: Comply with UL 1660.

E. RTRC: Comply with UL 1684A and NEMA TC 14.

F. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

G. Fittings for LFNC: Comply with UL 514B.

H. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper B-Line, Inc.
2. Hoffman; a Pentair company.
3. Mono-Systems, Inc.
4. Square D; a brand of Schneider Electric.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
   1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Screw-cover type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Wiremold / Legrand.
      b. Panduit Corp.
      c. Hubbell

2.5 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Adalet.
   2. Cooper Technologies Company; Cooper Crouse-Hinds.
   3. EGS/Appleton Electric.
   4. Erickson Electrical Equipment Company.
   5. FSR Inc.
   6. Hoffman; a Pentair company.
   7. Hubbell Incorporated; Killark Division.
   8. Kraloy.
   9. Milbank Manufacturing Co.
   10. Mono-Systems, Inc.
   11. O-Z/Gedney; a brand of EGS Electrical Group.
   12. RACO; a Hubbell Company.
   13. Robroy Industries.
   14. Spring City Electrical Manufacturing Company.
   15. Stahlin Non-Metallic Enclosures; a division of Robroy Industries.
   16. Thomas & Betts Corporation.
   17. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Non-metallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Metal Floor Boxes:
1. Material: As shown on the plans.
2. Type: As shown on the plans.
3. Shape: Rectangular.
4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Non-metallic Floor Boxes:
1. Material: As shown on the plans.
2. Type: As shown on the plans.
3. Shape: Rectangular.
4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

I. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

J. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

K. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

L. Gangable boxes are prohibited.

M. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

2.6 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:
1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Composite Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Hubbell - Quazite
   b. Carson Industries LLC.
   c. CDR Systems Corporation; Hubbell Power Systems.
   d. Oldcastle Precast, Inc.; Christy Concrete Products.
   e. Synertech Moulded Products; a division of Oldcastle Precast, Inc.
2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC." or as shown on the plans.

C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers as called for on plans.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Armorcast Products Company.
      b. Carson Industries LLC.
      c. CDR Systems Corporation; Hubbell Power Systems.
      d. NewBasis.
      e. Nordic Fiberglass, Inc.
      f. Oldcastle Precast, Inc.; Christy Concrete Products.
      g. Synertech Moulded Products; a division of Oldcastle Precast, Inc.
   2. Standard: Comply with SCTE 77.
   3. Color of Frame and Cover: Green.
   4. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
   5. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
   6. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
   7. Cover Legend: Molded lettering, "ELECTRIC." or as shown on the plans.

2.7 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Hand hole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
   1. Tests of materials shall be performed by an independent testing agency.
   2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
   3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed Conduit: GRC IMC.

2. Concealed Conduit, Aboveground: GRC IMC.
3. Underground Conduit: RNC, Type EPC-40-PVC or Type EPC-80-PVC (as shown on the Plans), direct buried or concrete encased as shown on the Plans.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC or IMC. Raceway locations include the following:
   a. Loading dock.
   b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
   c. Mechanical rooms.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: GRC or IMC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use setscrew or compression, steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

G. Install surface raceways only where indicated on Drawings.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches of enclosures to which attached.

I. Raceways Embedded in Slabs:
   1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-footintervals.
   2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
   3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
   4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
   5. Change from RNC, Type EPC-40-PVC, to GRC or IMC before rising above floor.

J. Stub-ups to Above Recessed Ceilings:
   1. Use EMT, IMC, or RMC for raceways.
   2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

N. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

P. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

Q. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

R. Surface Raceways:
1. Install surface raceway with a minimum 2-inchradius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

S. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

T. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

U. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

V. Expansion-Joint Fittings:
1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
    d. Attics: 135 deg F temperature change.
3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.

4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

W. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

X. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to bottom of box unless otherwise indicated.

Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

Z. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

AA. Locate boxes so that cover or plate will not span different building finishes.

BB. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

DD. Set metal floor boxes level and flush with finished floor surface.

EE. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:
1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section "Earthwork" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section "Earthwork."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section "Earthwork."

4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
   a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
   b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
5. Underground Warning Tape: Comply with requirements in Section 26 05 53 "Electrical Identification."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install handholes with bottom below frost line.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section "Through-Penetration Firestop Systems."

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

26 05 44 - 1 SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Architectural specifications for “Through-Penetration Firestop Systems" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.

b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Advance Products & Systems, Inc.
b. CALPICO, Inc.
c. Metraflex Company (The).
d. Pipeline Seal and Insulator, Inc.
e. Proco Products, Inc.

2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Stainless steel.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Description: Non-shrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in architectural specification section for "Joint Sealants."
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION

SECTION 26 05 53-1 IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Identification for raceways.
   2. Identification of power and control cables.
   3. Identification for conductors.
   4. Underground-line warning tape.
   5. Warning labels and signs.
   6. Instruction signs.
   7. Equipment identification labels.
   8. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and IEEE C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

2.2 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

2.3 FLOOR MARKING TAPE

A. 2-inch- wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

2.4 UNDERGROUND-LINE WARNING TAPE

A. Tape:
1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:
1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE,

2.5 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

2.6 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.
   1. Engraved legend with black letters on white face.
   2. Punched or drilled for mechanical fasteners.
   3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.7 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

B. Nameplate color and information required on nameplate as shown on the Plans.

2.8 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
   1. Minimum Width: 3/16 inch.
   2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
   3. Temperature Range: Minus 40 to plus 185 deg F.
   4. Color: Black except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.
   1. Minimum Width: 3/16 inch.
   2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
   3. Temperature Range: Minus 40 to plus 185 deg F.
   4. Color: Black.

C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
   1. Minimum Width: 3/16 inch.
   2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
   3. UL 94 Flame Rating: 94V-0.
   4. Temperature Range: Minus 50 to plus 284 deg F.
   5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Attach signs and plastic labels with mechanical fasteners appropriate to the location and substrate.

E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

F. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
   1. Outdoors: UV-stabilized nylon.
   2. In Spaces Handling Environmental Air: Plenum rated.

G. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

H. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl tape applied in bands. Install labels at 10-foot maximum intervals.

B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
   1. Emergency Power.
   2. Fire Alarm System.
   3. Power feeders
   4. Intercom System
   5. ETV System
   6. IT Systems

C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
   1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder, and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
b. Colors for 208/120-V Circuits:
   1) Phase A: Black.
   2) Phase B: Red.
   3) Phase C: Blue.
   4) Phase A Neutral: White, Black stripe.
   5) Phase B Neutral: White, Red stripe.
   6) Phase C Neutral: White, Blue stripe.
c. Colors for 480/277-V Circuits:
   1) Phase A: Brown.
   2) Phase B: Orange.
   3) Phase C: Yellow.
   4) Phase A Neutral: White/Gray, Brown stripe.
   5) Phase B Neutral: White, Gray, Orange stripe.
   6) Phase C Neutral: White/Gray, Yellow stripe.
d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

E. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive vinyl labels with the conductor or cable designation, origin, and destination.

F. Control-Circuit Conductor Termination Identification: For identification at terminations provide self-adhesive vinyl labels with the conductor designation.

G. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
   1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
   2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
   3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

H. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
   1. Install underground-line warning tape for both direct-buried cables and cables in raceway.

I. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
    a. Power transfer switches.
    b. Controls with external control power connections.

K. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

L. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer.

M. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
    1. Labeling Instructions:
        a. Indoor Equipment (in equipment rooms): Engraved, laminated acrylic or melamine label, screw fastened. Unless otherwise indicated, provide and install nameplates with equipment name, voltage, and phase – nameplate colors unique to system voltage.
        b. Indoor Equipment (in finished spaces): Engraved, laminated acrylic or melamine label, secured to inside of door. Unless otherwise indicated, provide and install nameplates with equipment name, voltage, and phase – nameplate colors unique to system voltage.
        c. Outdoor Equipment: Engraved, laminated acrylic or melamine label, screw fastened. Unless otherwise indicated, provide and install nameplates with equipment name, voltage, and phase – nameplate colors unique to system voltage
        d. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
        e. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
    2. Equipment to Be Labeled:
        a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
        b. Enclosures and electrical cabinets.
        c. Access doors and panels for concealed electrical items.
        d. Switchgear.
        e. Switchboards.
        f. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
        g. Emergency system boxes and enclosures.

h. Enclosed switches.
i. Enclosed circuit breakers.
j. Enclosed controllers.
k. Variable-speed controllers.
l. Push-button stations.
m. Power transfer equipment.
n. Contactors.
o. Remote-controlled switches, dimmer modules, and control devices.
p. Battery-inverter units.
q. Battery racks.
r. Monitoring and control equipment.
s. UPS equipment.

END OF SECTION

SECTION 26 09 23-1 LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Time switches.
   2. Photoelectric switches.
   3. Indoor occupancy sensors.

B. Related Requirements:
   1. Section 26 27 26 "Wiring Devices" for wall-switch occupancy sensors, digital time switches and manual light switches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.
   1. Interconnection diagrams showing field-installed wiring.
   2. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Intermatic, Inc.
   2. SensorSwitch
   3. Leviton Mfg. Company Inc.

B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Contact Configuration: SPST.
   3. Contact Rating: 20-A ballast load, 120-277-V AC.
   4. Programs: Two on-off set points on a 24-hour schedule, allowing different set points for each day of the week.
   5. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

2.2 INDOOR OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Cooper Industries, Inc.
   2. Hubbell Building Automation, Inc.
   3. Leviton Mfg. Company Inc.
   4. Sensor Switch, Inc.
   5. Lutron, Inc.

B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
   3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
   4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
   5. Mounting:
      a. Sensor: Suitable for mounting in any position on a standard outlet box.
      b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
      c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
   6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
   7. Bypass Switch: Override the "on" function in case of sensor failure.
   8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.

C. PIR Type: Ceiling mounted; detect occupants in coverage area by their heat and movement.
   1. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in..
   2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

D. Ultrasonic Type: Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy.
   1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
   2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch- high ceiling.
   3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.
   4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch- high ceiling.

E. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
   1. Sensitivity Adjustment: Separate for each sensing technology.
   2. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
   3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

2.3 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Cooper Industries, Inc.
   2. Hubbell Building Automation, Inc.
   3. Leviton Mfg. Company Inc.
   4. Lutron Electronics Co., Inc.
   5. Sensor Switch, Inc.

B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
   3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.

C. Wall-Switch Sensor Tag WS1:
   1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 2100 sq. ft.
   2. Sensing Technology: Dual technology - PIR and ultrasonic.
   3. Switch Type: SP. SP, field selectable automatic "on," or manual "on" automatic "off."
   4. Voltage: Dual voltage, 120 and 277 V; dual-technology type.
   5. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
   6. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

2.4 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 26 05 19 "Low Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multi-conductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 26 05 19 "Low Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multi-conductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 26 05 19 "Low Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 WIRING INSTALLATION

A. Wiring Method: Comply with Section 26 05 19 "Low Voltage Electrical Power Conductors and Cables." Minimum conduit size is 3/4 inch.

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and non-power-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.3 IDENTIFICATION

A. Identify components and power and control wiring according to Section 26 05 53 "Electrical Identification."
   1. Identify controlled circuits in lighting contactors.
   2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
   1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Lighting control devices will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
   1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
   2. For daylighting controls, adjust set points and dead-band controls to suit Owner's operations.

3.6 DEMONSTRATION

A. Coordinate demonstration of products specified in this Section with demonstration requirements for networked lighting control systems specified in Section 26 09 25 "Lighting Control System".

B. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single space wireless lighting control systems and associated components:
   1. Wireless occupancy/vacancy sensors.
   2. Wireless daylight sensors.
   3. Wired load control modules with wireless communication inputs.
      a. Includes fixture control modules with wired occupancy/vacancy/daylight sensors.
   4. Wired wall dimmers and switches with wireless communication inputs.
   5. Wireless control stations.

B. Wireless hub(s) for centralized control, monitoring, and system integration.

1.02 RELATED REQUIREMENTS

A. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

B. Section 26 27 26 - Wiring Devices - Lutron:
   1. Finish requirements for wall controls specified in this section.
   2. Accessory receptacles and wall plates, to match lighting controls specified in this section.

1.03 REFERENCE STANDARDS.

A. CSA C22.2 No. 223 – Power Supplies with Extra-low-voltage Class 2 Outputs; 2015.

B. IEC 60929 - AC and/or DC-Supplied Electronic Control Gear for Tubular Fluorescent Lamps - Performance Requirements; 2015.

C. IEC 61000-4-2 - Electromagnetic Compatibility (EMC) - Part 4-2: Testing and Measurement Techniques - Electrostatic Discharge Immunity Test; 2008.

D. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Cor 1, 2012).

E. ISO 9001 - Quality Management Systems-Requirements; 2008.

F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

G. NECA 130 - Standard for Installing and Maintaining Wiring Devices; National Electrical Contractors Association; 2010.

H. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; National Electrical Manufacturers Association; 2011.

I. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2010).

J. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

L. UL 508 - Industrial Control Equipment; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

M. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

N. UL 935 - Fluorescent-Lamp Ballasts; Current Edition, Including All Revisions.

O. UL 1310 – Class 2 Power Units; Current Edition, Including All Revisions.

P. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

Q. UL 1598C - Light-Emitting Diode (LED) Retrofit Luminaire Conversion Kits; Current Edition, Including All Revisions.

R. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; Current Edition, Including All Revisions.

S. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of sensors and wall controls with millwork, furniture, equipment, etc. installed under other sections or by others.

2. Coordinate the placement of wall controls with actual installed door swings.

3. Coordinate the placement of daylight sensors with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.

4. Coordinate the work to provide luminaires and lamps compatible with the lighting controls to be installed.

5. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Pre-Wire Meeting*; Lutron LSC-PREWIRE*: Include as part of the bid; additional costs for Lighting Control Manufacturer to conduct on-site meeting prior to commencing work. Manufacturer to review with installer:

1. Low voltage wiring requirements.

2. Separation of power and low voltage/data wiring.

3. Wire labeling.

4. Wireless hub locations and installation.

5. Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS", sensor locations to be reviewed in accordance with layout provided by Lighting Control Manufacturer. Lighting Control Manufacturer may direct Contractor regarding sensor relocation should conditions require a deviation from locations indicated.

6. Control locations.

7. Computer jack locations.

8. Load circuit wiring.

9. Network wiring requirements.

10. Connections to other equipment.

11. Installer responsibilities.

C. Sequencing:

1. Do not install sensors and wall controls until final surface finishes are complete.

1.05 SUBMITTALS

A. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

1. Occupancy/Vacancy Sensors: Include detailed basic motion detection coverage range diagrams.

2. Wall Dimmers: Include derating information for ganged multiple devices.

B. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

C. Project Record Documents: Record actual installed locations and settings for lighting control system components.

D. Operation and Maintenance Data: Include detailed information on lighting control system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

E. Warranty: Submit sample of manufacturer's Warranty or Enhanced Warranty as specified in Part 1 under “WARRANTY”. Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications:

1. Company with not less than ten years of experience manufacturing lighting control products using wireless communication between devices.

2. Registered to ISO 9001, including in-house engineering for product design activities.

3. Provides factory direct technical support hotline available 24 hours per day, 7 days per week.

4. Qualified to supply specified products and to honor claims against product presented in accordance with warranty.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1. Basis of Design System Requirements - *Lutron*, Unless Otherwise Indicated:

a. Ambient Temperature:

1) Lighting Control System Components, Except Fluorescent Electronic Dimming Ballasts: Between 32 and 104 degrees F (0 and 40 degrees C).

2) Fluorescent Electronic Dimming Ballasts: Between 50 and 140 degrees F (10 and 60 degrees C).

b. Relative Humidity: Less than 90 percent, non-condensing.

c. Protect lighting controls from dust.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer's Standard Warranty, With Manufacturer Full-Scope Start-Up; Lutron Standard 2-Year Warranty; Lutron LSC-B2:

1. Manufacturer Lighting Control System Components, Except Lighting Management System Computer, Ballasts/Drivers and Ballast Modules:

a. First Two Years:

1) 100 percent replacement parts coverage, 100 percent manufacturer labor coverage to troubleshoot and diagnose a lighting issue.

2) First-available on-site or remote response time.

3) Remote diagnostics for applicable systems.

b. Telephone Technical Support: Available 24 hours per day, 7 days per week, excluding manufacturer holidays.

2. Lighting Management System Computer: One year 100 percent parts coverage, one year 100 percent manufacturer labor coverage.

3. Ballasts/Drivers and Ballast Modules:

a. With On-Site Full-Scope Start-Up: Five years 100 percent parts coverage, no manufacturer labor coverage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Manufacturer: *Lutron Electronics Company, Inc; Vive; www.lutron.com*.

B. Other Acceptable Manufacturers:

1. *Wattstopper DLM*.

2. *Enlighted*.

3. Products by listed manufacturers are subject to compliance with specified requirements.

C. Substitutions:

1. By using pre-approved substitutions, Contractor accepts responsibility and associated costs for all required modifications to related equipment and wiring. Provide complete engineered shop drawings (including power wiring) with deviations from the original design highlighted in an alternate color for review and approval by Architect prior to rough-in.

D. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.02 LIGHTING CONTROLS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) as suitable for the purpose indicated.

B. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, programming, etc. as necessary for a complete operating system that provides the control intent indicated.

C. Design lighting control equipment for 10 year operational life while operating continually at any temperature in an ambient temperature range of 32 degrees F (0 degrees C) to 104 degrees F (40 degrees C) and 90 percent non-condensing relative humidity.

D. Electrostatic Discharge Tolerance: Design and test equipment to withstand electrostatic discharges without impairment when tested according to IEC 61000-4-2.

E. Wireless Devices:

1. Wireless device family includes area or fixture level sensors, area or fixture level load controls for dimming or switching, and load controls that can be mounted in a wallbox, on a junction box, or at the fixture.

2. Wireless devices including sensors, load controls, and wireless remotes or wall stations, can be set up using simple button press programming without needing any other equipment (e.g. central hub, processor, computer, or other smart device).

3. Wireless hub adds the ability to set up the system using any smart device with a web browser (e.g. smartphone, tablet, PC, or laptop).

4. System does not require a factory technician to set up or program the system.

5. Capable of diagnosing system communications.

6. Capable of having addresses automatically assigned to them.

7. Receives signals from other wireless devices and provides feedback to user.

8. Capable of determining which devices have been addressed.

9. RF Range: 60 feet (18 m) line-of-sight or 30 feet (9 m) through typical construction materials between RF transmitting devices and compatible RF receiving devices.

10. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of CFR, Title 47, Part 15, for Class B application.

F. Wireless Network:

1. RF Frequency: 434 MHz; operate in FCC governed frequency spectrum for periodic operation; continuous transmission spectrum is not permitted.

a. Wireless sensors, wireless wall stations and wireless load control devices do not operate in the noisy 2.4 GHz frequency band where high potential for RF interference exists.

b. Wireless devices operate in an uncongested frequency band providing reliable operation.

c. Fixed network architecture ensures all associated lights and load controls respond in a simultaneous and coordinated fashion from a button press, sensor signal, or command from the wireless hub (i.e. no popcorning).

2. Distributed Architecture: Local room devices communicate directly with each other. If the wireless hub is removed or damaged, local control, sensing, and operation continues to function without interruption.

3. Local room devices communicate directly with each other (and not through a central hub or processor) to ensure:

   a. Reliability of system performance.

   b. Fast response time to events in the space (e.g. button presses or sensor signals).

   c. Independent operation in the event of the wireless hub being removed or damaged.

G. Device Finishes:

1. Wall Controls: Color to be selected by Architect.

2. Visible Parts: Exhibit ultraviolet color stability when tested with multiple actinic light sources as defined in ASTM D4674. Provide proof of testing upon request.

2.03 WIRELESS SENSORS

A. General Requirements:

1. Operational life of 10 years without the need to replace batteries when installed per manufacturer's instructions.

2. Communicates directly to compatible RF receiving devices through use of a radio frequency communications link.

3. Does not require external power packs, power wiring, or communication wiring.

4. Capable of being placed in test mode to verify correct operation from the face of the unit.

B. Wireless Occupancy/Vacancy Sensors:

1. General Requirements:

   a. Provides a clearly visible method of indication to verify that motion is being detected during testing and that the unit is communicating to compatible RF receiving devices.

   b. Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.

   c. Sensing Mechanism: Passive infrared coupled with technology for sensing fine motions*; Lutron XCT Technology*. Signal processing technology detects fine-motion passive infrared (PIR) signals without the need to change the sensor's sensitivity threshold.

   d. Provide optional, readily accessible, user-adjustable controls for timeout, automatic/manual-on, and sensitivity.

   e. Turns off lighting after reasonable and adjustable time delay once the last person to occupy the space vacates a room or area. Provide adjustable timeout settings of 1, 5, 15, and 30 minutes.

   f. Capable of turning dimmer's lighting load on to an optional locked preset level selectable by the user. Locked preset range to be selectable on the dimmer from 1 percent to 100 percent.

   g. Color: White.

h. Provide all necessary mounting hardware and instructions for both temporary and permanent mounting.

i. Provide temporary mounting means for drop ceilings to allow user to check proper performance and relocate as needed before permanently mounting sensor. Temporary mounting method to be design for easy, damage-free removal.

j. Sensor lens to illuminate during test mode when motion is detected to allow installer to place sensor in ideal location and to verify coverage prior to permanent mounting.

k. Ceiling-Mounted Sensors:

1) Provide surface mounting bracket compatible with drywall, plaster, wood, concrete, and compressed fiber ceilings.

2) Provide recessed mounting bracket compatible with drywall and compressed fiber ceilings.

l. Wall-Mounted Sensors: Provide wall or corner mounting brackets compatible with drywall and plaster walls.

2. Wireless Combination Occupancy/Vacancy Sensors:

a. Ceiling-Mounted Sensors: Programmable to operate as an occupancy sensor (automatic-on and automatic-off), an occupancy sensor with low light feature (automatic-on when less than one footcandle of ambient light available and automatic-off), or a vacancy sensor (manual-on and automatic-off).

b. Wall-Mounted Sensors: Programmable to operate as an occupancy sensor (automatic-on and automatic-off), or a vacancy sensor (manual-on and automatic-off).

c. Product(s):

1) Ceiling-Mounted Occupancy/Vacancy Sensor*;* Lutron Radio Powr Savr Series, Model LFR2-OCR2B-P-WH Coverage from 324 square feet (30.2 sq m) to 676 square feet (62.4 sq m) depending on ceiling height from 8 to 12 feet (2.4 to 3.7 m); 360 degree field of view.

2) Wall-Mounted Occupancy/Vacancy Sensor*;* Lutron Radio Powr Savr Series, Model LFR2-OWLB-P-WH Minor motion coverage of 1500 square feet (139.4 sq m) and major motion coverage of 3000 square feet (278.7 sq m) with mounting height of 6 to 8 feet (1.8 to 2.4 m); 180 degree field of view.

3) Corner-Mounted Occupancy/Vacancy Sensor*;* Lutron Radio Powr Savr Series, Model LFR2-OKLB-P-WH Minor motion coverage of 1225 square feet (113.8 sq m) and major motion coverage of 2500 square feet (232.3 sq m) with mounting height of 6 to 8 feet (1.8 to 2.4 m); 90 degree field of view.

4) Hallway Occupancy/Vacancy Sensor*;* Lutron Radio Powr Savr Series, Model LFR2-OHLB-P-WH Major motion coverage of up to 150 feet (45.7 m) with mounting height of 6 to 8 feet (1.8 to 2.4 m); narrow field of view.

2.04 LOAD CONTROL MODULES

A. Provide wireless load control modules as indicated or as required to control the loads as indicated.

B. Junction Box-Mounted Modules:

1. Relay Modules:
    a. Product(s):
        1) 16 A relay module, without contact closure output*;* Lutron PowPak Relay Module Model RMJS-16R-DV-B
        2) 5 A relay module, without contact closure output*; Lutron PowPak Relay Module Model RMJS-5R-DV-B*.
    b. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors, ten wireless control stations, and one daylight sensor.
    c. Relay:
        1) Rated Life of Relay: Typical of 1,000,000 cycles at fully rated 16 A for all lighting loads.
        2) Load switched in manner that prevents arcing at mechanical contacts when power is applied to and removed from load circuits.
        3) Fully rated output continuous duty for inductive, capacitive, and resistive loads.

2.05 WIRELESS CONTROL STATIONS

A. Product(s):
    1. 2-Button Control; Lutron Pico Wireless Control Model PJ2-2B.
    2. 4-Button Control; Lutron Pico Wireless Control Model PJ2-4B
    3. Wallbox Adapter*; Lutron Model PICO-WBX-ADAPT*.
B. Communicates directly to compatible RF receiving devices through use of a radio frequency communications link.
C. Does not require external power packs, power or communication wiring.
D. Allows for easy reprogramming without replacing unit.
E. Button Programming:
    1. Single action.
    2. Toggle action.
F. Includes LED to indicate button press or programming mode status.
G. Mounting:
    1. Capable of being mounted with a table stand or directly to a wall under a faceplate.
    2. Faceplates: Provide concealed mounting hardware.
H. Power: Battery-operated with minimum ten-year battery life (3-year battery life for night light models).
I. Finish: To be selected by Architect.

2.06 WIRELESS HUBS

A. Product(s):
    1. Wireless hub with BACnet*; Lutron Vive Premium Hub*.
        a. Surface-mount wireless hub*; Model HJS-2-SM*.

B. Integrated multicolor LED provides feedback on what mode the hub is in for simple identification and diagnosis.

C. Integrated processor and web server allows hub to set up and operate the system without any external connections to outside processors, servers, or the internet.

D. Utilizes Ethernet connection for:

1. Networking up to 64 hubs together to create a larger system.

2. Integration with Building Management System (BMS) via native BACnet; does not require interface (*Lutron Vive Premium* wireless hub with BACnet only).

3. Remote connectivity capabilities, including maintaining system date/time and receiving periodic firmware updates (requires internet connection).

E. A single hub or network of hubs can operate on either a dedicated lighting control only network or can be integrated with an existing building network as a VLAN.

F. Communicates directly to compatible *Lutron Vive* RF devices through use *Lutron Clear Connect* radio frequency communications link; does not require communication wiring; RF range of 71 feet (23 m) through walls to cover an area of 15836 square feet (1471 sq m) (device and hub must be on the same floor).

G. Communicates directly to mobile device (smartphone or tablet) or computer using built-in Wi-Fi, 2.4 GHz 802.11b/g; wireless range of 71 feet (23 m) through walls (device and hub must be on the same floor).

1. Does not require external Wi-Fi router for connecting to the hub.

H. Allows for system setup, control, and monitoring from mobile device or computer using *Vive Vue* web-based software:

1. Supports up to 700 total paired devices including compatible wireless sensors, wireless control stations, and wireless load devices.

2. Allows for timeclock scheduling of events, both time of day and astronomic (sunrise and sunset).

a. Timeclock is integrated into the unit and does not require a constant internet connection.

b. Retains time and programming information after a power loss.

3. Allows for control, monitoring, and adjustment from anywhere in the world (*Lutron Vive* wireless hub internet connection required).

4. Uses RF signal strength detection to find nearby devices for quick association and programming without having to climb ladders.

a. Association and setup does not require a factory technician to perform.

5. System using *Lutron Vive* wireless hub(s) can operate with or without connection to the internet.

6. Supports energy reporting.

a. Reports measured energy data for *PowPak* fixture control modules at accuracy of plus/minus 2 percent or 0.5 W (whichever is higher).

b. Reports calculated energy data for *PowPak* junction box mounted modules at accuracy of 10 percent.

7. Supports automatic demand response for load shedding via:

a. Local contact closure without need for separate interface.

b. BACnet (*Lutron Vive Premium* wireless hub with BACnet only).

8. Wireless hub can be firmware upgraded to provide new software features and system updates.

a. Firmware update can be done either locally using a wired Ethernet connection or Wi-Fi connection, or remotely if the wireless hub is connected to the internet.

I. *Lutron Vive Vue* Web-Based Application:

1. Accessibility and Platform Support:

a. Web-based; runs on most HTML5 compatible browsers (including Safari and Chrome).

b. Supports multiple platforms and devices; runs from a tablet, desktop, laptop, or smartphone.

c. User interface supports multi-touch gestures such as pinch to zoom, drag to pan, etc.

d. Utilizes HTTPS (industry-standard certificate-based encryption and authentication for security).

e. Multi-level Password Protected Access: Individual password protection on both the integrated Wi-Fi network and web-based software.

f. WPA2 security for Wi-Fi communication with wireless hub.

2. System Navigation and Status Reporting:

a. Area Tree View: Easy navigation by area name to view status and make programing adjustments through the software.

b. Area and device names can be changed in real time.

J. BACnet Integration (*Lutron Vive Premium* wireless hub with BACnet only):

1. Provide ability to communicate by means of native BACnet IP communication (does not require interface) to lighting control system from a user-supplied 10BASE-T or 100BASE-T Ethernet network.

2. Requires only one network connection per hub.

3. BACnet Integrator Capabilities:

a. The BACnet integrator can command:

1) Area light output.

2) Area load shed level.

3) Area load shed enable/disable.

4) Enable/Disable:

(a) Area occupancy sensors.

(b) Area daylighting.

5) Daylighting level.

6) Area occupied and unoccupied level

7) Occupancy sensor timeouts (for fixture sensors).

b. The BACnet integrator can monitor:

1) Area on/off status.

2) Area occupancy status.

3) Area load shed status.

4) Area instantaneous energy usage and maximum potential power usage.

5) Enable/Disable:

(a) Area occupancy sensors.

(b) Daylighting.

(c) Timeclocks.

6) Daylighting level.

7) Light levels from photo sensors.

8) Area occupied and unoccupied level.

9) Occupancy sensor timeouts.

K. Contact Closure Interface: Provide two contact closure inputs; accepts both momentary and maintained contact closures that can be used for automatic demand response.

L. Rated for use in air-handling spaces as defined in UL 2043.

M. Meets CAL TITLE 24 P6 requirements.

2.07 SOURCE QUALITY CONTROL

A. See Section 01 4000 - *Quality Requirements*, for additional requirements.

B. Factory Testing*; Lutron Standard Factory Testing*:

1. Perform full-function factory testing on all completed assemblies. Statistical sampling is not acceptable.

2. Perform full-function factory testing on 100 percent of all ballasts and LED drivers.

3. Perform factory burn-in of 100 percent of all ballasts at 104 degrees F (40 degrees C).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that ratings and configurations of system components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive system components.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Lighting Control Manufacturer Sensor Layout and Tuning service may be specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS".

1. Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS", locate sensors in accordance with layout provided by Lighting Control Manufacturer. Lighting Control Manufacturer may direct Contractor regarding sensor relocation should conditions

require a deviation from locations indicated. Where Lighting Control Manufacturer Sensor Layout and Tuning service is not specified, locate sensors in accordance with Drawings.

2. Sensor locations indicated are diagrammatic. Within the design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage, in accordance with manufacturer's recommendations.

C. Ensure that daylight sensor placement minimizes sensor view of electric light sources. Locate ceiling-mounted and luminaire-mounted daylight sensors to avoid direct view of luminaires.

D. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

E. Lamp Lead Lengths: Do not exceed 3 feet (0.9 m) for T4 4-pin compact and T5 BIAX lamps and 7 feet (2.1 m) for T5, T5-HO, T8 U-bend, and T8 linear fluorescent lamps.

F. LED Light Engine/Array Lead Length: Do not exceed 100 feet (31 m).

G. Identify system components in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - *Quality Requirements*, for additional requirements.

B. Manufacturer's Full-Scope Start-Up Service is required.

C. Manufacturer’s Programming Service:

1. Product(s):

a. On-site programming, 8-hour block*; Lutron LSC-OS-PROG8-SP*.

D. Manufacturer's Full-Scope Start-Up Service: Provide Manufacturers On-Site Full-Scope Start-Up.

1. On-Site Full-Scope Start-Up Service*; Lutron LSC-OS-SU-VIVE*: Manufacturer's authorized Service Representative to conduct site visit upon completion of lighting control system installation to perform system startup and verify proper operation:

a. Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS", authorized Service Representative to verify sensor locations, in accordance with layout provided by Lighting Control Manufacturer; Lighting Control Manufacturer may direct Contractor regarding sensor relocation should conditions require a deviation from locations indicated.

b. Verify connection of power wiring and load circuits.

c. Verify connection and location of controls.

d. Energize wireless hubs.

e. Associate occupancy/vacancy sensors, daylight sensors, wireless remotes, and wall stations to load control devices.

f. Provide initial rough calibration of sensors; fine-tuning of sensors is responsibility of Contractor unless provided by Lighting Control Manufacturer as part of Sensor Layout and Tuning service where specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS".

g. Program timeclock schedules per approved sequence of operations.

h. Configure load shed parameters per approved sequence of operations.

i. Verify system operation control by control.

j. Obtain sign-off on system functions.

k. Train Owner's representative on system capabilities, operation, and maintenance, as specified in Part 3 under "Closeout Activities".

E. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 TESTING

A. Title 24 Acceptance Testing Service*; Lutron LSC-SPV-DOC-T24*: Include as part of the bid, Lighting Control Manufacturer to perform lighting control acceptance testing.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - *Closeout Submittals*, for closeout submittals.

B. See Section 01 7900 - *Demonstration and Training*, for additional requirements.

C. Demonstration:

1. Demonstrate proper operation of lighting control devices to facility representative, and correct deficiencies or make adjustments as directed.

2. On-Site Performance-Verification Walkthrough*; Lutron LSC-WALK*: Include as part of the bid additional costs for lighting control manufacturer to provide on-site demonstration of system functionality to facility representative.

D. Training:

1. Include services of manufacturer's certified service representative to perform on-site training of Owner's personnel on operation, adjustment, and maintenance of lighting control system as part of on-site system start-up services.

2. Customer-Site Solution Training Visit*; Lutron LSC-TRAINING-SP*: Include as part of the bid additional costs for Lighting Control Manufacturer to provide one day (of additional on-site system training.

3.07 PROTECTION

A. Protect installed products from subsequent construction operations.

END OF SECTION

SECTION 26 24 16-1 PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Distribution panelboards.
   2. Lighting and appliance branch-circuit panelboards.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.
   1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
   2. Detail enclosure types and details for types other than NEMA 250, Type 1.
   3. Detail bus configuration, current, and voltage ratings.
   4. Short-circuit current rating of panelboards and over-current protective devices.
   5. Detail features, characteristics, ratings, and factory settings of individual over-current protective devices and auxiliary components.
   6. Include wiring diagrams for power, signal, and control wiring.
   7. Include time-current coordination curves for each type and rating of over-current protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.4 INFORMATIONAL SUBMITTALS

A. Field Quality-Control Reports:
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

B. Panelboard Schedules: For installation in panelboards.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section "Operation and Maintenance Data," include the following:
   1. Manufacturer's written instructions for testing and adjusting over-current protective devices.

2. Time-current curves, including selectable ranges for each type of over-current protective device that allows adjustments.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Keys: Two spares for each type of panelboard cabinet lock.
   2. Circuit Breakers as called for in the panel schedule.
   3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
   4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.
   1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

C. Product Dimensions: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with NEMA PB 1.

F. Comply with NFPA 70.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NECA 407 and NEMA PB 1.

1.9 PROJECT CONDITIONS

A. Environmental Limitations:
   1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
   2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.
b. Altitude: Not exceeding 2000 feet.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
1. Notify Architect and Owner no fewer than ten (10) days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Architect's and Owner's written permission.
3. Comply with NFPA 70E.

1.10 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.
1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures: Flush- and/or surface-mounted cabinets as shown on the plans.
1. Rated for environmental conditions at installed location.
a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
b. Outdoor Locations: NEMA 250, Type 3R.
c. Kitchen and Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
2. Finishes:
a. Panels and Trim: Steel, factory finished immediately after cleaning and pre-treating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
b. Back Boxes: Galvanized steel.

3. Directory Card: Inside panelboard door, mounted in **metal** frame with transparent protective cover.

B. Incoming Mains Location: As required – coordinate prior to providing panelboard approval submittals.

C. Phase, Neutral, and Ground Buses:
1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

D. Conductor Connectors: Suitable for use with conductor material and sizes.
1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
4. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
5. Sub-feed (Double) Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

E. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.

F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

G. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Standard 4-piece trim.

D. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
   3. Siemens Energy & Automation, Inc.
   4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

D. Doors: Hinged trim to box (door-in-door) flush latch with steel tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
   3. Siemens Energy & Automation, Inc.
   4. Square D; a brand of Schneider Electric.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
   1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
   2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
   3. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
   4. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
      a. Standard frame sizes, trip ratings, and number of poles.
      b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
      c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
      d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
      e. Shunt Trip: 24-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
      f. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
      g. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.

h. Multi-pole units enclosed in a single housing or factory assembled to operate as a single unit.
i. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in the position indicated on the plans.

2.5 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NECA 407 and/or NEMA PB 1.1.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install panelboards and accessories according to NECA 407 and/or NEMA PB 1.1.

B. Mount such that the top-most switch or circuit breaker (in the panel) is not higher than 79 inches above finished floor or grade. Align adjacent panels for a neat appearance.

C. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

D. Install overcurrent protective devices and controllers not already factory installed.
1. Set field-adjustable, circuit-breaker trip ranges.

E. Install filler plates in unused spaces.

F. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.

G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

H. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 26 05 53 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 05 53 " Identification for Electrical Systems."

D. Device Nameplates: For all breakers in distribution panels, label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 26 05 53 " Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:
1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:
1. Perform each visual and mechanical inspection (only) test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 05 73 "Arc Flash Hazard Analysis”.

3.6 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION

SECTION 26 27 26 -1 WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Receptacles, receptacles with integral GFCI, and associated device plates.
   2. Twist-locking receptacles.
   3. Receptacles with integral surge-suppression units.
   4. Tamper-resistant receptacles.
   5. Weather-resistant receptacles.
   6. Snap switches and wall-box dimmers.
   7. Wall-switch and exterior occupancy sensors.
   8. Communications outlets.
   9. Pendant cord-connector devices.
   10. Cord and plug sets.
   11. Floor service outlets, poke-through assemblies, service poles, and multi-outlet assemblies.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
   2. Cord and Plug Sets: Match equipment requirements.
   3. Coordinate all device colors in writing with Architect/Engineer prior to submittal process and provide approval with submittals for devices.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Service/Power Poles: One for every 10, but no fewer than one.
   2. Floor Service-Outlet Assemblies: One for every 10, but no fewer than one.
   3. Poke-Through, Fire-Rated Closure Plugs: One for every five floor service outlets installed, but no fewer than two.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
   1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
   2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
   3. Leviton Mfg. Company Inc. (Leviton).
   4. Pass & Seymour/Legrand (Pass & Seymour).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
   1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
   2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Cooper; 5351 (single), CR5362 (duplex).
      b. Hubbell; HBL5351 (single), HBL5352 (duplex).

c. Leviton; 5891 (single), 5352 (duplex).
d. Pass & Seymour; 5361 (single), 5362 (duplex).

B. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Cooper; TR8300.
b. Hubbell; HBL8300SGA.
c. Leviton; 8300-SGG.
d. Pass & Seymour; TR63H.

2.4 GFCI RECEPTACLES

A. General Description:
1. Straight blade, feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
1. Products: Subject to compliance with requirements, provide one of the following:
a. Cooper; VGF20.
b. Hubbell; GFR5352L.
c. Pass & Seymour; 2095.
d. Leviton; 7590.

C. Tamper- and Weather-Resistant, GFCI Duplex Receptacles, 125 V, 20 A :
1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
2. Configuration: NEMA WD 6, Configuration 5-15R.
3. Type: Non feed-through.
4. Standards: Comply with UL 498 and UL 943 Class A.
5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

D. Tamper-Resistant GFCI Convenience Receptacles, 125 V, 20 A:
1. Products: Subject to compliance with requirements, provide one of the following:
a. Hubbell; GFTR20.
b. Pass & Seymour; 2095TR.

2.5 USB RECEPTACLES

A. USB Charging Receptacles :
1. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.
2. USB Receptacles: Dual, USB Type A, 5 V dc, and 2.1 A per receptacle (minimum).
3. Standards: Comply with UL 1310 and USB 3.0 devices.

2.6 TWIST-LOCKING RECEPTACLES

A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Cooper; CWL520R.
      b. Hubbell; HBL2310.
      c. Leviton; 2310.
      d. Pass & Seymour; L520-R.

2.7 CORD AND PLUG SETS

A. Description:
   1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
   2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
   3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.8 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Single Pole:
         1) Cooper; AH1221.
         2) Hubbell; HBL1221.
         3) Leviton; 1221-2.
         4) Pass & Seymour; CSB20AC1.
      b. Two Pole:
         1) Cooper; AH1222.
         2) Hubbell; HBL1222.
         3) Leviton; 1222-2.
         4) Pass & Seymour; CSB20AC2.
      c. Three Way:
         1) Cooper; AH1223.
         2) Hubbell; HBL1223.
         3) Leviton; 1223-2.
         4) Pass & Seymour; CSB20AC3.
      d. Four Way:
         1) Cooper; AH1224.
         2) Hubbell; HBL1224.
         3) Leviton; 1224-2.
         4) Pass & Seymour; CSB20AC4.

C. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Cooper; 1995.
      b. Hubbell; HBL1557.

c. Leviton; 1257.
d. Pass & Seymour; 1251.

D. Key-Operated, Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Cooper; 1995L.
b. Hubbell; HBL1557L.
c. Leviton; 1257L.
d. Pass & Seymour; 1251L.

2.9 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.
1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 302 Stainless steel.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.10 FLOOR SERVICE FITTINGS

A. Type: Modular, flush-type activation or recess-type activation, as scheduled on the plans.

B. Compartments: Barrier separates power from voice and data communication cabling.

C. Service Plate: As called for on the Plans.

D. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.

E. Voice and Data Communication Outlet: Modular, keyed, color-coded, RJ-45 jacks (quantity as shown on plans) for UTP cable complying with requirements in Section 269000 "Structured Cabling System."

2.11 FINISHES

A. Device Color:
1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.

B. Wall Plate Color: For plastic covers, match device color as selected by Architect.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:
   1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
   2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
   3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
   4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:
   1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
   2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
   3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
   4. Existing Conductors:
      a. Cut back and pigtail, or replace all damaged conductors.
      b. Straighten conductors that remain and remove corrosion and foreign matter.
      c. Pig tailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:
   1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
   2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
   3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
   4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
   5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
   6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
   7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
   8. Tighten unused terminal screws on the device.
   9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:
   1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the left.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:
   1. Install dimmers within terms of their listing.
   2. Verify that dimmers used for fan speed control are listed for that application.
   3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

A. Comply with Section 26 05 53 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Test Instruments: Use instruments that comply with UL 1436.
   2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:
   1. Line Voltage: Acceptable range is 105 to 132 V.
   2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
   3. Ground Impedance: Values of up to 2 ohms are acceptable.
   4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
   5. Using the test plug, verify that the device and its outlet box are securely mounted.
   6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION

SECTION 26 28 16 -1 ENCLOSED CIRCUIT BREAKERS AND SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Fusible switches.
   2. Non-fusible switches.
   3. Shunt trip switches.
   4. Molded-case circuit breakers (MCCBs).
   5. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
   1. Enclosure types and details for types other than NEMA 250, Type 1.
   2. Current and voltage ratings.
   3. Short-circuit current ratings (interrupting and withstand, as appropriate).
   4. Include evidence of NRTL listing for series rating of installed devices.
   5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
   6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
   1. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified elsewhere in these specifications "Operation and Maintenance Data," include the following:
   1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
   2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
   2. Fuse Pullers: Two for each size and type.

1.8 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Product Dimensions: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

1.9 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Provide mounting structure for safety switches independent of the equipment and install flexible connection from switch to equipment as required.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.

3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.2 NON-FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.3 SHUNT TRIP SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper Bussmann, Inc.
2. Ferraz Shawmut, Inc.
3. Littelfuse, Inc.

B. Switches: Three-pole, horsepower rated, with integral shunt trip mechanism and Class J fuse block; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.

C. Control Circuit: 120-V ac; obtained from integral control power transformer, with primary and secondary fuses, with a control power transformer of enough capacity to operate shunt trip, connected pilot, and indicating and control devices.

D. Accessories:
1. Oiltight key switch for key-to-test function.

2. Oiltight green ON pilot light.
3. Isolated neutral lug; 100 percent rating.
4. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
5. Form C alarm contacts that change state when switch is tripped.
6. Three-pole, double-throw, fire-safety and alarm relay; 24-V dc coil voltage.
7. Three-pole, double-throw, fire-alarm voltage monitoring relay complying with NFPA 72.

2.4 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Features and Accessories:
1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.

2.5 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Kitchen and Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in fusible devices.

D. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."
   1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
   2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:
   1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

C. Tests and Inspections:
   1. Perform each visual and mechanical inspection (only) test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
   3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 05 73 "Arc Flash Hazard Analysis."

END OF SECTION

SECTION 26 43 13-1 SURGE PROTECTION FOR LOW VOLTAGE POWER CIRCUITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section describes the quality, performance, and installation of Parallel Connected, AC Power, Panel Type, Surge Protective Devices (SPDs).

1.3 CODES AND STANDARDS

A. ANSI/IEEE Std C62.41.1ª-2002, IEEE Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits

B. ANSI/IEEE Std C62.41.2ª-2002, IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

C. ANSI/IEEE Std C62.45ª -2002, IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits

D. ANSI C8 4.1, American National Standard for Electric Power Systems and Equipment Voltage Ratings (60 Hertz)

E. ANSI/IEEE Standard 1100-2005, IEEE Recommended Practice for Power and Grounding Electronic Equipment (Emerald Book) - Clause 8.6.1

F. National Fire Protection Association (NFPA) 70 (N.E.C.) Ð 2002 - Article 285

1.4 DEFINITIONS

A. I nominal: Nominal discharge current.

B. MCOV: Maximum continuous operating voltage.

C. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.

D. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.

E. OCPD: Overcurrent protective device.

F. SCCR: Short-circuit current rating.

G. SPD: Surge protective device.

H. VPR: Voltage protection rating.

1.5 QUALITY ASSURANCE

A. All Surge Protective Devices (SPDs) shall be tested and listed to ANSI/UL 1449-2006 (UL 1449 3rd Edition) and Complimentary Listed to UL 1283 by an independent testing agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a Nationally Recognized Testing Laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction. This agency must comply with ANSI/IEEE C62.45 test procedures for all categories established in C62.41 (1991). Manufactured in accordance with UL 1449Ó is not equivalent to being listed to ANSI/UL 1449-2006 and does not meet the intention of this specification.

B. Pre-Approval submittals for products by manufacturers not listed above must be submitted not less than ten (10) business days prior to bid date to allow ample engineering time for review of submitted products. Products not submitted within this timeframe will not be reviewed.

C. Submit proper documentation showing detailed (line-by-line) compliance with this specification. Prior approvals not received by the deadline date defined above will not be considered.

D. Along with the line-by-line comparison from manufacturers not listed herein, pre-approval surge suppression submittals shall include all of the items listed in Section V, below.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
   2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.
   3. Complete schematic data for all suppressors indicating part numbers, conductor sizes, etc.
   4. Dimensioned drawing of each suppressor type indicating mounting arrangement.
   5. Manufacturers ANSI/UL 1449-2006 Third Edition listing classification page and listing number(s).
   6. Manufacturers UL 1283 listing classification page and listing number(s).
   7. Certified test data documenting ANSI/IEEE C62.41-2002 performance and the ability of the device to meet or exceed all requirements of this specification. Include complete let-through voltage/measured limiting voltage test data (not Voltage Protection Rating), test graphs, and scope traces for each mode for each product submitted for Category's C, B, A (including Cat A, 2 kV, 67 A, 100 kHz ring wave at both 90 & 270 degree electrical phase angles).
   8. Letter from manufacturer stating products are in strict compliance with the recommendations of IEEE Standard 1100-2005, Clause 8.6.1 and incorporate 10 individual dedicated discrete modes of protection for three-phase Wye systems, including direct line-to-line components. (Reduced-mode variations will not be accepted).
   9. Certificate of declaration that product is CE low voltage directive compliant
   10. Statement of manufacturer's warranty duration and replacement policy.

1.7 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample Warranty: For manufacturer's special warranty.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For SPDs to include in maintenance manuals.

1.9 WARRANTY

A. All SPD devices shall be warranted to be free from defects in materials and workmanship under normal use in accordance with the instructions provided for a period of twenty-five (25) years from date of substantial completion.

B. Any SPD device that shows evidence of failure or incorrect operation, including damage as the result of lightning strikes, during the warranty period shall be replaced as a complete unit (not just modules, subassemblies, or components) by the manufacturer at no charge to the owner. Warranty will provide for multiple exchanges of any inoperable devices at any time during the warranty period that starts at the date of substantial completion of the system to which the surge suppressor is installed.

C. SPD manufacturers whose warranty does not meet the requirements listed above standard shall submit a letter extending the warranty to meet these standards with the product submittal

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Surge Suppression Incorporated – Specified on plans.
2. Emerson (Liebert) Incorporated, (560xx16 & 570xx17) Series only.
3. Current Technology (SL3-150) Series only.

B. All surge suppression devices shall be manufactured by an ISO 9001-2000 certified company normally engaged in the design, development, and manufacture of such equipment, with at least 10 years of engineering experience in the design and manufacture of permanently connected SPD devices.

C. The surge suppressor manufacturer shall provide unlimited free replacement of the entire SPD for all inoperable SPD units during the warranty period.

D. The use of any mechanical or electro-mechanical thermal/over-current protection (i.e. moving parts and/or springs and shutters), in combination with or for the protection of the suppression elements are expressly prohibited and will be rejected.

E. The listing of a manufacturer as “acceptable” does not imply automatic approval. It is the sole responsibility of the Contractor to ensure that any submittals made are for products that meet or exceed the specifications included herein.

2.2 GENERAL SPD REQUIREMENTS

A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Comply with UL 1449.

D. The Surge Protective Devices (SPD's) shall be of a parallel-connected design using fast-acting transient energy protection components that will divert and dissipate the surge energy.

E. All SPDs shall be tested and listed to ANSI/UL 1449-2006 (UL 1449 3rd Edition) & Complimentary Listed to UL 1283 by a Nationally Recognized Testing Laboratory (NRTL) (i.e. CSA, UL, etc)

F. SPD's shall be Type 2 SPD's, Type 4 SPD's are not permitted.

G. The Surge Protective Devices (SPDs) shall be of a parallel-connected design using fast-acting transient energy protection components that will divert and dissipate the surge energy.

H. The SPD shall be self-restoring and fully automatic.

I. The SPD shall be tested and listed by an NRTL as a complete assembly to a symmetrical fault current rating greater than or equal to the available fault current at the location of installation at the connected panel, in accordance with NEC Article 285 and shall be marked with the short circuit current rating (SCCR). If the available fault current is unknown, then the SCCR of the SPD shall be 200 kAIC.

J. Permanently connected devices mounted parallel to the service, distribution, and sub panels are required. SPD device drawings shall be made available upon request.

K. The SPD shall have a Nominal Discharge Current (In) of 20 kA. ((The Nominal Discharge Current Test was designed to establish that the SPD remains functional after 15 surges at various currents (3 kA, 5 kA, 10 kA, and 20 kA) using the test procedure described in ANSI/UL 1449-2006. 20kA is the most severe.)

L. Fusing:
   1. The SPD shall provide as a minimum, over-current, over temperature protection in the form of component-level thermal fusing to ensure safe failure and prevent thermal runaway. This component-level fusing shall be an integral part of the MOV itself and not silver wire (or other) independently laid across each MOV.
   2. Surge protective devices shall contain integral short circuit current safety fusing within each device for over-current requirements of the NEC. This fusing will be independent of the "component-level" fusing and be specifically for over-current protection and shall be constructed utilizing surge rated, cartridge fuses and not rated "silver-fuse-wire" (or other).
   3. The use of any mechanical or electro-mechanical thermal/over-current protection (i.e. moving parts and/or springs and shutters) in combination with or for the protection of the suppression elements is expressly prohibited and will be rejected.

4. The fusing mechanisms employed must effectively coordinate their performance in conjunction with the high current abnormal over-voltage testing under ANSI/UL 1449-2006 (a.k.a. UL 1449 3rd Edition).

M. MCOV: The SPD shall have a maximum continuous operating voltage (MCOV) capable of sustaining 115% of nominal RMS voltage continuously without degrading.

N. Component Limitations: The SPD shall only use solid-state clamping components to limit the surge voltage and divert the surge current. SPD components that "crowbar" short-circuit the AC power system (e.g. spark gaps, gas tubes, selenium cells, or SCR's) shall not be acceptable. Device circuitry shall be bi-directional, enclosed in a UL listed encapsulated thermal stress reducing compound, and be of a parallel design.

O. Protection Modes: The SPD system shall provide (per IEEE Std. 1100-1999 8.6.1) dedicated independent, distinct, individual protection circuitry for every possible mode in the electrical distribution system at the point of SPD application. For example, a 277/480V, 3-phase Wye, 4-wire plus ground system has 10 distinct modes that require independent and dedicated protection (i.e., L1-L2, L2-L3, L3-L1, L1-N, L2-N, L3-N, L1-G, L2-G, L3-G, N-G). None of these modes of protection depend on protection elements purposed for other protection modes. Reduced mode SPD with only 3, 4, or 7 dedicated, distinct, independent protection modes are not acceptable and are not to be submitted. For 6 mode delta systems, 6 dedicated, independent, distinct protection modes are required (L1-L2, L2-L3, L3-L1, L1-G, L2-G, L3-G). When a mode of protection is specified, the protective mode must be specifically included. Thus, Line-to-Neutral-to-Line is not acceptable where Line-to-Line is specified.

P. Sinewave Tracking Capability: Power panels and MCCs serving sensitive electronic equipment shall utilize voltage independent, dedicated Sinewave Tracking circuitry. EMI/RFI filtering specifically will not be considered as equal to sinewave tracking! To demonstrate the sinewave tracking capability of the submitted devices, manufacturers shall submit 3rd party, independent tests results for units claiming sinewave tracking capability. Such tests shall include testing under the standards of ANSI/IEEE C62.41 and C62.45 category A1 (2kV, 67A, 100kHz ring wave) applied at the 270 degree phase angle, positive polarity, on a 120/208Vrms, 3 phase Wye device, on each of the following modes: line-to-neutral, line-to-ground, and line-to-line (dynamic tests with normal voltage applied to the unit under test), and neutral-to-ground (static test with no normal voltage applied to unit under test). The "let-through voltage" derived from each of these tests shall have a maximum amplitude of less than 50V peak deviation from the insertion point of the surge on the sine wave to the peak of the transient. Measurement of the let-through voltage shall be made with six-inches of lead length external to the SPD housing in accordance with ANSI/UL 1449-2006. Performance requirements are as stated in the table in Section VIII below (ANSI/IEEE C62.41 Let-Through Voltage) at Test Category A1.

Q. Status Indicators: SPD units shall have panel front status monitors as a minimum to indicate a continuous positive status of each protected phase. A remote audible alarm option must be supplied where the specifying engineer deems it necessary and cost effective under the circumstances. Refer to the appropriate drawings and schedules for these details.

R. Equipment Certification: Items shall be listed to ANSI/UL 1449-2006, shall bear the seal of the NRTL, shall bear the Marking "Listed to UL 1449", shall have been tested under ANSI/UL 1449-2006, and shall be marked in accordance with the referenced

standard. SPD units shall be UL 1283 Listed as an Electromagnetic Interference Filter and marked accordingly. All surge suppression devices shall be manufactured by an ISO 9001-2001 certified company normally engaged in the design, development, and manufacture of such equipment.

S. Circuit Configuration: The circuit configuration of the suppression units shall be bi-directional, thermal stress reducing, encapsulated, custom parallel connected, and solid state. (Series units or units equipped with “load carrying” components are expressly prohibited due to the possibility of single point series failures causing power interruption to protected loads.)

T. Enclosures: Unless otherwise noted, provide NEMA 1 or better enclosure for indoor mounting and NEMA 4 enclosure or better for all outdoor locations. All units will contain Form C, N/O or N/C, dry relay contacts, if so specified, and weatherproof fittings to maintain the required NEMA integrity.

U. Maintenance Restrictions: No suppression unit shall be supplied which requires scheduled preventive maintenance or replacement parts. Units requiring functional testing, special test equipment, or special training to monitor surge protection device (SPD) status are not acceptable. SPD shall require NO routine maintenance. SPD devices are considered non-repairable items and shall be fully replaced upon failure.

V. Commonality: All SPDs at the service entrance, distribution panels, and sub-panels shall be from the same manufacturer.

2.3 PERFORMANCE REQUIREMENTS

A. SPDs shall meet the following performance requirements:
1. Service Entrance (Category C): The SPD shall provide a minimum protection of 240kA per phase (three-phase Wye) and be capable of meeting the Category C-High Let-Through Voltage criteria as shown in the section below.
2. Building Distribution Panels (Category B): The SPD shall provide a minimum protection of 180 kA per phase and be capable of meeting the Category B3-High Let-Through Voltage criteria as shown in the section below.
3. Branch Panels/Panelboards (Non-Electronics) (Category A): The SPD shall provide a minimum protection of 120kA per phase and be capable of meeting the Category B-High Let-Through Voltage criteria as shown in the Section VII, below.
4. Branch Panels/Panelboards (Electronics) (Category A): The SPD shall provide a minimum protection of 120kA per phase, be of sinewave tracking design, and be capable of meeting the Category A Let-Through Voltage criteria as shown in the section below.

2.4 ANSI/IEEE C62.41 LET-THROUGH VOLTAGE

A. The SPD shall meet the Let-Through Voltage requirements shown below for voltage and locations specified. All voltages shall be peak (+or -10%) Positive Polarity, Time base = 10uS, Sampling Rate = 500ms/s to ensure maximum transient capture. These settings assure Let-through Voltage test results are accurate. Surge voltages shall be measured from the insertion of the surge on the sine wave to the peak of the surge. All tests are Static (un-powered), except for the 120V circuits that are Dynamic (powered). Let-through voltages on static tests calculated by subtracting sine wave peak from let-through measured from zero. All tests shall be performed in accordance with UL 1449 Third Edition with measurements performed at a point on the leads 15.24 cm (6 inches)

outside of the device enclosure. No data measured at a module, lugs, component, or undefined location will be accepted. These settings assure Let-through Voltage test results are accurate. SPDs shall meet the following criteria:

1. Service Entrance Panels - ANSI/IEEE Cat. C Impulse Wave The let-through voltage based on ANSI/IEEE C62.41 and C62.45 recommended procedures for the ANSI/IEEE Cat. C Impulse Wave (20kV, 10,000 amps) at the 90 degree phase angle shall be less than (values are total let-through voltage (LTV) measured from the insertion point of the transient on the sine wave to the peak of the transient):
    a. Line to Neutral: 1075 V for 208Y/120 V and 1340V for 480Y/277 V
    b. Line to Line: 1990 V for 480Y/277 V and 1390 V for 208Y/120 V.
    c. Line to Ground: 1310 V for 480Y/277 V and 1060 V for 208Y/120 V.
    d. Neutral to Ground: 1730 V for 480Y/277 V and 1450 V for 208Y/120 V.
2. Distribution and Branch Panels (non-electronics) - ANSI/IEEE Cat. B Combination Wave Impulse Let-Through Voltage: The let-through voltage based on ANSI/IEEE C62.41 and C62.45 recommended procedures for the ANSI/IEEE Cat. B Combination Wave Impulse (6kV, 3000 amps) at the 90 degree phase angle, shall be less than; (values are total let-through voltage (LTV) measured from the insertion point of the transient on the sine wave to the peak of the transient):
    a. Line to Neutral: 520 V for 480Y/277 V and 395 V for 208Y/120 V.
    b. Line to Line: 790 V for 480Y/277 V and 570 V for 208Y/120 V.
    c. Line to Ground: 500 V for 480Y/277 V and 375 V for 208Y/120 V.
    d. Neutral to Ground: 1010 V for 480Y/277 V and 590 V for 208Y/120 V.
3. Branch Panels Feeding Electronic Equipment - ANSI/IEEE Cat. A Ring Wave Let-through-Voltage: The let-through voltage based on ANSI/IEEE C62.41 and C62.45 recommended procedures for the ANSI/IEEE Cat. A Ring Wave (2kV, 67 amps, 100kHz ring wave) at the 270 degree phase angle, shall be less than; (values are total let-through voltage (LTV) measured from the insertion point of the transient on the sinewave to the peak of the transient):
    a. Line to Neutral: 67 V for 480Y/277 V and 30 V for 208Y/120 V.
    b. Line to Line: 65 V for 480Y/277 V and 60 V for 208Y/120 V.
    c. Line to Ground: 85 V for 480Y/277 V and 50 V for 208Y/120 V.
    d. Neutral to Ground: 65 V for 480Y/277 V and 50 V for 208Y/120 V.

2.5 ANSI/UL 1449-2006 VOLTAGE PROTECTIVE RATING

A. Voltage Protection Rating (VPR) is a rating selected from a list of preferred values as detailed in ANSI/UL 1449-2006 and assigned to each mode of protection. The value of VPR is determined as the nearest highest value taken from a list of preferred values (as detailed in ANSI/UL 1449-2006) compared to the measured limiting voltage determined during the transient voltage surge suppression test using the combination wave generator at a setting of 6 kV, 3 kA.

1. Single Phase Units (120/240 Volt)
    a. Line to Neutral: 600 V .
    b. Line to Ground: 600 V.
    c. Neutral to Ground: 700 V.
    d. Line to Line: 1000 V.
2. Three Phase Units (120/208 Volt)
    a. Line to Neutral: 600 V .
    b. Line to Ground: 600 V.
    c. Neutral to Ground: 700 V.
    d. Line to Line: 1000 V.

2.6 ENCLOSURES

A. Indoor Enclosures: NEMA 250, Type 1.

B. Outdoor Enclosures: NEMA 250, Type 3R or Type 4X.

2.7 CONDUCTORS AND CABLES

A. Power Wiring: Same size as SPD leads, complying with Section 260519 "Low Voltage Electrical Power Conductors and Cables."

B. Class 1 Control Cables: Multi-conductor cable with copper conductors not smaller than No. 14 AWG, complying with Section 260519 "Low Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.

C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible, and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

D. Use crimped connectors and splices only. Wire nuts are unacceptable.

E. Wiring:
   1. Power Wiring: Comply with wiring methods in Section 260519 "Low Voltage Electrical Power Conductors and Cables."
   2. Controls: Comply with wiring methods in Section 260519 "Low Voltage Electrical Power Conductors and Cables."

F. Provide surge suppressor at each building service entrance and at other distribution and panelboard locations as indicated on the drawings. The SPD shall be located immediately adjacent to the switchboard or panelboard being protected (close-nipple to panel-boards). The SPD may not be located integral (switchgear manufacturer installed) within the switchboard or panelboard(s) unless the switchgear manufacturer providing such SPD products expressly meets or exceeds ALL parameters of this specification for the SPD. These SPDs shall be individually tested and Listed to ANSI/UL 1449-2006 according to their type and not be listed solely as part of the larger assembly. SPD devices not meeting or exceeding the performance of this specification will be deemed unacceptable.

G. Do not energize or connect service entrance equipment and panelboards to their sources until TVSS devices are properly installed and connected.

H. Do not perform insulation resistance tests of the distribution wiring equipment with the TVSS installed. Disconnect before conducting insulation resistance tests, and reconnect immediately after the testing is over.

I. Install the SPD with #10 AWG minimum conductors to dedicated 30-amp breaker(s) in panel per manufacturer's installation instructions and close to the Neutral Bus. The dedicated breaker shall serve as a means of service disconnect for the SPD so that the electrical panel remains energized during SPD servicing. The installer may rearrange breaker locations to ensure the shortest and straightest leads to the SPD. If a dedicated breaker is not provided, an SPD with internal 30-amp fuse or a UL Listed fused disconnect switch shall be installed as a minimum. The conductors serving the SPD shall be twisted together (one twist per 12" of wire) to reduce the SPD system input impedance and shall be kept at the minimum length. The SPD shall be installed in strict accordance with the manufacturer's recommended practices and in compliance with N.E.C. requirements, State, and Local Codes.

J. If any lead lengths exceed 18", the Contractor responsible for installation must contact the specifying electrical engineer and the surge suppression manufacturer or distributor (888-212-2728) for installation assistance.

K. The electrical contractor shall verify the proper application of the SPD (i.e., voltage, phases, etc.). The electrical contractor shall ensure that all Neutral conductors are bonded to the system Ground at the service entrance or the serving isolation transformer prior to installation of the associated SPD. The electrical contractor will ensure that neutral-to-ground bonds do not exist at locations that are not service entrances or newly derived power sources.

L. The electrical contractor shall furnish all labor, materials, equipment, and services necessary for and incidental to the installation of the SPD system components as specified herein.

M. The electrical contractor shall coordinate with other electrical work as necessary to interface installation of the transient voltage surge suppression systems with other work on the site.

N. The SPD installation shall be certified by a licensed electrician that the installation is in accordance with the manufacturer's recommendations, applicable electrical code requirements and the requirements of the specification above. Any deficiencies noted shall be corrected by the Contractor. Provide written documentation of this inspection as part of the closeout documentation

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Compare equipment nameplate data for compliance with Drawings and Specifications.
   2. Inspect anchorage, alignment, grounding, and clearances.
   3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

B. An SPD will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.3 STARTUP SERVICE

A. Complete startup checks according to manufacturer's written instructions.

B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests, and reconnect them immediately after the testing is over.

C. Energize SPDs after power system has been energized, stabilized, and tested.

END OF SECTION

SECTION 26 51 00 -1 INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior lighting fixtures, lamps, and ballasts.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.

B. Related Sections:

1. Section 26 27 26 "Wiring Devices" for manual wall-box dimmers LED fixtures/drivers.
2. Section 26 09 23 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multi-pole lighting relays and contactors.

1.3 DEFINITIONS

A. BF: Ballast factor.

B. CCT: Correlated color temperature.

C. CRI: Color-rendering index.

D. HID: High-intensity discharge.

E. LER: Luminaire efficacy rating.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting fixture, including ballast housing if provided.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture including dimensions.
2. Emergency lighting units including battery and charger.
3. Ballast, including BF.
4. Energy-efficiency data.
5. Sound Performance Data: For air-handling lighting fixtures. Indicate sound power level and sound transmission class in test reports certified according to standards specified elsewhere in these specifications - "Diffusers, Registers, and Grilles."
6. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
7. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.

a. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Shop Drawings: For nonstandard or custom lighting fixtures. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Wiring Diagrams: For power, signal, and control wiring.

C. Installation instructions.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Lighting fixtures.

2. Suspended ceiling components.

3. Partitions and millwork that penetrate the ceiling or extends to within 12 inches of the plane of the luminaires.

4. Ceiling-mounted projectors.

5. Structural members to which suspension systems for lighting fixtures will be attached.

6. Other items in finished ceiling including the following:

a. Air outlets and inlets.

b. Speakers.

c. Sprinklers.

d. Smoke and fire detectors.

e. Occupancy sensors.

f. Photo-sensors.

g. Access panels.

h. Ceiling projector mounts.

i. Ceiling mounted surveillance cameras.

7. Perimeter moldings.

B. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.

C. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, from manufacturer.

D. Field quality-control reports.

E. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fixtures: 10 for every 100 of each type and rating installed. Furnish at least one of each type.

2. LED drivers: 10 for every 100 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NFPA 70.

D. FM Global Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

1. Approved fixtures in mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. On-site coordination meetings: Provide three on-site coordination meetings between contractor and authorized lighting manufacturer's representative to review the following:

1. Pre-construction meeting, prior to rough in stage to review control wiring diagrams, control component placement, occupancy sensor location/placement, wiring types and interconnections, locations of racks/panels, and general overview of control system.

2. Mock up review, after completion of mock-up areas to review operation of each area type for correct operation. At this meeting, the general settings, adjustments, and programming shall be documented and implemented.

3. Final operational test shall take place at substantial completion to verify proper operation of entire building and site lighting control systems. Final settings and programming adjustments shall be made to the satisfaction of the engineer and architect and fully documented for future reference by the owner as required, and included/provided in the final closeout documentation.

1.9 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide product indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Sheet Metal Components:

1. Formed from 22 gauge steel unless otherwise indicated.

2. Form and support to prevent warping and sagging.

3. Free of burrs and sharp corners and edges.

4. Cleaned and powder-coated after fabrication

C. LED fixtures: Comply with UL 1598. L80 Performance for 50,000 hours. Color temperature consistency shall be indistinguishable and the color shift over a five year period shall be less than 0.007 on the CIE 1976 (u',v') diagram, or a 7-step MacAdam ellipse.

D. Metal Parts: Free of burrs and sharp corners and edges.

E. Doors, Frames, and Other Internal Access:

1. Spring loaded cam type latches.

2. Gasketed lens frame – fixture to be free of light leakage under operating conditions.

3. Designed to permit re-lamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during re-lamping and when secured in operating position.

F. Diffusers and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

a. Lens Thickness: 0.125 inch MINIMUM unless otherwise indicated.

b. UV stabilized.

2. Glass: Annealed crystal glass unless otherwise indicated.

G. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp and ballast characteristics:

a. "USE ONLY" and include specific lamp type.

b. CCT and CRI for all luminaires.

2.3 LED DRIVERS

A. Ambient temperature ratings shall be -40 deg F minimum, 130 deg F maximum

B. Power factor: 0.94 or higher

C. Total Harmonic distortion: <20%

D. Minimum warranty on drivers 5 years

E. NRTL certified (UL/CSA/FM)

2.4 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

1. Lamps for AC Operation: Fluorescent, two for each fixture, 20,000 hours of rated lamp life.

2. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.

3. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

a. Battery: Sealed, maintenance-free, nickel-cadmium type.

b. Charger: Fully automatic, solid-state type with sealed transfer relay.

c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.

e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

f. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.

g. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.5 EMERGENCY LIGHTING UNITS

A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.

1. Battery: Sealed, maintenance-free, lead-acid type.

2. Charger: Fully automatic, solid-state type with sealed transfer relay.

3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.

5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

6. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures.

7. Integral Time-Delay Relay: Holds unit on for fixed interval of 15 minutes when power is restored after an outage.

8. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.6 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.

F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures:

1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.

2. Install lamps in each luminaire.

B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.

C. Remote Mounting of Ballasts: Distance between the ballast and fixture shall not exceed that recommended by ballast manufacturer. Verify, with ballast manufacturers, maximum distance between ballast and luminaire.

D. Lay-in Ceiling Lighting Fixtures Supports:

1. Install ceiling support system wires, independent of the ceiling suspension devices and grid, to all four 4 corners of each fixture.

2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.

3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.

E. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.

2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.

3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.

4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.

F. Air-Handling Lighting Fixtures: Install with dampers closed and ready for adjustment.

G. Connect wiring according to Section 26 05 19 "Low Voltage Electrical Power Conductors and Cables."

3.2 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 26 05 53 "Electrical Identification."

3.3 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.4 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark.

1. Adjust aimable luminaires in the presence of Architect.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior LED luminaires.
2. Luminaire-mounted photoelectric relays.
3. Poles and accessories.

B. Related Sections:

1. Section 26 51 00 "Interior Lighting" for exterior luminaires normally mounted on exterior surfaces of buildings.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color rendering index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaire.
4. Lamps, include life, output (lumens, CCT, and CRI), and energy-efficiency data.
5. Photometric data and adjustment factors based on laboratory tests, complying with IES LM-79.
    a. Manufacturer's Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the NVLAP for Energy Efficient Lighting Products.
    b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
6. Wiring diagrams for power, control, and signal wiring.

7. Photoelectric relays.
8. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

D. Delegated-Design Submittal: For luminaire supports.

1. Include design calculations for luminaire supports.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Luminaires.
2. Structural members to which equipment and luminaires will be attached.
3. Underground utilities and structures.
4. Existing underground utilities and structures.
5. Above-grade utilities and structures.
6. Existing above-grade utilities and structures.
7. Building features.
8. Vertical and horizontal information.

B. Qualification Data: For testing laboratory providing photometric data for luminaires and their installation requirements.

C. Product Certificates: For each type of the following:

1. Luminaire.
2. Photoelectric relay.

D. Product Test Reports: For each luminaire, for tests performed by a qualified testing agency.

E. Source quality-control reports.

F. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and photoelectric relays to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: One for every 100 of each type and rating installed. Furnish at least one of each type.
2. Glass and Plastic Lenses, Covers, and Other Optical Parts: One for every 100 of each type and rating installed. Furnish at least one of each type.
3. Ballasts: One for every 100 of each type and rating installed. Furnish at least one of each type.
4. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with IEEE C2, "National Electrical Safety Code."

E. Comply with NFPA 70.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Package aluminum poles for shipping according to ASTM B 660.

B. Store poles on decay-resistant-treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

C. Handle wood poles so they will not be damaged. Do not use pointed tools that can indent pole surface more than 1/4 inch deep. Do not apply tools to section of pole to be installed below ground line.

D. Retain factory-applied pole wrappings on fiberglass and laminated wood poles until right before pole installation. Handle poles with web fabric straps.

E. Retain factory-applied pole wrappings on metal poles until right before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.

1. Warranty Period for Luminaires: Five years from date of Substantial Completion.
2. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.
3. Warranty Period for Color Retention: Five years from date of Substantial Completion.
4. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide product indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR LUMINAIRES

A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.

B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.

E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.

G. Exposed Hardware Material: Stainless steel.

H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

J. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

M. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
    a. Color: As selected from manufacturer's standard catalog of colors.

N. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.
3. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
4. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.
    a. Color: As selected by Architect from manufacturer's standard catalog of colors.

O. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp and ballast characteristics:

a. "USES ONLY" and include specific lamp type.

b. Lamp diameter code (T-4, T-5, T-8, T-12), tube configuration (twin, quad, triple), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.

c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.

d. Start type (preheat, rapid start, instant start) for fluorescent and compact fluorescent luminaires.

e. ANSI ballast type (M98, M57, etc.) for HID luminaires.

f. CCT and CRI for all luminaires.

2.3 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

A. Structural Characteristics: Comply with AASHTO LTS-4-M.

1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article.

2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.2 to obtain the equivalent projected area to be used in pole selection strength analysis.

B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.

1. Materials: Shall not cause galvanic action at contact points.

2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.

3. Anchor-Bolt Template: Plywood or steel.

D. Handhole: Oval-shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws.

E. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

F. Power-Installed Screw Foundations: Factory fabricated by pole manufacturer, with structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to ASTM A 123/A 123M; and with top-plate and mounting bolts to match pole base flange and strength required to support pole, luminaire, and accessories.

G. Breakaway Supports: Frangible breakaway supports, tested by an independent testing agency acceptable to authorities having jurisdiction, according to AASHTO LTS-4-M.

2.4 STEEL POLES

A. Poles: Comply with ASTM A 500, Grade B, carbon steel with a minimum yield of 46,000 psig; one-piece construction up to 40 feet in height with access handhole in pole wall.

1. Shape: Square, straight.

2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

B. Steel Mast Arms: Type as shown/called for on the plans, continuously welded to pole attachment plate. Material and finish same as pole.

C. Brackets for Luminaires: Detachable, cantilever, without underbrace.

1. Adapter fitting welded to pole, allowing the bracket to be bolted to the pole mounted adapter, then bolted together with stainless-steel bolts.

2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire.

3. Match pole material and finish.

D. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

E. Steps: Fixed steel, with nonslip treads, positioned for 15-inch vertical spacing, alternating on opposite sides of pole; first step at elevation 10 feet above finished grade.

F. Intermediate Handhole and Cable Support: Weathertight, 3-by-5-inch handhole located at midpoint of pole with cover for access to internal welded attachment lug for electric cable support grip.

G. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

H. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported cable times a 5.0 safety factor.

I. Platform for Lamp and Ballast Servicing: Factory fabricated of steel with finish matching that of pole.

J. Prime-Coat Finish: Manufacturer's standard prime-coat finish ready for field painting.

K. Galvanized Finish: After fabrication, hot-dip galvanize complying with ASTM A 123/A 123M.

L. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove

mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or with SSPC-SP 8, "Pickling."

2. Interior Surfaces of Pole: One coat of bituminous paint, or otherwise treat for equal corrosion protection.

3. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

   a. Color: As selected by Architect from manufacturer's standard catalog of colors.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

A. Install lamps in each luminaire.

B. Fasten luminaire to indicated structural supports.

1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

3.2 POLE INSTALLATION

A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.

B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Drawings:

1. Fire Hydrants and Storm Drainage Piping: 60 inches.

2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet.

3. Trees: 15 feet from tree trunk.

C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 033000 "Cast-in-Place Concrete."

D. Foundation-Mounted Poles: Mount pole with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.

1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.

2. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.

3. Install base covers unless otherwise indicated.

4. Use a short piece of 1/2-inch- diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

E. Embedded Poles with Tamped Earth Backfill: Set poles to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.

1. Dig holes large enough to permit use of tampers in the full depth of hole.

2. Backfill in 6-inch layers and thoroughly tamp each layer so compaction of backfill is equal to or greater than that of undisturbed earth.

F. Embedded Poles with Concrete Backfill: Set poles in augered holes to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.

1. Make holes 6 inches in diameter larger than pole diameter.

2. Fill augered hole around pole with air-entrained concrete having a minimum compressive strength of 3000 psi at 28 days, and finish in a dome above finished grade.

3. Use a short piece of 1/2-inch- diameter pipe to make a drain hole through concrete dome. Arrange to drain condensation from interior of pole.

4. Cure concrete a minimum of 72 hours before performing work on pole.

G. Poles and Pole Foundations Set in Concrete Paved Areas: Install poles with minimum of 6-inch- wide, unpaved gap between the pole or pole foundation and the edge of adjacent concrete slab. Fill unpaved ring with pea gravel to a level 1 inch below top of concrete slab.

H. Raise and set poles using web fabric slings (not chain or cable).

3.3 INSTALLATION OF INDIVIDUAL GROUND-MOUNTED LUMINAIRES

A. Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified elsewhere in these specifications.

3.4 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 26 05 33 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.5 GROUNDING

A. Ground metal poles and support structures according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole unless otherwise indicated.

2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

B. Ground non-metallic poles and support structures according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole.

2. Install grounding conductor and conductor protector.
3. Ground metallic components of pole accessories and foundations.

3.6 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.

1. Verify operation of photoelectric controls.

C. Illumination Tests:

1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IESNA testing guide(s):

a. IESNA LM-5, "Photometric Measurements of Area and Sports Lighting Installations."

b. IESNA LM-50, "Photometric Measurements of Roadway Lighting Installations."

c. IESNA LM-52, "Photometric Measurements of Roadway Sign Installations."

d. IESNA LM-64, "Photometric Measurements of Parking Areas."

e. IESNA LM-72, "Directional Positioning of Photometric Data."

D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION:

A. **Contractor Qualifications/Certifications: The fire detection and alarm system controls contractor shall hold a permit from the Alabama State Fire Marshal. The fire alarm system contractor shall provide a copy of the State Fire Marshal's permit to the owner and engineer so that the Engineer may review the contractor's qualifications prior to any work taking place. SEE SPECIFICATIONS SECTION 28 31 11, APPENDIX FOR COPY OF STATE REQUIREMENTS FOR FIRE ALARM CONTRACTOR**.

B. This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, new voice evacuation module, auxiliary control devices, annunciators, and wiring as shown on the drawings and specified herein.

C. The fire alarm system shall comply with requirements of IFC Latest edition and NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.

D. The fire alarm system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.

E. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof).

F. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.

G. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final checkout and to ensure the systems integrity.

1.2 SCOPE:

A. Furnish and install new digital addressable fire alarm system in the new building as shown on the Plans.

B. Furnish and install new appliances (initiation and notification) and connect to new fire alarm control panel as required.

1.3 ASIC PERFORMANCE:

A. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 4 (Class B) Signaling Line Circuits (SLC).

B. Initiation Device Circuits (IDC) shall be wired Class A (NFPA Style D) as part of an addressable device connected by the SLC Circuit.

C. Notification Appliance Circuits (NAC) shall be wired Class A (NFPA Style Z) as part of an addressable device connected by the SLC Circuit.

D. On Style 6 or 7 (Class A) configurations a single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.

E. Alarm signals arriving at the FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.

F. Where required, two-way telephone communication circuits shall be supervised for open and short circuit conditions.

1.4 BASIC SYSTEM FUNCTIONAL OPERATION

A. When a fire alarm condition is detected and reported by the system initiating devices, the following functions shall immediately occur:

1. The system alarm LED on the system display shall flash.

2. A local piezo electric signal in the control panel shall sound.

3. A backlit LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.

4. Printing and history storage equipment shall log the information associated each new fire alarm control panel condition, along with time and date of occurrence.

5. All system output programs assigned via control-by-event interlock programming to be activated by the particular point in alarm shall be executed, and the associated system outputs (notification appliances and/or relays) shall be activated.

1.5 SUBMITTALS

A. Two copies of all submittals shall be submitted to the Architect/Engineer for review.

B. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.

C. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.

2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.

3. Show annunciator layout, configurations, and terminations.

4. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.

5. Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.

6. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

1.6 SOFTWARE MODIFICATIONS

A. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.

B. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site.

1.7 CERTIFICATIONS

A. Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of the installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

1.8 GUARANTY

A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal.

1.9 POST CONTRACT MAINTENANCE

A. Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the guaranty.

B. As part of the submittal, include a quote for a maintenance contract to provide all maintenance, tests, and repairs described below. Include also a quote for unscheduled maintenance/repairs, including hourly rates for technicians trained on this equipment, and response travel costs for each year of the maintenance period. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.

C. Maintenance and testing shall be on a semiannual basis or as required by the AHJ. A preventive maintenance schedule shall be provided by the contractor describing the protocol for preventive maintenance. The schedule shall include:

D. Systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, waterflow switches and all accessories of the fire alarm system.

E. Each circuit in the fire alarm system shall be tested semiannually.

F. Each smoke detector shall be tested in accordance with the requirements of NFPA 72 Chapter 7.

1.10 POST CONTRACT EXPANSIONS

A. The contractor shall have the ability to provide parts and labor to expand the system specified, if so requested, for a period of five (5) years from the date of acceptance.

B. As part of the submittal, include a quotation for all parts and material, and all installation and test labor as needed to increase the number of intelligent or addressable devices by ten percent (10%). This quotation shall include intelligent smoke detectors, intelligent heat detectors, addressable manual stations, addressable monitor modules and addressable modules equal in number to one tenth of the number required to meet this specification (list actual quantity of each type).

C. The quotation shall include installation, test labor, and labor to reprogram the system for this 10% expansion. If additional FACP hardware is required, include the material and labor necessary to install this hardware.

D. Submittals that do not include this estimate of post contract expansion cost will not be accepted.

1.11 APPLICABLE STANDARDS AND SPECIFICATIONS:

A. The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.

1. International Building Code latest edition

2. International Fire Code latest edition

3. National Fire Protection Association (NFPA) - USA:

   a. No. 13 Sprinkler Systems
   b. No. 15 Water Spray Systems
   c. No. 17 Dry Chemical Extinguishing Systems
   d. No. 72 National Fire Alarm Code
   e. No. 101 Life Safety Code
   f. Underwriters Laboratories Inc. (UL) - USA:
   g. No. 268 Smoke Detectors for Fire Protective Signaling Systems
   h. No. 864 Control Units for Fire Protective Signaling Systems
   i. No. 268A Smoke Detectors for Duct Applications
   j. No. 521 Heat Detectors for Fire Protective Signaling Systems
   k. No. 464 Audible Signaling Appliances
   l. No. 38 Manually Actuated Signaling Boxes
   m. No. 346 Waterflow Indicators for Fire Protective Signaling Systems
   n. No. 1076 Control Units for Burglar Alarm Proprietary Protective Signaling Systems
   o. No. 1971 Visual Notification Appliances

4. Local and State Building Codes.

5. All requirements of the Authority Having Jurisdiction (AHJ).

1.12 APPROVALS

A. The system shall have proper listing and/or approval from the following nationally recognized agencies:

   1. UL Underwriters Laboratories Inc

B. The fire alarm control panel shall meet UL Standard 864 (Control Units) and UL Standard 1076 (Proprietary Burglar Alarm Systems).

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. EST or equal by Silent Knight or FCI

B. The substitute equipment proposed as equal to equipment specified shall meet or exceed requirements of this section. For equipment other than that specified proof that such substitute equipment equals or exceeds features, functions, performance, and quality of specified equipment shall be provided. This proof shall be provided by submission of a copy of specification with each copy of the submittals that has had each paragraph marked as either compliant or non-compliant along with a letter from engineering manager or product manager at factory that certifies information presented as either compliant or non-compliant including a detailed explanation of each paragraph identified as non-compliant. In order to ensure that the Owner is provided with a system that incorporates required survivability features, this letter shall also specifically certify that the system is capable of complying with the test requirements of this section.

2.2 CONTROL PANEL HARDWARE

A. Batteries:

   1. Sufficient capacity to provide power for entire system upon loss of normal AC power for a period of 24 hours with 15 minutes of alarm signaling at end of this 24-hour period, as

required by NFPA 72, Local Systems.

2.3 SYSTEM PERIPHERALS

A. Addressable Devices - General:

1. Provide address-setting means using rotary-decimal switches.
2. Use simple to install and maintain decade-type (numbered 0 to 9) address switches by using standard screwdriver to rotate 2 dials on device to set address. Devices which use binary address set via dipswitch packages, handheld device programmer, or other special tools for setting device address shall not be acceptable.
3. Detectors: Analog and addressable. Connect to fire alarm control panel's Signaling Line Circuits.
4. Addressable Thermal and Smoke Detectors: Provide 2 status LEDs. Both LEDs shall flash under normal conditions, indicating detector is operational and in regular communication with control panel, and both LEDs shall be placed into steady illumination by control panel, indicating alarm condition has been detected. If required, flashing mode operation of detector LEDs can be programmed off via fire control panel program.
5. Fire Alarm Control Panel: Permit detector sensitivity adjustment through field programming of system. Sensitivity can be automatically adjusted by panel on time-of-day basis.
6. Using software in INCC Command Center, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. Detectors shall be listed by UL as meeting calibrated sensitivity test requirements of NFPA 72, Chapter 7.
7. Detectors shall be ceiling-mounted and shall include separate twist-lock base with tamper-proof feature.
8. Following bases and auxiliary functions shall be available:
    a. Standard base with remote LED output.
    b. Sounder base rated at 85 dBA minimum.
    c. Form-C relay base rated 30 VDC, 2.0 A.
    d. Isolator base.
9. Detectors shall provide test means whereby they will simulate alarm condition and report that condition to control panel. Such test shall be initiated at detector itself by activating magnetic switch or initiated remotely on command from control panel.
10. Detectors shall store internal identifying type code that control panel shall use to identify type of device (ION, PHOTO, THERMAL).

B. Addressable Manual Stations:

1. Manual Fire Alarm Stations: Non-code, non-break glass type, equipped with key lock so they may be tested without operating handle.
2. Operated Station: Visually apparent, as operated, at a minimum distance of 100 feet (30.5 m) from front or side.
3. Stations shall be designed so after actual activation, they cannot be restored to normal except by key reset.
4. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on cover. The word FIRE shall appear on front of stations in raised letters, 1.75 inches (44 mm) or larger.
5. Addressable manual stations shall, on command from control panel, send data to panel

representing state of manual switch and addressable communication module status.

C. Intelligent Thermal Detectors: Intelligent addressable devices rated at 135 degrees F (58 degrees C) and have rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. Connect via 2 wires to fire alarm control panel signaling line circuit.

D. Intelligent Photoelectric Smoke Detectors with CO sensor: Use photoelectric (light-scattering) principal to measure smoke density and shall, on command from control panel, send data to panel representing analog level of smoke density.

E. Intelligent Ionization Smoke Detectors with CO sensor: Use dual-chamber ionization principal to measure products of combustion and shall, on command from control panel, send data to panel representing analog level of products of combustion.

F. Intelligent Duct Smoke Detectors:

1. In-Duct Smoke Detector Housing: Use on-board intelligent photoelectric detector, which provides continuous analog monitoring and alarm verification from panel.

2. When sufficient smoke is sensed, alarm signal is initiated, and appropriate action taken to shut down or change over air handling systems to help prevent rapid distribution of toxic smoke and fire gases throughout areas served by duct system.

3. Duct Smoke Detectors Mounted Above Ceiling or Otherwise Obstructed from Normal View: Provide with remote alarm indicator.

4. Each Detector: Install in either supply side or return side duct in accordance with local mechanical code.

G. Addressable Dry Contact Monitor Modules:

1. Provide to connect 1 supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.

2. Mount in standard deep electrical box.

3. IDC Zone: Suitable for Style B operation.

H. Addressable Dry Contact Monitor Modules:

1. Provide to connect 1 supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.

2. Mount in 4-inch (102-mm) square, 2-1/8-inch (54-mm) deep electrical box.

3. IDC Zone: Suitable for Style D or Style B operation.

4. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

I. Addressable Dry Contact Monitor Modules:

1. Provide to connect 2 supervised IDC zones of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.

2. Mount in 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box.

3. IDC Zones: Suitable for Style B operation.

4. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

J. Addressable Control Modules:

1. Provide to supervise and control operation of 1 conventional NAC of compatible, 24-VDC powered, polarized audio/visual notification appliances or UL-listed polarized relays for fan shutdown and other auxiliary control functions.

2. Mount in standard 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box or to surface-mounted back box.

3. Control Module NAC: Wire for Style Z or Style Y (Class A/B) with up to 1 amp of inductive signal or 2 amps of resistive signal operation. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires.

4. Audio/Visual Power: Provide by separate supervised power circuit from main fire alarm control panel or from supervised, UL-listed remote power supply.

K. Addressable Relay Modules:

1. Available for HVAC control and other building functions. Relay shall have 2 Form C sets of contacts that operate in tandem and are rated for a minimum of 2.0 amps resistive or 1.0 amps inductive. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires.

2. Mount in standard 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box or to surface-mounted back box.

L. Isolator Modules:

1. Provide to automatically isolate wire-to-wire short circuits on SLC Class A or Class B branch. Isolator module shall limit number of modules or detectors that may be rendered inoperative by short-circuit fault on SLC loop segment or branch. At least 1 isolator module shall be provided for each floor or protected zone of building. No more than 25 devices shall be connected to 1 isolator module.

2. If wire-to-wire short occurs, isolator module shall automatically open-circuit (disconnect) SLC. When short-circuit condition is corrected, isolator module shall automatically reconnect isolated section.

3. Does not require address-setting, and its operations shall be totally automatic. Not necessary to replace or reset isolator module after normal operation.

4. Mount in standard 4-inch (101.6-mm) deep electrical box or in surface-mounted back box.

5. Single LED: Flash to indicate isolator is operational and illuminate steadily to indicate short-circuit condition has been detected and isolated.

M. Notification appliances

1. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.

2. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.

3. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.

4. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.
   a. Rated Light Output:
      1) 15/30/75/110 cd, selectable in the field.
   b. Mounting: Wall mounted unless otherwise indicated.
   c. For units with guards to prevent physical damage, light output ratings shall be

determined with guards in place.
d. Flashing shall be in a temporal pattern, synchronized with other units.
e. Strobe Leads: Factory connected to screw terminals.
f. Mounting Faceplate: Factory finished, red.

5. Voice/Tone Notification Appliances:
a. Appliances shall comply with UL 1480 and shall be listed and labeled by an NRTL.
b. High-Range Units: Rated 2 to 15 W.
c. Low-Range Units: Rated 1 to 2 W.
d. Mounting: semirecessed.
e. Matching Transformers: Tap range matched to acoustical environment of speaker location.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer***. Fire alarm system cabling, where routed above accessible ceilings, may be supported with j-hooks but must be supported separately from other low-voltage cabling.***

B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

D. Manual fire alarm boxes shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.

3.2 **TEST**

A. The service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72, Chapter 7.

B. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

C. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.

D. Verify activation of all waterflow switches.

E. Open initiating device circuits and verify that the trouble signal actuates.

F. Open and short signaling line circuits and verify that the trouble signal actuates.

G. Open and short notification appliance circuits and verify that trouble signal actuates.

H. Ground all circuits and verify response of trouble signals.

I. Check presence and audibility of tone at all alarm notification devices.

J. Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.

K. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

L. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.3 FINAL OBSERVATION

A. At the final inspection, a factory-trained representative of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect.

B. Provide NFPA Form 72C Completion Form for the new fire alarm system installation.

3.4 SYSTEM INSTRUCTION

A. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.

B. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

END OF SECTION

ACT# 2009-657

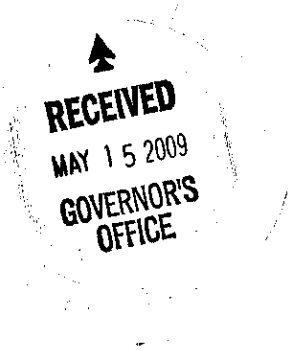
HB289

111990-4

By Representatives Hurst and Sanderford

RFD: Boards and Commissions

First Read: 03-FEB-09



ENROLLED, An Act,

Relating to fire alarm systems, to create a new chapter in Title 34 of the Code of Alabama 1975, to regulate and license persons who install a fire detection, fire alarm, or fire communication system; to provide for administration by the State Fire Marshal; to provide exceptions; to provide for fees; to provide for criminal and civil penalties; and in connection therewith would have as its purpose or effect the requirement of a new or increased expenditure of local funds within the meaning of Amendment 621 of the Constitution of Alabama of 1901, now appearing as Section 111.05 of the Official Recompilation of the Constitution of Alabama of 1901, as amended.

BE IT ENACTED BY THE LEGISLATURE OF ALABAMA:

Section 1. Chapter 33A is added to Title 34 of the Code of Alabama 1975, to read as follows:

§34-33A-1.

For purposes of this chapter, the following words have the following meanings:

(1) CERTIFICATE HOLDER. An individual who is listed on the State Fire Marshal's permit as the responsible managing owner, partner, officer, or employee who is actively in charge of the work of the certified fire alarm contractor meeting the requirements established in Section 34-33A-4.

(2) CERTIFIED FIRE ALARM CONTRACTOR. A fire alarm contractor who has qualified and received a permit from the State Fire Marshal, with an NICET Level III on staff.

(3) FIRE ALARM CONTRACTOR. An individual, partnership, corporation, association, or joint venture engaged in the business of installation, repair, alteration, addition, maintenance, or inspection of fire alarm systems. The term does not include local building officials, fire inspectors, or insurance inspectors when acting in their official capacity.

(4) FIRE ALARM SYSTEM. A system or portion of a combination system that consists of components and circuits arranged to monitor and annunciate the status of fire alarm or supervisory signal-initiating devices and to initiate the appropriate response to those signals. ~~The~~ Any system installed after the passage of this chapter shall follow the installation standard set forth by the latest edition of the National Fire Protection Association 72 National Fire Alarm Code. The system shall meet the requirements of all locally adopted codes and standards of the local municipality into which the system is installed and shall be acceptable to the local authority having jurisdiction.

(5) LICENSED ELECTRICAL CONTRACTOR. An individual, partnership, corporation, association, or joint venture which is licensed as an electrical contractor engaged in the

business of installation of conduit, wire, and fire alarm associated equipment, but does not design, program, certify, inspect, or test fire alarm systems. A licensed electrical contractor is not a fire alarm contractor for the purpose of this chapter.

(6) NICET. National Institute for Certification in Engineering Technology.

(7) STATE FIRE MARSHAL'S PERMIT. The form issued by the State Fire Marshal to a fire alarm contractor upon application being approved and fee paid. The permit shall be issued in the name of the fire alarm contractor, with the name of the certificate holder noted thereon.

§34-33A-2.

The administration of this chapter is vested in the State Fire Marshal who shall have the power to set or make changes in the amount of the fee charged as necessary for the administration and enforcement of this chapter.

§34-33A-3.

(a) It shall be unlawful for any individual, partnership, corporation, association, or joint venture to engage in the business of installation, repair, alteration, addition, maintenance, or inspection of a fire alarm system in this state except in conformity with this chapter.

(b) This chapter shall not apply to the following:

(1) The owner of a fire alarm system who employs ~~registered professional fire protection engineers and~~ skilled trained workers who regularly and routinely ~~design,~~ install, repair, alter, add to, maintain, and inspect fire alarm systems on and within the premises of the owner for the use of the owner only.

~~(2) A smoke detector installed in one- or two-family dwellings by a licensed electrical contractor.~~

(2) A smoke detector installed in a residential dwelling.

(3) A residential combination burglary and fire alarm system installed by a licensed burglary alarm contractor in a residential occupancy as defined in the adopted building code where located.

§34-33A-4.

(a) Every fire alarm system installed in this state shall have a record of completion signed by a certified fire alarm contractor, in accordance with the requirements of the adopted building code and fire alarm code. The record of completion and all supporting documents shall be available for inspection by the State Fire Marshal or his or her designated representative during normal business hours.

(b) Every fire alarm system in this state shall have the name, address, phone number, and permit number, of the responsible certified fire alarm contractor attached to the

main fire alarm control in a manner as prescribed by and acceptable to the State Fire Marshal.

(c) Every fire alarm system in this state <u>installed after the passage of this chapter</u> shall be maintained and inspected by a certified fire alarm contractor in accordance with the requirements of the most recently adopted version of the National Fire Protection Association 72 National Fire Alarm Code. Testing documentation shall be maintained by the owner for inspection by the State Fire Marshal or his or her designated representative during normal business hours.

§34-33A-5.

(a) Any individual, partnership, corporation, association, or joint venture desiring to engage in the business as a fire alarm contractor shall submit to the State Fire Marshal on standard forms provided by the State Fire Marshal a completed application. The applicant shall include a fee of one hundred dollars ($100) when making the application. The applicant shall designate in the application the name of the proposed certificate holder and provide written proof that the individual has met all of the requirements and passed a competency test administered by NICET as a Fire Alarm System Technician - Level III or above. A copy of the current NICET certificate shall be accepted as sufficient written proof as required above. The State Fire Marshal, upon receipt of the application and fee, shall issue a State Fire Marshal's permit

to a fire alarm contractor who has a current State Fire Marshal's Permit, or who produces evidence of having a current state permit from another state, if the state has entered into an agreement of reciprocity with the State of Alabama.

(b)(1) Any individual desiring to engage in the programming, maintenance, testing, inspection, certification, or modification of fire alarm systems shall provide current written proof that he or she has passed a competency test administered by the NICET as a Fire Alarm System Technician - Level II or any other acceptable nationally recognized fire alarm technician certification requiring continuing education that is deemed equivalent by the State Fire Marshal.

(2) Each individual, partnership, corporation, association, or joint venture shall have 36 months after the effective date of this chapter to be in full compliance with the requirement of this subsection.

(3) A new employee who is hired by a certified fire alarm contractor shall have 12 months from the date of hiring to comply with the requirements of this chapter. A new employee who is not in compliance with this chapter shall work under the direct supervision of the certificate holder of the certified fire alarm contractor.

§34-33A-6.

If the required fee has been paid, satisfactory written proof from the NICET has been provided that the

requirements have been met and a competency test was passed when required by this chapter, and the proposed certificate holder is found to be a responsible, managing owner, partner, officer, or employee of the fire alarm contractor, the State Fire Marshal within 30 days shall issue a State Fire Marshal's permit in the name of the fire alarm contractor with the name of the certificate holder noted thereon.

§34-33A-7.

A certificate holder may not obtain a State Fire Marshal's permit for more than one fire alarm contractor at any time. A certificate holder may only hold a certificate for the fire alarm contractor where he or she is currently employed. If the certificate holder leaves the employment of the fire alarm contractor, the certificate holder shall notify the State Fire Marshal within 30 days. The certificate holder may not obtain a State Fire Marshal's permit for more than one other fire alarm contractor for a period of 12 months thereafter. If the certificate holder leaves the employment of the fire alarm contractor, or dies, the fire alarm contractor shall have nine months to submit a new application proposing designation of another individual as the certificate holder for the applicant. If the application is not received and a new permit issued within the allotted time, the State Fire Marshal shall revoke the permit of the fire alarm contractor.

§34-33A-8.

A State Fire Marshal's permit shall expire annually at midnight on September 30. At least 30 days prior to expiration, a renewal application with a renewal fee shall be submitted. A permit which is not renewed prior to expiration shall be null and void on the expiration date, and it shall be unlawful under this chapter for any individual, partnership, corporation, association, or joint venture to engage in the business of installing, repairing, altering, adding, maintaining, or inspecting a fire alarm system without a validly renewed State Fire Marshal's permit. The permit may be reinstated by making application as before and payment of the fee; however, until the time as a new permit is issued, it shall be unlawful for the fire alarm contractor to engage in installing, repairing, altering, adding, maintaining, or inspecting fire alarm systems.

§34-33A-9.

If a certified fire alarm contractor desires to do business in any part of the state, he or she shall deliver to the local building official a copy of his or her State Fire Marshal's permit. The local building official shall require a copy of the State Fire Marshal's permit before issuing a license or building permit. The certified fire alarm contractor shall pay any fees normally imposed for local licenses or permits. The local official may not impose other requirements on the certified fire alarm contractor to prove

competency other than proper evidence of a valid State Fire Marshal's permit.

§34-33A-10.

Nothing in this chapter limits the power of a municipality, county, or the state to regulate the quality and character of work performed by contractors, through a system of permits, fees, and inspections which are designed to assure compliance with, and aid in the implementation of, state and local building laws or to enforce other local laws for the protection of the public health and safety. Nothing in this chapter limits the power of a municipality, county, or the state to adopt any system of permits requiring submission to and approval by the municipality, county, or the state, of plans and specifications for work to be performed by contractors before commencement of the work. If the plans for a fire alarm system are required to be submitted to and approved by any municipality, county, or the state, or any departments or agencies thereof, the plans shall bear the seal of a professional engineer licensed in the State of Alabama or be submitted by a certified fire alarm contractor. The official authorized to issue building or other related permits shall ascertain that the fire alarm contractor is duly certified by requiring evidence of a valid State Fire Marshal's permit.

§34-33A-11.

(a) This chapter applies to any fire alarm contractor performing work for any municipality, county, or the state. Officials of any municipality, county, or the state shall determine compliance with this chapter before awarding any contract for the installation, repair, alteration, addition, or inspection of a fire alarm system. Any bid for a contract shall be accompanied by a copy of a valid State Fire Marshal's permit.

(b) All architects and engineers preparing plans and specifications for work involving fire alarm systems to be contracted in the State of Alabama shall include in their invitation to bidders and their specifications a copy of this chapter or portions as are deemed necessary to convey to the invited bidder that it will be necessary for the bidder to show evidence of licensure before a bid is considered whether the bidder is a resident or nonresident of this state and whether a license has been issued to the bidder or not.

§34-33A-12.

All funds collected pursuant to this chapter shall be deposited in the State Treasury to the credit of the State Fire Marshal's Fund authorized in Section 24-5-10. The State Fire Marshal may expend moneys from the State Fire Marshal's Fund for the administration and enforcement of this chapter. The State Fire Marshal may receive grants and donations from associations, firms, or individuals who are interested in the

upgrading and quality of fire alarm systems in compliance with Alabama state ethics laws.

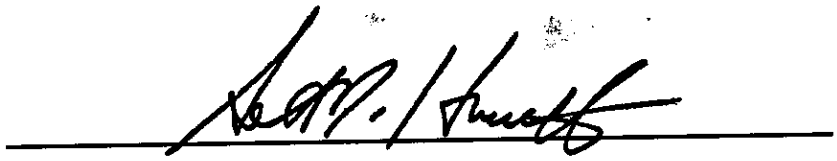
§34-33A-13.

Whenever the State Fire Marshal has reason to believe that any individual, partnership, corporation, association, or joint venture is or has been violating any provision of this chapter, the State Fire Marshal or his or her deputy or assistant may issue and deliver to the individual, partnership, corporation, association, or joint venture an order to cease and desist the violation. Failure to comply with any order under this section shall constitute a Class B misdemeanor and shall be punishable as provided by state law. In addition, the State Fire Marshal may impose a civil penalty not to exceed two hundred fifty dollars ($250) for each day the violation exists. Violation of any provision of this chapter or failure to comply with a cease and desist order shall be cause for revocation of a State Fire Marshal's permit.

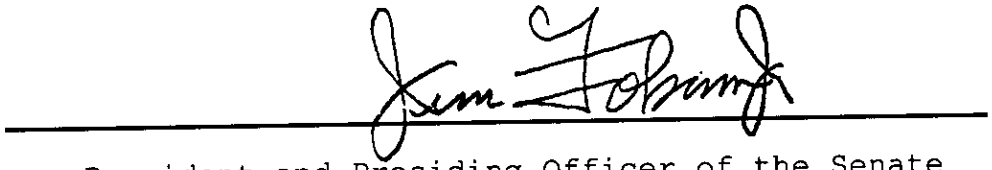
Section 2. Although this bill would have as its purpose or effect the requirement of a new or increased expenditure of local funds, the bill is excluded from further requirements and application under Amendment 621, now appearing as Section 111.05 of the Official Recompilation of the Constitution of Alabama of 1901, as amended, because the

bill defines a new crime or amends the definition of an existing crime.

Section 3. This act shall become effective on the first day of the third month following its passage and approval by the Governor, or its otherwise becoming law.



Speaker of the House of Representatives



President and Presiding Officer of the Senate

House of Representatives

I hereby certify that the within Act originated in and was passed by the House 06-MAY-09, as amended.

Greg Pappas
Clerk

Senate	15-MAY-09	Amended and Passed
House	15-MAY-09	Concurred in Senate Amendment

APPROVED May 21, 2009

TIME 9:07 a.m.

Bob Riley
GOVERNOR

Alabama Secretary Of State

Act Num....: 2009-657
Bill Num...: H-289

Recv'd 05/21/09 02:51pmJJB

SECTION 26 90 00

STRUCTURED CABLING SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section 26 01 01 “Basic Electrical Requirements”.

C. Section 26 05 26 “Grounding and Bonding for Electrical Systems”.

D. Section 26 05 29 “Hangers and Supports for Electrical Systems”.

E. Section 26 05 33 “Raceways and Boxes for Electrical Systems”

F. Section 26 05 44 “Sleeves and Seals for Electrical Raceways and Cabling”

G. Section 26 05 53” Identification for Electrical Systems”

1.2 SUMMARY

A. All work under this specification section to be performed by a qualified telecommunications contractor as defined in this section. This includes, but is not limited to, cabling installation, cabling termination, equipment installation, system component labeling, owner coordination, etc. **All work performed by a contractor who does not meet the contractor qualifications as defined in this section will be replaced at no expense to the owner.**

B. This document describes the products and execution requirements relating to furnishing and installing Telecommunications Cabling at the building. Backbone and horizontal cabling comprised of copper and fiber cabling, and support systems are covered under this document.

C. The Horizontal (workstation) Cabling System shall consist of 4-pair Unshielded Twisted Pair (UTP) Copper Cables to each work area outlet as shown on the plans. The cables shall be installed from the Work Area Outlet to the Telecommunications Room location as called for, and routed to the appropriate rack serving that area and terminated as specified in this document.

D. All cables and related terminations, support and grounding hardware shall be furnished, installed, wired, tested, labeled, and documented by the Telecommunications contractor as detailed in this document or as required for a fully functional system as intended.

E. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities of telecommunications outlets, typical installation details, cable routing and outlet types will be provided as an attachment to this document. If the bid documents are in conflict, this specification shall take precedence. Any/ all work called for in this document or the attachment shall be included in the bid price as if called for in both this document and any/ all attachments. The successful vendor shall meet or exceed all requirements for the cable system described in this document.

F. Section Includes:

1. Patch cords.
2. Telecommunications outlet assemblies.
3. Horizontal (workstation) cabling and terminations.
4. Cable identification.
5. Cable connecting hardware.
6. Cross-connects.
7. Patch panels.
8. Telecommunications equipment racks, cabinets and enclosures.
9. Cable management system.
10. Optical fiber panels/ enclosures, patch panels and terminations.
11. Backbone cabling.
12. Telecommunications mounting elements.
13. Backboards.
14. Copper cable protection units.
15. Copper cable punch-down blocks.
16. Grounding.
17. Firestopping.

G. Related Requirements:

1. All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association (latest edition of applicable sections), all local codes, requirements of authority having jurisdiction, and present manufacturing standards.
2. All materials shall be UL Listed and shall be marked as such. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled.
3. All modular jacks, patch cords, patch panels and CAT6 cable performance shall be verified (not just tested) by a third party to be category 6 component and channel compliant.
4. Regulatory References:

    a. NFPA 70/ NEC (latest edition): National Electrical Code.
    b. ANSI J-STD-607 (latest edition): Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
    c. TIA/EIA-606 (latest revision): Administration Standard for Telecommunications Infrastructure.
    d. UL 969 (latest revision): Marking and Labeling Systems.
    e. NECA 1 (latest edition): Standard Practice of Good Workmanship in Electrical Construction.
    f. BICSI TDMM (latest edition): Telecommunications Distribution Methods Manual.
    g. TIA/EIA-569 (latest edition): Commercial Building Standard for Telecommunications Pathways and Spaces.
    h. TIA/EIA-568 (latest edition): Cabling Standard.
    i. All other regulatory references noted in this document.

5. If this document and any of the documents listed above are in conflict, then the more stringent requirement shall apply. The Contractor has the responsibility to determine and adhere to the most recent release when developing the proposal for installation.
6. This document does not replace any code, either partially or wholly. The contractor must be aware of local codes that may impact this project.

H. ALL CABLE/ DEVICE/ FACEPLATE COLORS SHALL BE COORDINATED, IN WRITING, WITH OWNER/ ARCHITECT PRIOR TO ORDERING.

1.3 WORK INCLUDED

A. The work included under this specification consists of furnishing all labor, equipment, materials, and supplies and performing all operations and setup necessary to complete the installation of this structured cabling system in compliance with the specifications, drawings and applicable codes/ regulatory references. The Telecommunications contractor will provide and install all of the required material to form a complete system whether specifically addressed in the technical specifications or not.

B. The work shall include, but not be limited to the following:

1. Furnish and install a complete telecommunications wiring infrastructure.
2. Furnish, install, and terminate **ALL** UTP and Optical Fiber cable.
3. Furnish and install all wall plates, jacks, patch panels, punch-down blocks and equipment room patch cords.
4. Furnish and install all required cabinets and/or racks and/ or enclosures as required or as indicated.
5. Perform link or channel testing (100% of horizontal and/or backbone links/ channels) and certification of all components.
6. Furnish test results of all cabling to the owner in electronic (searchable PDF file) and paper format, listed by each closet, then by workstation ID with the close-out documents.
7. Adhere and comply with all requirements of connectivity and cabling manufacturer Certification programs.
8. Provide owner training and documentation.
9. Coordinate with the owner and the engineer for the required telecom room and equipment identification, conduit routes and identifications, cable identification (at the rack and at the work area). Provide and install labeling for all cables using the owner approved labeling scheme.
10. Furnish any other material required to form a complete system.

1.4 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. LAN: Local Area Network.

C. CLAN: Campus Local Area Network.

D. RCDD: Registered Communications Distribution Designer.

E. EF: Entrance facility.

F. ER: Equipment Room.

G. MDF: Facility Main Distribution Frame. May include the Entrance Facility equipment and/ or the Equipment Room equipment.

H. IDF: Intermediate Distribution Frame.

I. EMI: Electromagnetic Interference.

J. Cross-connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

K. IDC: Insulation Displacement Connector.

L. UTP: Unshielded Twisted Pair.

M. Consolidation point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.

N. MUTOA: Multiuser telecommunications outlet assembly, a grouping in one location of several telecommunications outlet/ connectors.

O. Outlet/ connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.

P. WAP: Wireless Access Point

1.5 HORIZONTAL CABLING DESCRIPTION

A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/ connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called a "permanent link," a term that is used in the testing protocols.
   1. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
   2. Bridged taps and splices shall not be installed in the horizontal cabling.
   3. Splitters shall not be installed as part of the optical fiber or copper cabling system (excluding coaxial cable).

B. A work area is approximately 100 sq. ft., and includes the components that extend from the telecommunications outlet/connectors to the station equipment.

C. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet of patch cord to the workstation equipment or in the horizontal cross-connect.

1.6 ADMINISTRATIVE REQUIREMENTS

A. Coordinate layout and installation of telecommunications cabling with Owner's telecommunications department and LAN equipment and service suppliers.

B. Coordinate telecommunications outlet/ connector locations with location of power receptacles at each work area.

C. Coordinate typical labeling configuration with owner in writing prior to implementing.

D. Coordinate cable pathway routings with electrical contractor and all other trades.

1.7 SUBMITTALS

A. Contractor shall provide 7 hard copies and an electronic copy (searchable PDF file) of all submittal data required including Product Data, Shop drawings, Informational submittals and samples. Submittals will not be reviewed until complete Structured Cabling submittal package is received.

B. The Structured Cabling contractor shall check all suppliers' submittals regarding measurements, capacity, performance and details to satisfy him/ herself that they conform to the intent of the contract drawings and specifications. Submittals package shall bear the stamp of approval of the Structured Cabling contractor as evidence that the submittals have been checked by him/ her. Submittals will not be reviewed without the Structured Cabling contractor's stamp.

C. See Section 26 01 01 for additional submittal requirements.

D. Product Data: For each type of product including but not limited to: Patch cords, jacks, faceplates, cables, patch panels, racks/ cabinets

1. Work shall NOT proceed without the engineer's approval of the submitted items.
2. For all cable types used include:

    a. Performance characteristics.

    b. Nominal outside diameter.
    c. Minimum bending radius.
    d. Maximum pulling tension.

3. For all racks/ cabinets and associated accessories include:

    a. Construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets.
    b. Rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

E. Shop Drawings:
1. Submit a typical outlet assembly and labeling configuration.

2. System Labeling Schedules:

    a. Systems Labeling Schedule method shall be approved by owner, in writing, prior to implementation.
    b. Provide a typical Systems Labeling Schedule sampling with submittals.

3. Cabling administration drawings and printouts.
4. Wiring diagrams to show typical wiring schematics including the following:

    a. Cross-connects.
    b. Patch panels (copper and fiber)
    c. Patch cords and jumpers.
    d. Work area outlet.
    e. Active network equipment.

5. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.
6. Cable pathway layout, showing raceway route and type (cable tray, J-hooks, conduit, sleeves and pullboxes) to scale, with relationship between the pathway and adjacent structural, electrical, and mechanical elements. Include the following:

    a. Vertical and horizontal offsets and transitions.
    b. Clearances for access above and to side of cable trays and J-hook pathway.
    c. Vertical elevation of pathway above the floor or bottom of ceiling structure.

d. Load calculations to show dead and live loads as not exceeding manufacturer's rating for tray/ J-hooks and support elements.
e. Load calculations to show dead and live loads as not exceeding manufacturer's rating for conduit support elements.

7. Detail equipment assemblies and indicate dimensions, weights, loads, recommended clearances, method of field assembly, components, and location and size of each field connection.
8. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
9. Grounding: Submit a scale drawing of grounding bus bar and its mounting detail showing standoff insulators and wall mounting brackets.
10. Contractor shall include in the submittal package 1-1/2" scale equipment rack elevations (front) for all equipment racks/ cabinets. Elevations must include and identify (by manufacturer and model# where applicable) the following:

    a. Individual equipment rack identification
    b. All rack-mounted equipment
    c. All rack-mounted cable management
    d. All rack-mounted Power Distribution Units
    e. All rack-mounted ground bars
    f. All blank filler plates
    g. All rack mounted Uninterruptable Power Supplies (UPS)

11. Contractor shall include in the submittal package ½" scale drawings of each telecom room. Drawings must include and identify (by manufacturer and model# where applicable) the following:

    a. All equipment rack(s) and clearances.
    b. All backboard(s).
    c. All cable tray/ cable runway.
    d. Wall mounted ground bar.
    e. All raceway penetrations.
    f. All riser conduits.
    g. All punch-down blocks.
    h. All floor or wall-mounted Uninterruptable Power Supplies (UPS).
    i. Receptacle locations.
    j. All fire-stopping material/ fittings
    k. All other equipment indicated on drawings or existing (where applicable).

12. Contractor shall include in the submittal package ½" scale interior elevations of all walls in each Comm room. Elevations must include and identify (by manufacturer and model# where applicable) the following:

    a. All backboards.
    b. All wall mounted equipment.
    c. All raceway penetrations.
    d. All riser conduits.
    e. All wall mounted cable management (D-rings).
    f. All backbone cabling.
    g. All receptacles.
    h. All punch-down blocks.
    i. Wall mounted ground bar(s).
    j. All fire-stopping material/ fittings.

F. INFORMATIONAL SUBMITTALS

1. **The following informational submittal information must be provided with the submittal package:**
   a. Qualification Data: For all telecommunications contractor's personnel on site, qualified layout technicians, installation supervisor, Installers, telecommunications contractor's field quality inspector and RCDD. Personnel qualification data shall include all BICSI certifications as well as all current cabling/ connectivity manufacturer's certifications.
      1) Contractor shall submit names of all personnel to be performing work related to this project
      2) Contractor shall submit a copy of the current cabling/ connectivity manufacturer's certification documents for all contractor personnel to be involved with this project.
      3) Contractor shall submit a copy of all BICSI certification documents for all contractor personnel to be involved with this project.
   b. Seismic Qualification Certificates: For equipment frames from manufacturer.
      1) Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
      2) Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions. Base certification on the maximum number of components capable of being mounted in each rack type. Identify components on which certification is based.
      3) Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
   c. Contractor must submit the following information regarding the 3 projects of similar size and scope (see "Quality Assurance"):
      1) Project name.
      2) Project location.
      3) Project owner. Include contact information (name, address, telephone and e-mail) for owners IT department or responsible party as it relates to structured cabling.
      4) Approximate value of project structured cabling.
      5) Approximate drop count.
      6) Contact information (including name, address, telephone and e-mail) of electrical or general contractor directly responsible for the structured cabling subcontractor.
   d. Contractor must submit a sample of the labeling system for all outlets, cables and patch panels.

G. Samples: jacks, jack assemblies, icons, cable (1 foot section), patch cable (3 foot length) and faceplate. Provide one of each type and size of each product submitted.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance data: For splices and connectors to include in maintenance manuals.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

C. System Labeling Schedules: Electronic copy of labeling schedules in searchable PDF file format.

D. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.

E. All testing records.

F. All as-built drawings.

G. All warranty materials.

H. Other records as called for within this specification.

1.9 MAINTENANCE SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Patch cables: Ten of each length used.
2. Jacks: Ten of each type used.
3. Faceplates: Two of each type/ port capacity used.
4. 4 pair UTP Cable: One 500ft reel of each type used.
5. Patch-Panel units: One of each type used.
6. Rack filler panels: One of each type used.
7. Power distribution units: One of each type used.
8. Punch-down blocks: One of each type used.

1.10 QUALITY ASSURANCE

A. Installer Qualifications: The successful telecommunications contractor shall be a company specializing in communication cabling installation and shall have been in business for a minimum of 5 years under the same name and with the same board of directors/ management. Contractor must have successfully completed a minimum of 3 projects of similar size and scope within the last 5 years. At least 30 percent of the copper installation and termination crew must be certified by BICSI **and** the cable/connectivity manufacturer with a Technicians Level of Training. At least 10 percent of the optical fiber installation and termination crew must be certified by BICSI **and** the fiber cable/ connectivity manufacturer in optical fiber installation and termination practices. The contractor must have an RCDD on staff in responsible charge of the project. Provide all contact information for the RCDD as this will be the point of contact for the project.

1. Layout Responsibility: Preparation of Shop Drawings shall be under the direct supervision of an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of a BICSI certified Commercial Installer, Level 2, who shall be present at all times when work of this Section is performed at Project site.
3. Contractor's field quality inspector shall be the RCDD who is in responsible charge of the project or the on-site installation supervisor. **Contractor's field quality inspector shall provide biweekly on-site inspection reports to the engineer documenting this discipline's project progress**. These reports shall be submitted to adam@eegrpinc.com. Report shall include work that has been completed, work that is in progress, work remaining and estimated date of completion for each phase of work for

the project. Report shall include photographs of completed work and work in progress. Report shall include telecommunications contractor's personnel on-site for the duration of time included in the report.

4. Structured cabling contractor shall have, on site for final inspection, the RCDD who is in responsible charge of the project or the on-site installation supervisor. If one of the requested personnel is not present at the final inspection, the structured cabling contractor will be charged for time ($125.00/ hour) and mileage ($0.56/ mile) for the Jack R. Morgan Engineering, Inc. representative for the missed inspection. This charge must be paid prior to any subsequent visits to the site.
5. Testing supervisor shall be currently certified by BICSI as an RCDD and shall be on-site to supervise all testing.

B. The cabling/ connectivity manufacturer shall extend a manufacturer's warranty for all products installed, this project, to the end user once the telecommunications contractor fulfills all requirements under this specification. See section 3 of this document for full warranty requirements.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.

E. Grounding: Comply with ANSI-J-STD-607-A.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Delivery and receipt of products shall be at the site.

B. Cable shall be stored according to manufacturer's recommendations at a minimum. In addition, cable must be stored in a location protected from vandalism and weather. If cable is stored outside, it must be covered with opaque plastic or canvas with provision for ventilation to prevent condensation and for protection from weather. If air temperature at cable storage location will be below 40 degrees F., the cable shall be moved to a heated (50 degrees F. minimum) location. If necessary, cable shall be stored off site at the contractor's expense.

C. If the telecommunications contractor wishes to have a trailer on site for storage of materials, arrangements shall be made with the Owner.

D. Test all cables upon receipt at Project site.

1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical loss test set.
2. Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in closeout submittals.
3. Test each pair of UTP cable for open and short circuits.

1.12 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install ANY cables or connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.13 DRAWINGS

A. It shall be understood that the electrical details and drawings provided with the specification package are diagrammatic. They are included to show the intent of the specifications and to aid the telecommunications contractor in bidding the job. The telecommunications contractor shall make allowance in the bid proposal to cover whatever work is required to comply with the intent of the plans and specifications and provide a fully functional system as intended.

B. The telecommunications contractor shall verify all dimensions at the site and be responsible for their accuracy.

C. Prior to submitting the bid, the telecommunications contractor shall call the attention of the Engineer to any materials or apparatus the telecommunications contractor believes to be inadequate and to any necessary items of work omitted.

PART 2 - PRODUCTS

2.1 EQUIVALENT PRODUCTS

A. Due to the nature and type of communications all products, including but not limited to faceplates, jacks, patch panels, racks, punch-down blocks, and patch cords, for the purpose of this document, shall be manufactured by Leviton. All copper cable products shall be manufactured by Berktek. All fiber cable products shall be manufactured by Berktek.

2.2 TELECOMMUNICATIONS OUTLET/CONNECTORS (CAT6)

A. Work area cables shall each be terminated at their designated work area location in the connector types specified on drawings/ described in the subsections below. Included are modular telecommunication jacks. These connector assemblies shall snap into a faceplate.

B. The Telecommunications Outlet Assembly shall accommodate a minimum of two (2) modular jacks plus any additional accommodations for specific locations as noted in the plans for optical fiber and/or additional copper cables as necessary

C. A blank filler will be installed when extra ports are not used.

D. A dust cap shall be provided on all modular jacks with the circuit number on the identifier strip.

E. Multiple jacks that are identified in close proximity on the drawings (but not separated by a physical barrier) may be combined in a single assembly. The telecommunications contractor shall be responsible for determining the optimum compliant configuration based on the products proposed.

F. The same orientation and positioning of jacks and connectors shall be utilized throughout the installation. Prior to installation, the telecommunications contractor shall submit the proposed configuration for each outlet assembly for review by the owner.

G. The modular jack shall incorporate printed label strip on the dust cap module for identifying the outlet. Printed labels shall be permanent and compliant with ANSI/TIA/EIA–606-A standard specifications. Labels shall be printed using standard connectivity manufacturer’s label program or using a printer such as a Brady hand held printer. **Hand printed labels shall NOT be accepted**.

H. Workstation Outlets shall be as specified on drawings with connector and faceplate.

1. Jacks shall:

a. Be 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-B.1.
b. Meet category 6 performance as defined by the references in this document including ANSI/TIA/EIA-568-B.2-1. All pair combinations must be considered, with the worst-case measurement being the basis for compliance. Modular jack performance shall be third-party verified by a nationally recognized independent testing laboratory.
c. Use dual reactance modular contact array.
d. Have low emission IDC contacts.
e. Use standard termination practice using 110 impact tool.
f. Be backwards compatible to Category 3, 5, and 5e.
g. Be center tuned to category 6 test specifications.
h. Dust covers shall be used on each termination.
i. Be as specified on drawings. Jack and icon color to be selected by owner/ architect.

2. Faceplate shall:

a. Be as manufactured by connectivity manufacturer.
b. Be UL listed and CSA certified.
c. Be available in single-gang or dual-gang.
d. Shall provide easy access for adds, moves, and changes by front removal of jack modules.
e. Possess recessed designation windows to facilitate labeling and identification.
f. Shall include a clear plastic cover to protect labels in the designation window.
g. Have mounting screws located under recessed designation windows.
h. Comply with ANSI/TIA/EIA-606-A work area labeling standard.
i. Allow for the UTP modules to be inverted in place for termination purposes.
j. Be manufactured by an ISO 9001 registered company.
k. Be compliant with the above requirements along with the following when incorporating optical fiber:
l. Be a low profile assembly,
m. Incorporate a mechanism for storage of cable and fiber slack needed for termination,
n. Position the fiber optic couplings to face downward or at a downward angle to prevent contamination.
o. Incorporate a shroud that protects the fiber optical couplings from impact damage.
p. Be Stainless steel as specified on drawings and complying with requirements in section 26 27 26.
q. For use with snap-in jacks accommodating any combination of UTP, optical fiber and coaxial work area cords.
r. Flush mounting jacks.
s. Shall have window for snap-in, clear-label covers and machine-printed paper inserts.

2.3 UTP CABLE (CAT6)

A. Subject to compliance with requirements, provide product indicated on drawing.

B. UTP cable shall be as manufactured by Berktek

C. Performance:

1. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1 when tested according to test procedures of this standard.
2. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

    a. Flame-Spread Index: 25 or less.
    b. Smoke-Developed Index: 50 or less.

3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
4. Grounding: Comply with J-STD-607-A.

D. Description: 100-ohm, four-pair UTP, covered with a thermoplastic jacket shall:

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-B.1 for performance specifications.
3. Comply with TIA/EIA-568-B.2, Category 6.
4. Be listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

    a. Communications, General Purpose: CMP or CMR.
    b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
    c. Communications, Riser Rated: Type CMR, complying with UL 1666.

5. Be plenum rated and meet applicable requirements of ANSI/ICEA S-80-576 in all locations where the cable path crosses any space rated as a return air plenum. All 4 pairs must be insulated with F.E.P. No constructions that use mixed insulation materials for a single cable pathway will be allowed.
6. Consist of (4) 23 AWG twisted pairs.
7. Be suitable for the environment in which they are to be installed.
8. Have an overall diameter no larger than 0.250 inches.
9. Have an ultimate breaking strength measured in accordance with ASTM D 4565 and shall be no less than 400 N minimum.
10. Shall withstand a bend radius of 1 inch at -20 degrees Celsius without jacket or insulation cracking.
11. Be third party verified to meet ANSI/TIA/EIA-568-B.2.
12. Shall be color coded as required to meet owners color coding scheme.
13. Be as specified on drawings**.**

2.4 UTP CABLE HARDWARE (CAT6)

A. Subject to compliance with requirements, provide product indicated on drawing.

B. UTP cable hardware shall be as manufactured by Leviton

C. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

D. Connecting Blocks: 110-style IDC for Category 5e and Category 6. Provide blocks for the number of cables terminated on the block, plus 10 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

E. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.

1. Number of Terminals per Field: One for each conductor in assigned cables.

F. Patch Panel shall:

1. House multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
2. Have number of Jacks required to provide one for each four-pair UTP Data and Voicecable indicated plus 10 percent spare.
3. **Have Data, Voice, Building automation and security related cables terminated on separate patch panels**.
4. meet category 6 component compliance and be verified by a third-party nationally recognized independent testing laboratory
5. Use low emission IDC contacts
6. Use dual reactance technology to enhance the signal-to-noise ratio
7. Require standard termination practices using a 110 impact tool
8. Use a single piece IDC housing designed to accept larger Category 6 conductors
9. Support both T568B and T568A wiring
10. Include easy to follow wiring labels
11. Include label fields
12. Allow for the use of icons
13. Include full length metal rear cable management
14. Be available in standard or high density
15. Be backward compatible to category 3, 5 and 5e
16. Be center tuned to category 6 test specifications
17. Be accompanied by horizontal cable management in a ratio of one rack unit of wire management per 24 ports of patch panel.
18. Be as specified on drawings**.**

G. Copper Patch Cords:

1. Patch Cords shall:

a. Be factory-made, four-pair cables in standard lengths; terminated with eight-position modular plug at each end.
b. Have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
c. Have color-coded boots for circuit identification.
d. Use 8 position connector with impedance matched contacts and designed using dual reactance.
e. Be constructed of 100 ohm, 4 pair, 24 AWG, stranded conductor, unshielded twisted pair copper per the requirements of the ANSI/TIA/EIA-568-B.2 and ANSI/TIA/EIA-568-B.2–1 standard.
f. Meet TIA category 6 component specifications in ANSI/TIA/EIA-568-B.2-1
g. Be 100% factory tested to meet category 6 performance
h. Have ETL or any other nationally recognized 3rd party verification
i. Be center tuned to category 6 performance specifications by using paired bi-level contact array
j. Be capable of universal T568A or T568B wiring schemes

k. Have a connector that maintains the paired construction of the cable to facilitate minimum untwisting of the wires.
l. Have a performance marking indelible label on the jacket (by the manufacturer).
m. Have the ability to accept color-coded labels and icons to comply with ANSI/TIA/EIA-606A labeling specifications.
n. Have “snag-less” protection for the locking tab to prevent snagging and to protect locking tab in tight locations and provide bend relief
o. Be available in three standard colors
p. Be backwards compatible to Category 3, 5, and 5e
q. Be manufactured by a ISO 9001 registered company.
r. Be color coded as directed by owner.
s. Be as manufactured by submitted cable or connectivity manufacturer.
t. The contractor shall not be required to provide patch cords for voice work area outlets.

2. Cross-connect copper Patch Cords: Factory-made, four-pair, category 6 cables in lengths as required; terminated with eight-position modular plug at each end. Equipment room cross connect patch cables shall be 12” in length

a. Contractor shall provide one each patch cord for each Data and Voice cable terminated in telecom room. Cables shall be furnished in lengths as required to facilitate a neat and flexible installation.

3. Cross-connect fiber patch cords: factory made, single pair, multimode, 50/125 micrometer, or singlemode in lengths as required, terminated with type LC or MTP connectors. Verify connector type with owner prior to ordering.

2.5 COAXIAL CABLE

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Superior Essex.
2. Belden Inc.
3. CommScope, Inc.

B. Cable Characteristics: Broadband type, recommended by cable manufacturer specifically for broadband data transmission applications. Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss of 20 dB maximum from 7 to 806 MHz.

C. RG-6/U: NFPA 70, Type CATV or CM.
1. No. 16 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
2. Quad shielded with 100 percent aluminum-foil shield and minimum 60 percent aluminum braid.
3. Jacketed with black PVC or PE.
4. Suitable for indoor installations.

D. NFPA and UL compliance, listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1655 and with NFPA 70 "Radio and Television Equipment" and "Community Antenna Television and Radio Distribution" Articles. Types are as follows:
1. CATV Cable: Type CATV, or CATVP or CATVR.
2. CATV Plenum Rated: Type CATVP, complying with NFPA 262.
3. CATV Riser Rated: Type CATVR; or CATVP, CATVR, or CATV, complying with UL 1666.
4. CATV Limited Rating: Type CATVX.

2.6 COAXIAL CABLE HARDWARE

A. Subject to compliance with requirements, provide product indicated on drawing.

B. Coaxial-Cable Connectors: Type BNC, 75 ohms; Type F, 75 ohms.

2.7 COPPER CABLE PROTECTION UNITS

A. All copper circuits shall be provided with protection for any/ all copper cabling that penetrates the building envelope (including exterior wall mounted cameras, WAPs or data outlets). The protector shall be connected with a #4 AWG copper bonding conductor between the protector ground lug and the structured cabling ground point. Protector modules shall be housed in connector with cover and splice chamber and shall contain punch-down blocks of same style as specified elsewhere. Enclosure shall be consistent with the environment in which it is installed. Protector must be installed within 50ft of the building envelope penetration.
   1. Copper cable protection modules for Digital voice, Data and Security cabling shall be Circa# 4B1FS-240 or equal.
   2. Copper cable protection modules for P.O.T.S, Fire Alarm System and paging cabling shall be Circa# 4B1E or equal.

2.8 PATHWAYS

A. Subject to compliance with requirements, provide product indicated on drawing.

B. General Requirements: Comply with TIA/EIA-569-A.

C. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

   1. Support brackets with cable tie slots for fastening cable ties to brackets.
   2. Lacing bars, spools, J-hooks, and D-rings.
   3. Straps and other devices.

D. Cable Trays:

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Cablofil Inc.
      b. Cooper B-Line, Inc.
      c. WBT

   2. Cable Tray Material: Metal, suitable for indoors, and protected against corrosion by electroplated zinc galvanizing, complying with ASTM B 633, Type 1, not less than 0.000472 inches (0.012 mm) thick.

      a. Basket Cable Trays: 12 inches wide and 4 inches deep. Wire mesh spacing shall not exceed 2 by 4 inches.
      b. Ladder Cable Trays: Nominally 24 inches wide, and a rung spacing of 8 inches.
      c. Solid-Bottom Cable Trays: One-piece construction, nominally 12 inches wide. Provide with solid covers in locations with exposed structure.

E. Conduit and Boxes: Comply with requirements in Section 26 05 33.

1. Outlet boxes shall be no smaller than 4 inches wide, 4 inches high, and 2-1/2 inches deep.

2.9 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches sheets to cover area indicated on drawings.

2.10 EQUIPMENT FRAMES

A. Subject to compliance with requirements, provide product indicated on drawing.

B. General Frame Requirements:

1. Equipment racks/ cabinets shall provide vertical cable management and support for the patch cords at the front of the rack and wire management, support, and protection for the horizontal cables inside the legs of the rack. Waterfall cable management shall be provided at the top of the rack for patch cords and for horizontal cables entering the rack channels for protection and to maintain proper bend radius and cable support. Horizontal Wire management shall also be mounted above and below each patch panel and/or piece of equipment on the rack at a ratio of 1 rack unit of horizontal cable management per each rack unit of patching or equipment or 1 rack unit of horizontal cable management per 24 ports of patching or active network equipment (whichever is greater). The rack shall include mounting brackets for cable tray ladder rack/ cable runway to mount to the top of the rack. Velcro cable ties shall be provided inside the rack channels to support the horizontal cable. Rack shall be black in color to match the patch panels and cable management. Contractor shall provide complete dimensioned rack assembly details showing all components including part numbers as called for in as built drawings submittals section of this document.
2. Distribution Frames: Freestanding and wall-mounting, modular-steel units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
3. Module Dimension: Width compatible with EIA 310-D standard, 19-inch panel mounting.
4. Finish: Manufacturer's standard, baked-polyester powder coat.

C. Floor-Mounted Racks shall:

1. Be modular type steel construction. vertical and horizontal cable management channels, top and bottom cable troughs, grounding lug and PDU.
2. Have Baked-polyester powder coat finish.
3. Provide the necessary strain relief, bend radius and cable routing for proper installation of high performance cross connect products, meeting all specifications of ANSI/TIA/EIA-568-B.
4. Have top cable trough with waterfall and built in patch/ horizontal cable distribution separator.
5. Have EIA hole pattern on front and rear.
6. Provide floor and ceiling access for cable management and distribution.
7. Provide pre-drilled base for floor attachment of rack.
8. Be available in standard color of black.
9. Be manufactured by an ISO 9001 registered company.
10. Be furnished with manufacturer’s grounding kit.
11. Use blank panels where required

D. Modular Freestanding Cabinets shall:

1. Have removable and lockable side panels.
2. Have hinged and lockable front and rear doors.
3. Have adjustable feet for leveling.
4. Have screened ventilation openings in the roof and rear door.
5. Provide cable access provisions in the roof and base.
6. Have grounding bus bar.
7. Have integral, 550-cfm fan with filter.
8. Provide the necessary strain relief, bend radius and cable routing for proper installation of high performance cross connect products, meeting all specifications of ANSI/TIA/EIA-568-B.
9. Have top cable trough with waterfall and built in patch/ horizontal cable distribution separator.
10. Have EIA hole pattern on front and rear.
11. Provide floor and ceiling access for cable management and distribution.
12. Provide pre-drilled base for floor attachment of rack.
13. Be available in standard color of black.
14. Be manufactured by an ISO 9001 registered company.
15. Be furnished with manufacturer’s grounding kit.
16. Use blank panels where required
17. Baked-polyester powder coat finish.
18. All cabinets keyed alike.

E. Cable Management for Equipment Frames:

1. Metal, with integral wire retaining fingers.
2. Baked-polyester powder coat finish.
3. Vertical cable management panels shall have front and rear channels, with covers.
4. Provide horizontal crossover cable manager at the top of each relay rack, with a minimum height of two rack units each.

2.11 POWER DISTRIBUTION UNITS

A. Power Distribution Units shall:

1. Comply with UL 1363.
2. Be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Be rack mounted.
4. LED indicator lights for power and protection status.
5. LED indicator lights for reverse polarity and open outlet ground.
6. Be provided in each rack/ cabinet as required to provide one 5-20R outlet for each 24 cables terminated at the rack.
7. Shall NOT have on/ off switch.
8. Have integral amp/ current meter.
9. Have integral surge suppression with a minimum rating of 26 kA.
10. Surge suppression protection modes shall be line to neutral, line to ground, and neutral to ground. UL 1449 clamping voltage for all three modes shall be not more than 330 V.

B. Vertical Power Distribution Unit

1. The vertical power distribution unit shall be equipped with a minimum of ten (10) 3-prong, NEMA 5-20R, 120 VAC outlets, 10' cord.

2. The vertical power distribution unit shall be equipped with surge protection with a 20 Amp current limit.
3. The vertical power distribution unit shall be equipped with a bracket that enables it to be mounted on a 19" rack, cabinet or wall mount bracket without modification.

2.12 GROUNDING

A. The facility shall be equipped with a Telecommunications Bonding Backbone (TBB) furnished and installed by the electrical contractor. This backbone shall be used to ground all telecommunications cable shields (where applicable), equipment, racks, cabinets, raceways, and other associated hardware that has the potential to act as a current carrying conductor.

B. Each distribution frame location (backboard location) shall be equipped with a telecommunications ground bus bar (TGB). Each TGB shall be connected to the building electrical entrance grounding facility with #3 AWG in 1”C. The intent of this system is to provide a grounding system that is equal in potential to the building electrical ground system. Therefore, ground loop current potential is minimized between telecommunications equipment and the electrical system to which it is attached.

C. All racks, cabinets, enclosures, cable sheaths, metallic strength members, splice cases, cable trays, sleeves, conduits, etc. entering or residing in the EF, ER, MDF or IDF shall be grounded to the respective TGB using conductors as shown on the plans or called for elsewhere in the specifications. Telecommunications grounding conductors shall be a minimum of #6 AWG.

D. All cable tray sections shall be connected to building ground.

E. All metallic components of fire-stop fittings and conduits shall be connected to system ground.

F. All wires used for telecommunications grounding purposes shall be identified with a green insulation. Non-insulated wires shall be identified at each termination point with a wrap of green tape. All cables and bus bars shall be identified and labeled in accordance with the System Documentation Section of this specification.

G. Comply with requirements in Section 26 05 26 for grounding conductors and connectors.

H. Telecommunications Main Bus Bar:

1. Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
2. Ground Bus Bar: Copper, minimum 1/4 inch thick by 4 inches wide with 9/32-inch holes spaced 1-1/8 inches apart.
3. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

I. Comply with J-STD-607-A.

2.13 FIRE-STOP

A. Fire-stop system is comprised of the item or items penetrating the fire rated structure, the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure. Fire-stop systems comprise an effective block for fire, smoke, heat, vapor and pressurized water stream.

B. All penetrations through fire-rated building structures (walls and floors) shall be sealed with an appropriate fire-stop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating item i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall be properly fire-stopped.

C. All through penetrations shall be fire-stopped with Wiremold flamestopper (or equal) adjustable fire-stop fitting with integrated intumescent barrier.

D. Fire-stop systems shall be UL Classified to ASTM E814 (UL 1479) and shall be approved by a qualified Professional Engineer (PE), licensed (actual or reciprocal) in the state where the work is to be performed. A drawing showing the proposed fire-stop system, stamped/embossed by the PE shall be provided to the Owner's Technical Representative prior to installing the fire-stop system(s).

2.14 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

B. Comply with requirements in Section 26 05 53.

2.15 LABELING

A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.16 SOURCE QUALITY CONTROL

A. Testing Agency: Contractor shall engage a qualified, third party testing agency to evaluate all cables.

B. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-B.1.

C. Factory test UTP cables according to TIA/EIA-568-B.2.

D. Factory test multimode optical fiber cables according to TIA-526-14-A and TIA/EIA-568-B.3.

E. Cable will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WORK AREA OUTLETS

A. Cables shall be coiled in the in-wall or surface-mount boxes if adequate space is present to house the cable coil without exceeding the manufacturer's bend radius. In hollow wall installations where box-eliminators are used, excess wire can be stored in the wall. No more than 12" of UTP and 36" of fiber slack shall be stored in an in-wall box, modular furniture

raceway, or insulated walls. Excess slack shall be loosely coiled and stored in the ceiling above each drop location when there is not enough space present in the outlet box to store slack cable.

B. Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-B.1 document, manufacturer's recommendations and best industry practices.

C. Pair untwist at the termination shall not exceed one-half inch.

D. Bend radius of the horizontal cable shall not be less than 4 times the outside diameter of the cable

E. The cable jacket shall be maintained to within one inch of the termination point.

F. Data jacks, unless otherwise noted in drawings, shall be located in the bottom position(s) of each faceplate. Data jacks in horizontally oriented faceplates shall occupy the right-most position(s).

G. Voice jacks shall occupy the top position(s) on the faceplate. Voice jacks in horizontally oriented faceplates shall occupy the left-most position(s).

3.2 INSTALLATION OF EQUIPMENT ROOM FITTINGS

A. Comply with NECA 1.

B. Comply with BICSI TDMM for layout and installation of communications equipment rooms.

C. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

D. Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment and service departments.

1. Meet jointly with owner’s telecommunications and LAN equipment departments to exchange information and agree on details of equipment arrangements and installation interfaces.
2. Record agreements reached in meetings and distribute them to other participants.
3. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment as directed by owner’s IT department.
4. Adjust arrangements and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in the equipment room. Contractor shall coordinate with owner’s IT, Security and maintenance departments and facilitate inter-department coordination for acceptable configuration of shared space in telecom rooms.

E. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

F. Racks/ cabinets shall be securely attached to the concrete floor using a minimum 3/8” hardware or as required by local codes.

G. Racks/ cabinets shall be placed with a minimum of 36 inch clearance from the walls or other equipment on all sides of the rack. When mounted in a row, maintain a minimum of 36 inches from the wall or equipment behind and in front of the row of racks and from the wall or equipment at each end of the row.

H. All racks/ cabinets shall be grounded to the telecommunications ground bus bar in accordance with other sections of this document.

I. Rack mount screws not used for installing patch panels and other hardware shall be bagged and left with the rack upon completion of the installation.

J. The contractor shall install 24” ladder cable tray from wall to each rack/ cabinet.

3.3 INSTALLATION OF PATHWAYS

A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A.

B. Comply with requirements for demarcation point, pathways, cabinets, and racks specified elsewhere in this document. Drawings indicate general arrangement of pathways and fittings.

C. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.

D. Comply with requirements in Section 26 05 33 for installation of conduits and wireways.

E. Install manufactured conduit sweeps and long-radius elbows whenever possible.

F. Pathway Installation in Communications Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard when entering room from overhead.
4. Extend conduits a minimum of 6 inches above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

G. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

3.4 WIRING METHODS

A. Wiring Method: Install cables in raceways, cable trays and J-hooks except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for raceways and boxes specified in Section 26 05 33.

B. Conceal conductors and cables in accessible ceilings, walls and floor

C. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

D. Wiring within Enclosures:

1. Bundle, lace, and train cables within enclosures.
2. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
3. Provide and use lacing bars and distribution spools.
4. Install conductors parallel with or at right angles to sides and back of enclosure.

3.5 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling installation:

1. Comply with TIA/EIA-568-B.1.
2. Cable shall be installed in accordance with manufacturer’s recommendations, best industry practices and these specifications.
3. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.
4. Cable raceways shall not be filled greater than the ANSI/TIA/EIA-569-A maximum fill for the particular raceway type or 40% (whichever is less).
5. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
6. Install 110-style IDC termination hardware as required for copper cables unless otherwise indicated.
7. Terminate all conductors; no cable shall contain un-terminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
8. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
9. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
10. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
11. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable. Any cabling found to be damaged during installation shall be removed and replaced at no cost to owner.
12. Cold-Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not be used for heating.
13. In the communications equipment room, install a 10-foot long service loop on each end of cable.
14. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
15. MUTOA shall not be used as a cross-connect point.
16. Consolidation points may be used only for making a direct connection to telecommunications outlet/ connectors and may only be used where specifically called for in the contract documents.

    a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to work station equipment.
    b. Locate consolidation points for UTP at least 49 feet from communications equipment room.

17. Cables shall be installed in continuous lengths from origin to destination (no splices) except for transition points, or consolidation points.
18. Where transition points or consolidation points are allowed, they shall be located in accessible locations and housed in an enclosure intended and suitable for the purpose.
19. The cable's minimum bend radius and maximum pulling tension shall not be exceeded.
20. If a J-hook or trapeze system is used to support cable bundles all horizontal cables shall be supported at a maximum of 36 inch intervals. At NO point shall cable(s) rest on acoustic ceiling grids, ceiling panels, electrical conduits, fire alarm system conduits, structural elements, mechanical piping or ductwork.
21. Horizontal distribution cables shall be bundled in groups of no more than 50 cables. Cable bundle quantities in excess of 50 cables may cause deformation of the bottom cables within the bundle and degrade cable performance
22. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
23. Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, the contractor shall install appropriate carriers to support the cabling. See the plans for approximate support locations and requirements.
24. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to the Owner.
25. Cables shall be identified by a self-adhesive label in accordance with the System Documentation Section of this specification and ANSI/TIA/EIA-606-A. The cable label shall be applied to the cable behind the faceplate on a section of cable that can be accessed by removing the cover plate.
26. Unshielded twisted pair cable shall be installed so that there are no bends smaller than four times the cable outside diameter at any point in the run and at the termination field.
27. Pulling tension on 4-pair UTP cables shall not exceed 25-lbf for a four-pair UTP cable.
28. Backbone cabling

    a. Backbone cables shall be installed separately from horizontal distribution cables.
    b. Where cables are housed in conduits, the backbone and horizontal cables shall be installed in separate conduits.
    c. Where backbone cables are installed in an air return plenum, riser rated cable shall be installed in metallic conduit.
    d. Where backbone cables and distribution cables are installed in a cable tray or wireway, backbone cables shall be installed first and bundled separately from the horizontal distribution cables.
    e. All backbone cables shall be securely fastened to the sidewall of the telecom room.
    f. Backbone cables spanning more than two floors shall be securely attached at the top of the cable run with a wire mesh grip and on alternating floors or as required by local codes.
    g. Vertical runs of cable shall be supported to messenger strand, cable ladder, or other method to provide proper support for the weight of the cable.
    h. Large bundles of cables and/or heavy cables shall be attached using metal clamps and/or metal banding to support the cables.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.
2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.

D. Optical Fiber Cable Installation:

1. Comply with TIA/EIA-568-B.3.
2. Cable may be terminated on connecting hardware that is rack or cabinet mounted.
3. Verify termination type with owner prior to ordering.

E. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway, a minimum of 8 inches above ceilings by cable supports not more than 36 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

F. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable 6 feet long not less than 12 inches in diameter below each feed point.

G. UTP cable hardware installation

1. Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-B standard, manufacturer's recommendations and best industry practices.
2. Pair untwist at the termination shall not exceed one-half inch.
3. Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.
4. Cables shall be neatly bundled and dressed to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.
5. The cable jacket shall be maintained as close as possible to the termination point.

    a. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable

H. Optical Fiber hardware installation

1. Splice Trays:

    a. Fiber slack shall be neatly coiled within the fiber splice tray or enclosure. No slack loops shall be allowed external to the fiber panel.
    b. Each cable shall be individually attached to the respective splice enclosure by mechanical means. The cables strength member shall be securely attached the cable strain relief bracket in the enclosure.
    c. Each fiber bundle shall be stripped upon entering the splice tray and the individual fibers routed in the splice tray.
    d. Each cable shall be clearly labeled at the entrance to the splice enclosure. Cables labeled within the bundle shall not be acceptable.
    e. A maximum of 12 strands of fiber shall be spliced in each tray
    f. All spare strands shall be installed into spare splice trays.
2. Adapter Plates/ fiber patch panels:

I. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.6 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with ANSI-J-STD-607-A.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.7 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Section 26 05 53.
    1. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.

B. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A.

C. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

E. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 50 feet and at every cable pathway transition.
3. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

    a. Individually number wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device with name and number of particular device as shown.
    b. Label each unit and field within distribution racks and frames.

4. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
5. Uniquely identify and label work area cables extending from the MUTOA to the work area. These cables may not exceed the length stated on the MUTOA label.

F. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA 606-A, for the following:

1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections:

1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
2. Visually confirm Category 6, marking of outlets, cover plates, outlet/connectors, and patch panels.
3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

4. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

5. Optical Fiber Cable Tests:

    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
    b. Link End-to-End Attenuation Tests:

        1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in 1 direction according to TIA-526-14-A, Method B, One Reference Jumper.
        2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.

6. UTP Performance Tests:

    a. Test for each outlet and MUTOA. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:

        1) Wire map.
        2) Length (physical vs. electrical, and length requirements).
        3) Insertion loss.
        4) Near-end crosstalk (NEXT) loss.
        5) Power sum near-end crosstalk (PSNEXT) loss.
        6) Equal-level far-end crosstalk (ELFEXT).
        7) Power sum equal-level far-end crosstalk (PSELFEXT).
        8) Return loss.
        9) Propagation delay.
        10) Delay skew.

7. Optical Fiber Cable Performance Tests: Perform optical fiber end-to-end link tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.3.
8. Final Verification Tests: Perform verification tests for UTP and optical fiber systems after the complete communications cabling and workstation outlet/connectors are installed.

    a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.
    b. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.

D. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

G. Perform tests and inspections.

H. Tests and Inspections:

1. Visually inspect UTP and optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test UTP copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

4. Optical Fiber Cable Tests:

    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
    b. Link End-to-End Attenuation Tests:

        1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in 1 direction according to TIA/EIA-526-14-A, Method B, one Reference Jumper.
        2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.

I. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

J. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

K. End-to-end cabling will be considered defective if it does not pass tests and inspections.

L. Prepare test and inspection reports. All testing shall be performed by equipment that has been maintained and calibrated as directed by testing equipment manufacturer. Include calibration history with test and inspection reports.

3.9 SLEEVE AND SLEEVE SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44

3.10 FIRESTOPPING

A. All fire-stop systems shall be installed in accordance with the manufacturer's recommendations and shall be completely installed and available for inspection by the local inspection authorities prior to cable system acceptance

B. Comply with TIA-569-B, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.11 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements in Section 26 05 44.

B. The contractor shall develop and submit for approval a labeling system for the cable installation. The Owner will negotiate an appropriate labeling scheme with the successful contractor. At a minimum, the labeling system shall clearly identify all components of the system: racks, cables, panels and outlets. The labeling system shall designate the cables origin and destination and a unique identifier for the cable within the system. Racks and patch panels shall be labeled to identify the location within the cable system infrastructure. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme. Labeling shall follow the guidelines of ANSI/TIA/EIA-606-A.

C. All label printing will be machine generated by connectivity/ cabling manufacturer software using indelible ink ribbons or cartridges. Self-laminating labels will be used on cable jackets, appropriately sized to the OD of the cable, and placed within view at the termination point on each end. Outlet, patch panel and wiring block labels shall be installed on, or in, the space provided on the device.

D. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A.

E. Labels shall be preprinted or computer-printed type.

3.12 DEMONSTRATION

A. Train Owner's maintenance personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and keeping records of cabling assignments and revisions when extending wiring to establish new workstation outlets.

3.13 TESTING AND ACCEPTANCE

A. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-B. All pairs of each installed cable shall be verified prior to system

acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.

B. All cables shall be tested in accordance with this document, the ANSI/TIA/EIA standards, the connectivity/ cabling manufacturer Certification Program Information Manual and best industry practice. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.

C. Copper Channel Testing.

1. All twisted-pair copper cable links shall be tested for continuity, pair reversals, shorts, opens and performance as indicated below. Additional testing is required to verify Category performance. Horizontal cabling shall be tested using a Level III test unit for category 6 performance compliance as specified in ANSI/TIA/EIA-568-B.2-1.
2. Continuity – Each pair of each installed cable shall be tested using a test unit that shows opens, shorts, polarity and pair-reversals, crossed pairs and split pairs. Shielded/screened cables shall be tested with a device that verifies shield continuity in addition to the above stated tests. The test shall be recorded as pass/fail as indicated by the test unit in accordance with the manufacturers' recommended procedures, and referenced to the appropriate cable identification number and circuit or pair number. Any faults in the wiring shall be corrected and the cable re-tested prior to final acceptance.
3. Length - Each installed cable link shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to the maximum distances set forth in the ANSI/TIA/EIA-568-B Standard. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number. For multi-pair cables, the shortest pair length shall be recorded as the length for the cable.
4. Category 6 Performance

    a. Follow the Standards requirements established in ANSI/TIA/EIA-568-B .1, B.2-1
    b. A Level III test unit is required to verify category 6 performance.
    c. The basic tests required are:

        1) Wire Map
        2) Length
        3) Attenuation
        4) NEXT (Near end crosstalk)
        5) Return Loss
        6) ELFEXT Loss
        7) Propagation Delay
        8) Delay skew
        9) PSNEXT (Power sum near-end crosstalk loss)
        10) PSELFEXT (Power sum equal level far-end crosstalk loss)

D. Fiber Testing

1. All fiber testing shall be performed on all fibers in the completed end to end system. There shall be no splices unless clearly defined in an RFP. Testing shall consist of an end to end power meter test performed per EIA/TIA-455-53A. The system loss measurements shall be provided at 850 and/or 1300 nanometers for multimode fibers and 1310 and/or 1550 nanometers for single mode fibers. These tests also include continuity checking of each fiber.
2. Backbone multimode fiber cabling shall be tested at both 850 nm and 1300 nm (or 1310 and 1550 nm for singlemode) in both directions.

3. Test set-up and performance shall be conducted in accordance with ANSI/EIA/TIA-526-14 Standard, Method B.
4. Where links are combined to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. ONLY LINK TEST IS REQUIRED. The contractor can optionally install patch cords to complete the circuit and then test the entire channel. The test method shall be the same used for the test described above. The values for calculating loss shall be those defined in the ANSI/TIA/EIA Standard.
5. Attenuation testing shall be performed with an approved hand held tester from an industry recognized test equipment manufacturer.

E. System Documentation

1. Upon completion of the installation, the telecommunications contractor shall provide three (3) full documentation sets and one (1) searchable PDF document to the Engineer for approval. Documentation shall include the items detailed in the sub-sections below.
2. Documentation shall be submitted within ten (10) working days of the completion of each testing phase (e.g. subsystem, cable type, area, floor, etc.). This is inclusive of all test result and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase. At the request of the Engineer, the telecommunications contractor shall provide copies of the original test results.
3. The Engineer may request that a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the telecommunications contractor, additional testing can be requested to the extent determined necessary by the Engineer, including a 100% re-test. This re-test shall be at no additional cost to the Owner.

F. Test Results

1. Test documentation shall be provided (in searchable PDF format) on disk within three weeks after the completion of the project. The disk shall be clearly marked on the outside front cover with the words “Project Test Documentation”, the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.
2. The field test equipment shall meet the requirements of ANSI/TIA/EIA-568-B including applicable TSB’s and amendments. The appropriate Level III tester shall be used to verify Category 6 cabling systems.
3. Printouts generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package. The telecommunications contractor must furnish this information in electronic form (flash drive or CD-ROM).
4. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.

3.14 AS-BUILT DRAWINGS

A. The drawings are to include cable routes and outlet locations. Outlet locations shall be identified by their sequential number as defined elsewhere in this document. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. Construction documents will be modified accordingly by the telecommunications contractor to denote as-built information as defined above and returned to the Owner.

B. The Contractors shall annotate the base drawings and return a hard copy (same plot size as originals) and electronic (PDF format) form.

3.15 WARRANTY

A. Supplier will honor claims on this warranty for Life (which is defined as the usable life of the building and is referred to as the “Warranty Period” and shall be no less than 30 years).

B. This warranty covers the copper and fiber optic permanent links of the network (as defined by ANSI/TIA/EIA-568-C.2 for CAT 5e, CAT.6, CAT 6A, ANSI/TIA/EIA-568-C.3 for Optical Fiber Cabling and Components): which includes the cable and connecting hardware.

C. This warranty will be extended to include the entire channel.

D. The network copper cabling infrastructure must be installed in accordance with TIA 568 Series Standards and installed by Leviton Certified installers. The fiber cabling and components shall be installed by a Corning NPI certified installer.

E. Each permanent link or channel in the network must be field tested in accordance with the TIA 568 series industry standard in force at the time of purchase AND the installed permanent links and channels must have passed all applicable TIA and manufacturer performance requirements.

F. Appropriate Warranty Application form must be properly completed and submitted to Supplier prior to initiating the installation. The Warranty Submittal Form must be submitted within 10 days of installation completion.

G. Copies of all certification test reports must be submitted as part of the Warranty Submittal Form, and be kept on file by the registrant to be re-submitted when requested by Supplier. Data must be saved in raw data and summary formats. Submitting the data via online upload, e-mail or on disc are the preferred methods for providing test data.

H. The Campus Warranty provides that at the time of delivery, Premises Voice-Grade Cable and Outside Plant Cable products, when installed as part of a campus network along with copper and/or fiber cables from specified manufacturer for 100% of the premises LAN installation, will be free from defects in design, material, and manufacture and conform to manufacturer specifications in force at the time of purchase for a period of no less than thirty (30) years from the delivery date (the “Campus Warranty”).

I. Transfer manufacturer's warranties to the owner in addition to the General System Guarantee. Submit these warranties on each item in list form with shop drawings. Detail specific parts within equipment that are subject to separate conditional warranty. Warranty proprietary equipment and systems involved in this contract during the guarantee period. Final payment shall not relieve you of these obligations.

J. An Extended Product Warranty shall be provided which warrants functionality of all components used in the system for no less than thirty (30) years from the date of registration. The Extended Product Warranty shall warrant the installed horizontal and/or backbone copper, and both the horizontal and the backbone optical fiber portions of the cabling system.

K. The manufacturer and contractor shall provide a warranty on the physical installation.

3.16 CONTINUING MAINTENANCE

A. The contractor shall furnish an hourly rate with the proposal submittal, which shall be valid for a period of one year from the date of acceptance. This rate will be used when cabling support is required to affect moves, adds, and changes to the system (MACs). MACs shall be performed by contractor that meets the qualifications outlined elsewhere in these Specifications.

3.17 FINAL ACCEPTANCE AND SYSTEM CERTIFICATION

A. The contractor shall furnish an hourly rate with the proposal submittal, which shall be valid for a period of one year from the date of acceptance. This rate will be used when cabling support is required to affect moves, adds, and changes to the system (MACs). MACs shall be performed by an connectivity/ cabling manufacturer certified Integrator and shall be added to the warranty when registered with manufacturer. Completion of the installation, in-progress and final inspections, receipt of the test and as-built documentation and successful performance of the cabling system for a two week period will constitute acceptance of the system. Upon successful completion of the installation and subsequent inspection, the end user shall be provided with a numbered certificate, from connectivity/ cabling manufacturer, registering the installation.

END OF SECTION