LIVE FIRE SHOOT HOUSE

Camp Blanding Joint Training Center
Starke, Florida

To be constructed for and the contract administered by

State of Florida
Department of Military Affairs
Construction and Facility Management Office
2305 State Road 207
St. Augustine, Florida 32086
Project Number 120193

CONSTRUCTION CONTRACT PROJECT MANUAL

02 MARCH 2012

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SECTION A
REQUESTS FOR PROPOSALS

A-1 INVITATION TO BID

The "Invitation To Bid" form enclosed as Exhibit 1 shall be utilized for requesting proposals from all Bidders. The standard template for the Invitation to Bid (ITB) form shall be completed by the Contract Management Branch and distributed through the DMS Vendor Bid System (VBS), Florida Administrative Weekly (FAW) or local news media (newspaper), depending on the level of the project. The ITB shall contain all information needed for the site visit/pre-bid meeting, RFI's for addenda, submittal of bids and bid opening. Sources of information other than the DMA should not be relied upon.

A-2 FUNDING

The State of Florida's award, performance and obligation to pay under this contract is contingent upon availability of funding and an annual appropriation by the Legislature.

A-3 REQUIRED FORMS

The following are the forms required for use by this office. They are available by contacting the Contract Management Branch at (904) 823-0255. Use of other forms may cause rejection of bids or a delay in approval and payment of your invoices.

- Project Advertisement "Invitation To Bid" - Exhibit 1
- Insurance Form – Exhibit 2
- Contractor Qualifications Form FNG Form 5085 - Exhibit 3
- Proposal Form - Exhibit 4
- List of Subcontractors - Exhibit 5
- Agreement Between Owner & Contractor - Exhibit 6
- Performance Bond - Exhibit 7
- Labor and Material Bond - Exhibit 8
- Final Receipt of Payment & Release of All Liens & Claims - Exhibit 9
- Owners Certificate of Partial Pay Form 4012E - Exhibit 10

- Schedule of Contract Values - Exhibit 11
- Contractors Affidavit of Contract Completion - Exhibit 12
- A/E Certificate of Contract Completion - Exhibit 12a
- Percentage Factor/Contract Conditions - Exhibit 13
- Contractor Project Sign - Exhibit 14
- Minority Business Status Report - Exhibit 15
- CFMO Change Order Request Summary - Exhibit 16
- Contractor Estimated Payment Draw Schedule – Exhibit 17
- Consent of Surety to Final Payment – Exhibit 18
- Surety Power of Attorney (to accompany Exhibit 18) – Exhibit 19
- Waiver and Release of Lien Upon Progress Payment – Exhibit 20

SECTION B
INSTRUCTIONS TO BIDDERS

B-1 SPECIFICATION TERMINOLOGY

DEFINITION OF TERMS:
Whenever in these Instructions the following terms (or pronouns which replace these terms) are used, their intent and meaning shall be interpreted as follows:

OWNER
State of Florida, Department of Military Affairs
2305 State Road 207
St. Augustine, FL 32086

PROJECT MANAGER:
The authorized representative of the Owner charged with the construction management of the project for the Department of Military Affairs

CONTRACT MANAGER:
The authorized representative of the Owner charged with the contract management and administration of the project for the Department of Military Affairs.

ARCHITECT-ENGINEER/PROJECT REPRESENTATIVE:
The Design Professional (Architect-Engineer, Architect, Engineer or Other) commissioned by the Owner, acting directly or through a duly authorized representative.

BIDDER:
Any individual, firm, partnership or corporation submitting a proposal for the work contemplated.

SURETY:
The corporate body, which is bound with and for the Contractor, which is primarily liable, and which guarantees the faithful performance of the Agreement.

PROPOSAL:
A bid for the work contemplated, which the Bidder shall submit on approved forms (Exhibit 4).

AGREEMENT:
"Agreement" shall mean the document entitled "Agreement between Owner and Contractor."

CONTRACT LEVELS:

LEVEL 1:
Contracts where Agreement has a Contract Sum which does not exceed $10,000

LEVEL 2:
Contracts where Agreement has a Contract Sum greater than $10,000 but does not exceed $25,000.

LEVEL 3:
Contracts where Agreement has a Contract Sum greater than $25,000 but does not exceed $200,000.

LEVEL 4:
Contracts where Agreement has a Contract Sum greater than $200,000 but does not exceed $500,000.

LEVEL 5:
Contracts where Agreements Contract Sum exceeds $500,000.

THRESHOLD BUILDING:
Threshold Building means any building which is greater than three stories or 50 feet in height, or which has an assembly occupancy classification that exceeds 5,000 square feet in area and an occupant content of greater than 500 persons.

SUBSTANTIAL COMPLETION:
The term "Substantial Completion" shall mean that the project under this contract is sufficiently completed in accordance with the
Contract Documents, so that the Owner can occupy or utilize the work or designated portions thereof for the use for which it is intended, as expressed in the Contract Documents. The term "Substantial Completion" shall not mean the inclusion of such minor alterations and patching as the Final Inspection shall disclose.

B-2 BIDDER'S QUALIFICATION REQUIREMENTS AND PROCEDURES

Each Bidder and each subcontractor whose field or area is governed by Chapter 399, 455, 489 or 633 of the Florida Statutes for licensure must hold a valid current license as required by the Statute. If the Bidder is a corporation, he must also be properly registered with the State of Florida, Department of State, Division of Corporations.

Bidder qualification requirements and procedures are established by Department rule (Rule 60D-5, Florida Administrative Code) and by the bidding conditions and Specifications. Failure of the Bidder to strictly meet and follow all such requirements and procedures may result in bid rejection or disqualification for contract award. For the Bidder's convenience, the provisions of Rule 60D-5.004 Bidder's Qualification Requirements and Procedures are set forth below.

60D-5-004 Bidder's Qualification Requirements and Procedures.

There are two steps in qualifying to perform construction of State projects: A.) Prequalification to submit a bid, and B.) Prequalification for award of the contract. However, the submission date of qualifications may change dependent upon the complexity of a project, funding time constraints or availability of personnel to perform qualification review and approval procedures. Contractor should verify at the Pre-Bid meeting the exact prequalification requirements and submission due dates.

Pre-qualifications with one agency will not automatically prequalify the contractor with other agencies. Pre-qualifications, unless otherwise stated in writing, shall be submitted on each project advertised by the Department. Qualification documents are not held on file for other projects.

A. Prequalification to submit a bid.

1. Prequalification requirements apply to all Bidders on Levels Four and Five contracts. Bidders must supply this information during the bidding of a specific project, unless otherwise advertised.

a. Current State Contractor license certification or registration as required under Florida Statutes.
b. Current Corporate Charter registration, if the potential Bidder is a domestic (Florida) corporation, or authority to transact business if the potential Bidder is a foreign (non-Florida) corporation, as may be required by Florida law.
c. For projects that require (based on Agency discretion) a contractor with specific expertise and experience, the Agency may state additional prequalification requirements.

d. A completed FNG 5085 Contractor Questionnaire. (See Exhibit 3)
e. Proof of registration in www.myfloridamarketplace.com web site.

2. For projects that require a contractor with specific expertise and experience, the Agency may state additional prequalification requirements relating to demonstrated performance of similar work of similar size and complexity and the possession or availability of facilities or equipment needed for performance of the work in addition to prequalification requirements in accordance with conditions that will be established in the bidding documents.

3. In each instance where the bid documents set forth certain additional prequalification requirements each potential Bidder shall submit these prequalification data to the Agency as provided in the bid documents. The conditions may include a deadline date for submittal of additional prequalification data, which date will be earlier than the deadline for submission of bids. Bids are to be accepted only from those potential Bidders who have pre-qualified in accordance with this section and the terms of the bidding documents.

4. Each potential Bidder will be notified by the Agency to which it applied for prequalification of ineligibility to submit bids during the balance of the qualification period for a specific field or area of construction. A firm will be permitted to correct prequalification deficiencies if proof of correction is received 120 hours prior to the bid opening date and time. Any Bidder or potential Bidder that is determined to be ineligible because of failure to provide evidence of the minimum requirements will not be qualified to submit a bid and will be informed in writing of the deficiencies that must be corrected to be considered for future projects. Each potential Bidder notified of its eligibility may submit a bid at the time and place designated in the bidding documents as long as the Bidder is qualified and eligible to perform the work required by the bidding documents.

B. Pre-qualifications for award of the contract

1. Requirements: Any Bidder that has submitted a bid on Levels Four and Five contracts must satisfy the following requirements as judged by the Agency in order to be eligible for award of the contract for construction.

a. Satisfactory compliance with bid pre-qualification criteria.
b. On projects where the bid total exceeds $100,000, the Bidder must provide with the bid, a good faith deposit in the amount of 5% of the bid by way of a bid bond from a surety insurer authorized to do business in this State as surety or a certified check accompanying the bid, such requirement may be satisfied by the Bidder depositing in lieu of such certified check, a cashier's check, treasurer's check or bank draft of any national or state bank.
c. On projects where the bid exceeds $100,000, unless such requirement has been waived in accordance with Rule 60D-5.0041, the Bidder must provide with the bid, evidence of ability to provide the necessary performance and payment bonds for the project by providing a letter of intent to provide a 100% performance bond and a 100% labor and material payment bond from a surety company authorized to do business in the State of Florida by the Department of Insurance, and meeting the financial and performance rating required by the bidding documents. For contract amounts not exceeding $500,000 the provisions of Section 287.0935 F.S. shall govern.
d. Supervisor - On Level 5 projects, the Contractor must agree to provide field (on-site) supervision (through a named superintendent) for each of the general, concrete forming and placement, masonry, mechanical, plumbing, electrical and roofing trades. In addition, the Contractor shall assign and name a qualified employee to provide scheduling direction to the entire project. Supervisory employees (including field superintendents, foremen and schedulers at all levels) must have been employed in a supervisory (leadership) capacity of a substantially equivalent level on a similar project for at least two years within the last five years. The Contractor shall include a resume of experience for each of those employees identified by him to supervise each trade, and for scheduling, with its submittal of the experience questionnaire (item d above).
e. Specific expertise and experience a contractor's staff must have to perform a project requiring unique or specialized capabilities.

2. The Agency will evaluate all data submitted within fourteen days of receipt and determine whether the firm is a qualified Bidder. Should the Bidder be judged unqualified, its bid will be rejected and the Bidder submitting the next low responsive bid will be given seven (7) working days to submit its qualification data. Additional qualification data may be requested.

B-3 FAMILIARITY WITH LAWS

The Bidder is required to be familiar with all Federal, State and local laws, ordinances, rules and regulations that in any manner affect the work. Ignorance on the part of the Bidder will in no way relieve him from responsibility.

B-4 FLORIDA PRODUCTS AND LABOR

The Contractor's attention is called to Section 255.04, Florida Statutes, which requires that on public building contracts Florida products and labor shall be used wherever price and quality are equal.

B-5 TAXES

Although the Owner is not subject to the Florida Sales and Use Tax, any Contractor who purchases materials and services, which will be used in the construction of State-owned buildings, will not be exempted from the tax on these materials and services as evidenced by the following excerpt from the Florida Statutes:

"The State, any county, municipality or political subdivision of this State is exempt from the sales tax, except this exemption shall not include sales of tangible personal property made to contractors employed either directly or as agents of any such government
or political subdivision thereof when such tangible personal property goes into or becomes a part of public works owned by such government or political subdivision thereof."

The Owner is not subject to:

A. Federal Excise Taxes on materials or appliances that are incorporated into and become a part of the completed improvement.

B. Federal Tax on Transportation of Property.

In every case of a purchase of materials to be incorporated in the work, which are subject to Federal Excise Tax, the Owner will furnish to the Contractor the necessary Federal Excise Tax Exemption Certificate upon receipt of a copy of the supplier's invoice showing the item or items, the net price, and Federal Excise Tax separately.

The Bidder shall take these factors into consideration in preparing his proposal, including therein the cost of the State Sales Tax and Use Tax on materials, but excluding the cost of those taxes not applicable.

B-6 ALTERNATES

If the Owner wishes to learn the relative or additional construction cost of an alternative method of construction, an alternative use or type of material or an increase or decrease in scope of the project, these items will be defined as alternates and will be specifically described by the contract documents. Alternates will be listed in the Proposal form in a manner that the Bidder shall be able to clearly indicate what sums he will add to (or deduct from) his Base Bid.

B-7 ADDENDA

In case the Architect-Engineer finds it expedient to supplement, modify or interpret any portion of the Bidding Documents during the bidding period, such procedure will be accomplished by the issuance of written Addenda to the Bidding Documents. Addenda shall be made available to all prospective Bidders. It is the Bidders responsibility to ensure receipt of all issued addenda before bid due date. Failure to acknowledge addenda on the Exhibit 4 proposal form may be cause for rejection.

B-8 INTERPRETATION OF BIDDING DOCUMENTS

No interpretation of the meaning of the Drawings, Specifications or other Bidding Documents and no correction of any apparent ambiguity, inconsistency or error therein will be made to any Bidder orally. Every request for such interpretation or correction shall be in writing, and addressed to the Architect-Engineer (or the contact indicated in the bidding documents). All such interpretations and supplemental instruction will be in the form of written Addenda to the Bidding Documents, sent via E-Mail by the Architect-Engineer or posted on the VBS by a Contract Management Branch Official.

Only the interpretation or correction so given by the Architect-Engineer (or Owner appointed expert) in writing shall be binding, and prospective Bidders are advised that no other source is authorized to give information concerning, or to explain or interpret, the Bidding Documents. The DMA will not be responsible for information obtained through sources other than those used by

the DMA for solicitations (Vendor Bid System or Florida Administrative Weekly) that may cause rejection of bids.

B-9 EXAMINATION OF BIDDING DOCUMENTS AND SITE OF WORK

Bidders are required, before submitting their proposals, to visit the site of the proposed work and completely familiarize themselves with the nature and extent of the work and any local conditions that may in any manner affect the work to be performed and the equipment, materials and labor required. They are also required to examine carefully any Drawings, Specifications and other Bidding Documents to inform themselves thoroughly regarding any and all conditions and requirements that may in any manner affect the work. Only those contractors listed on the pre-bid /site visit meeting sign-in roster will be allowed to bid.

B-10 BASIS FOR BIDDING - TRADE NAMES

For clarity of description and as a standard of comparison, certain equipment, materials, etc., have been specified by at least two trade names or manufacturers. To ensure a uniform basis for bidding, the Bidder shall base his Proposal on the particular system,
equipment or material specified. After the contract is let, other equipment materials, etc., as manufactured by other manufacturers may be accepted only if, in the opinion of the Architect-Engineer, same is equivalent in quality and workmanship and will perform its intended purpose satisfactorily.

B-11 BID GUARANTEE

On projects where the base bid and sum of all additive alternates exceeds $100,000, bids shall be accompanied by a bid guarantee of not less than five (5) percent of the amount of the bid, which may be a certified check, a cashier's check, treasurer's check, bank draft or Bid Bond made payable to the Owner. If a bid bond is submitted, it must be signed by a Florida Licensed Resident Agent who holds a current Power of Attorney from the Surety Company issuing the Bond and the Power of Attorney must be attached to the Bid Bond. Such check or Bid Bond shall be submitted with the understanding that it shall guarantee that the Bidder will not withdraw his bid for a period of forty (40) days after the scheduled closing time for the receipt of bids; that if his bid is accepted, he will enter into a written contract with the Owner in accordance with the form of agreement included as a part of the Contract Documents, and that the required Performance Bond and Labor and Material Payment Bond will be given; and that in the event of the withdrawal of said bond within said period, or failure to enter into said Agreement and give said bonds within ten (10) calendar days after he has received notice of acceptance of his bid, the Bidder shall be liable to the Owner for the full amount of the bid guarantee as representing the damage to the Owner on account of the default of the Bidder in any particular hereof. The Bid Bonds or checks shall be returned to all except the apparent lowest two qualified Bidders after the formal opening of bids. The remaining Bid Bonds or checks will be returned to the two lowest Bidders after the Owner and the accepted Bidder have executed the Agreement and the Performance Bond and Labor and Material Payment Bond have been approved by the Owner. If the required Agreement and Bonds have not been executed within forty (40) calendar days after the date of the opening of the bids, then the Bid Bond or check of any Bidder will be returned upon his request, provided he has not been notified of the acceptance of his bid prior to the date of such request.

B-12 SURETY COMPANIES ACCEPTABLE TO STATE

To be acceptable to the State as Surety for Bid Bonds, Performance Bonds and Labor and Material Payment Bonds, a Surety Company shall comply with the following provisions:

A. The Surety Company shall have a currently valid Certificate of Authority, issued by the State of Florida, Department of Insurance, authorizing it to write surety bonds in the State of Florida.

B. The Surety Company shall have currently valid Certificate of Authority issued by the United States Department of Treasury under Sections 9304 to 9308 of Title 31 of the United States Code.

C. The Surety Company shall be in full compliance with the provisions of the Florida Insurance Code.

D. The Surety Company shall have at least twice the minimum surplus and capital required by the Florida Insurance Code at the time the invitation to bid is issued.

E If the Contract Award Amount exceeds $500,000, the Surety Company shall also comply with the following provisions:

1. The Surety Company shall have at least the following minimum ratings in the latest issue of Best's Key Rating Guide.

   Policy Required:

Contract Amount	Holder's Rating	Financial Rating
$ Up to1,000,000	A-	CLASS I
1,000,000 to 2,000,000	A-	CLASS II
2,000,000 to 5,000,000	A-	CLASS III
5,000,000 to 10,000,000	A-	CLASS IV
10,000,000 to 25,000,000	A-	CLASS V
25,000,000 to 50,000,000	A-	CLASS VI
50,000,000 to 100,000,000	A-	CLASS VII

2. The Surety Company shall not expose itself to any loss on any one risk in an amount exceeding ten (10) percent of its surplus to policyholders, provided:

   (a) Any risk or portion of any risk being reinsured shall be deducted in determining the limitation of the risk as prescribed in this section. These minimum requirements shall apply to the reinsuring carrier providing authorization or approval from the State of Florida, Department of Insurance requirements to do business in this state have been met.

   (b) In the case of the surety insurance company, in addition to the deduction for reinsurance, the amount assumed by any co-surety, the value of any security deposited, pledged or held subject to the consent of the surety and for the protection of the surety shall be deducted.

B-13 PREPARATION AND SUBMISSION OF BIDS

Each Bidder shall copy the proposal form enclosed as Exhibit 4 on his own letterhead, indicate his bid prices thereon in proper spaces, for the Base Bid and for alternates on which he bids. Any erasure or other correction in the proposal may be explained or noted over the signature of the Bidder.

Proposals containing any conditions, omissions, unexplained erasures, alterations, items not called for or irregularities of any kind may be rejected by the Owner.

Each bid must give the full business name, federal ID number, address, telephone and fax of the Bidder and state whether it is an individual, corporation or partnership. The bid must be signed before submitting in duplicate in a sealed envelope. The envelope must be clearly marked on its face as follows:

SEALED BID - PROJECT NO. 120193
PROJECT NAME: Live Fire Shoot House
ATTN: CFMO Contract Management Branch

The bid shall be submitted only prior to the time and the place specified in the Invitation to Bid or in accordance with any Addendum issued subsequent to the advertisement. Sealed bid envelopes submitted by mail or by delivery service must be delivered within a separate mail or delivery envelope, also marked "SEALED BID". Bids not delivered in sealed envelopes may be returned to the Bidder. All bids submitted by mail or delivery service need to be confirmed by Bidder with the CFMO Contract Management Branch.

B-14 LISTING OF SUBCONTRACTORS

In order that the Owner may be assured that only qualified and competent subcontractors will be employed on the project, each Bidder shall submit in duplicate with his proposal a list of the subcontractors who will perform the work for each Division of the Specifications utilizing the "List of Subcontractors" form enclosed as Exhibit 5. The Bidder shall have determined to his own complete satisfaction that a listed subcontractor has been successfully engaged in this particular type of business for a reasonable length of time, has successfully completed installations comparable to that which is required by this Agreement and is qualified technically and financially to perform the work for which he is listed. Only one subcontractor shall be listed for each phase of work.

Any Bidder who lists a subcontractor not certified and/or registered by the State to perform the work of his trade if, such certification or registration is required for the trade, by Florida Laws, will be rejected as non-responsive.

No change shall be made in the List of Subcontractors, before or after the award of a contract, unless agreed to in writing by the Owner.

B-15 WITHDRAWAL OF BIDS

Bids may be withdrawn on written, e-mail or facsimile request received from Bidders prior to the time fixed for opening. Negligence on the part of the Bidder in preparing the bid confers no right for withdrawal of the bid after it has been opened.

B-16 RECEIPT AND OPENING OF BIDS

Bids will be opened publicly at the time and place stated in the Bidding Documents. An official time clock will be used to monitor the closing of the bids and to time-stamp bids as received. No responsibility will be attached to any officer for the premature opening of a bid not properly addressed and identified. At the time fixed for the opening of bids, the bids will be read aloud.

B-17 DISQUALIFICATION OF BIDS

More than one bid from an individual, firm, partnership, corporation or association under the same or different names will not be considered. Reasonable grounds for believing that a Bidder is interested in more than one proposal for the same work will cause the rejection of **all** proposals in which such Bidders are believed to be interested.

Any or all proposals will be rejected if there is reason to believe that collusion exists among the Bidders and no participants in such collusion will be considered in future proposals for the same work.

The Owner reserves the right to accept or reject any or all proposals received and reserves the right to make an award with or without further discussion of the proposals submitted or accept minor informalities or irregularities in the best interest of the State of Florida, which are considered a matter of form and not substance, and the correction or waiver of which is not prejudicial to other proposers. Minor irregularities are defined as those that will not have an adverse effect on the Department's interest and will not affect the price of the proposal by giving a proposer an advantage or benefit not enjoyed by all other proposers. It is understood the proposal will become a part of the Department's official file, without obligation to the Department. Proposals may be rejected if found to be irregular or not in conformance with the requirements and instructions contained herein. A proposal may be found to be irregular or non-responsive by reasons that include, but are not limited to failure to utilize or complete in their entirety prescribed forms, conditional proposals, incomplete proposals, ambiguous proposals, and improper, missing and/or undated signatures. Bids not complete with Bid Bonds, (when applicable), List of Subcontractors, or addenda not acknowledged will not be read aloud. The Official announces the deficiency causing the bid to be non-responsive and its disqualification thereby. The disqualified proposal will be impounded and not returned.

Falsification of any entry made on the contractor's bid proposal will be deemed a material bid deviation and will be grounds for rejection.

Any and all bid proposals may be rejected if determined to be non-responsive (does not conform in all material aspects to the invitation to bid or request for proposals) or non-responsible (firm is not deemed capable in all respects to perform fully the contract requirements and the integrity and reliability to assure good faith performance).

B-18 REJECTION OF BIDS

The Owner reserves the right to reject any and all bids under any of the circumstances prescribed in Rule 60D-5.0071, Florida Administrative Code, and to negotiate the contract in accordance with Rules 60D-5.00, 60D-5.0082, and 60D-5.0091, Florida Administrative Code, if the low qualified bid exceeds the project construction budget.

B-19 NOTICE AND PROTEST PROCEDURES

A. Notification:

1. Bid Solicitation: The Owner shall provide notice of its decision or intended decision concerning a bid solicitation as provided in the advertising for bids and distribution of bidding documents.

2. Contract Award: On contracts within Levels 2, 3, 4 & 5, the notice of a decision or intended decision on contract award or bid rejection shall be given by posting electronically on the My Florida Market Place (MFMP) Vendor Bid System (VBS), or by posting in the same manner in which the bid solicitation was announced by the Contract Management Branch of the DMA.

B. Protest:

1. Any person who is affected adversely by the Owner's decision or intended decision shall file with the Owner a notice of protest in writing within 72 hours, excluding Saturday, Sunday and State legal holidays, after receipt of the bidding documents if the protest is directed toward the bidding documents or after the notice of the Owner's decision or intended decision on contract award or bid rejection if the protest is directed toward contract award or bid rejection.

2. Thereafter a formal written protest by petition in compliance with Section 120.57(3), Florida Statutes, and Rule 28-110, Florida Administrative Code, must be filed with the Owner within ten (10) days after the date the notice of protest was filed.

3. Failure to file a timely notice of protest or failure to file a timely formal written protest petition shall constitute a waiver of protest proceedings. Any protest filed prior to posting of the bid tabulation or receipt of the notice of the agency decision or intended decision will be considered abandoned unless renewed within the time limit provided for protests.

4. The Agency and the Commission on Minority Economic and Business Development is hereby granted standing to protest, pursuant to s. 287.0945, in a timely manner, any contract award in competitive bidding for contractual services and construction contracts that fail to include minority business enterprise participation, if any responding Bidder has demonstrated the ability to achieve any level of participation, or any contract award for commodities where, a reasonable and economical opportunity to reserve a contract statewide or district level, for minority participation was not executed or, and agency failed to adopt applicable preference for minority participation. Any low Bidder with no participation may be presumed not in "good faith." All Bidders will be notified of the minority participation goal by addendum.

C. Owner Action:

1. Upon receipt of a notice of protest that has been timely filed, the Owner shall delay the contract award process until the subject of the protest is resolved by mutual agreement between the parties or by final Owner action, unless the Owner sets forth in writing particular facts and circumstances which require the continuation of the bid solicitation process or the contract award process without delay to avoid an immediate and serious danger to public health, safety, or welfare; provided, however, that if the petition is not filed within the time stated above, the contract award process may continue as if the notice of protest had not been filed.

2. Upon receipt of the formal written protest petition which has been timely filed, the Owner shall attempt to resolve the protest by mutual agreement between the parties within 7 days, excluding Saturday, Sunday and legal State holidays.

3. If the protest is not resolved by mutual agreement within said seven (7) days, and if no disputed issue of material fact is involved, the Owner may designate a Hearing Officer who shall conduct an informal proceeding pursuant to Section 120.57(2), Florida Statutes, and Rule 60Q-2.014, Florida Administrative Code. The qualifications of such designated Hearing Officer shall be: 1 a member in good standing of The Florida Bar; or 2. a person knowledgeable by virtue of practical experience of the procedures relating to soliciting and evaluating bids for state contracts. Notice of informal proceedings shall be given no less than three days prior to the proceeding. The proceeding may be held before the Owner.

4. If there is a disputed issue of material fact, the protest shall be referred to the Division of Administrative Hearings of Department of Administration, State of Florida, for proceedings under section 120.57(1).

B-20 DETERMINATION OF SUCCESSFUL BIDDER

A. All projects except where competitive bidding is waived under the provisions of Rule 60D-5.008, Florida Administrative Code, will be publicly bid in accordance with the provisions herein. Award of contract will be made to the lowest responsive responsible Bidder, determined in accordance with the provisions herein and meeting the requirements of the bidding documents, that submits the lowest valid bid for the work. The lowest bid will be determined as follows:

1. The lowest bid will be the bid from the responsive responsible Bidder that has submitted the lowest price for the base bid or the base bid plus the additive alternates or less the deductive alternates chosen by the Agency to be included in or excluded from the proposed contract, taken in numerical order listed in the bid documents. The order of the alternates may be selected by the Agency in any sequence so long as such acceptance out of order does not alter the designation of the low Bidder.

2. On projects whose bidding documents provide for evaluation of the bids based on first cost and life cycle cost and performance criteria, the lowest bid will be the bid by the firm whose bid products are determined to yield the lowest total cost in accordance with the criteria set forth in the bidding documents.

B-21 NOTICE TO SECURE PERMITS AND PAY FOR UTILITY CONNECTIONS; SCHEDULE OF VALUES; NOTICE TO PROCEED TO MOBILIZE ON SITE AND TO PROCEED WITH CONSTRUCTION; TIME OF COMPLETION AND LIQUIDATED DAMAGES

A. The contract will be issued to the Contractor after all signatures have been acquired. At that time, the Contractor will be given a Notice to Secure Permits for required permits from all agencies with jurisdiction over the area in which the project is located; and to pay, at the Contractor's cost, the required connection fees from all agencies supplying utilities to the project.

The Contractor is allowed thirty (30) calendar days from the issuance of the Notice to Secure Permits to obtain the required permits and utility connections before construction can begin. Special permits, such as tree removal, Water Management District, Department of Environmental Regulation, septic tank, etc., may be necessary before construction can begin. If additional time is required, the Contractor will request approval of a time extension for good cause for the purpose of obtaining any permit required prior to commencing construction on the site.

The Contractor is obligated to obtain and pay for a building permit from the local authority for construction of this facility. In the case of plumbing, electrical, other internal system permits and connection permits, the Contractor is obligated to obtain such permits and pay such fees.

The Contractor shall determine the permits and fees required by any entity having jurisdiction over any part of the project and shall include the cost of all such permits in his bid proposal.

B. The Contractor shall, within ten (10) calendar days from date of Notice to Secure Permits letter, submit to the Architect-Engineer and Project Manager, for review and approval, three copies of a Schedule of Contract Values which will reflect the estimated cost of each subdivision of work of each specification section, further detailed by subcontractor item, and utilizing the Construction Specification's Institute "Master Format Broad Scope Section Numbers". The value of each item shall include a true proportionate amount of the Contractor's overhead and profit. The sum of all such scheduled values shall equal the Contract Sum as evidenced by the Agreement.

C. Upon paying for all required utility connections (not limited to but including telephone, data, electric, water and sewer) and securing the Building Permit, the Contractor shall provide a copy of any and all Permits required and receipts showing payments to the Architect-Engineer and the Owner. The Notice to Proceed to Mobilize on Site and to Proceed with Construction will then be issued by the Owner. The work to be performed under this contract shall be commenced within ten (10) calendar days after date of Notice to Proceed to Mobilize on Site and to Proceed with Construction, shall be substantially completed within **270** calendar days after the date of this Notice to Proceed, and shall be finally completed within **30** calendar days after the date of substantial completion. It is the Contractor's responsibility to ensure the Certificate of Occupancy from the authority having jurisdiction is provided to Owner prior to substantial completion.

D. Inasmuch as failure to complete the project within the time fixed above will result in substantial injury to the Owner, and as damages arising from such failure cannot be calculated with any degree of certainty, it is hereby agreed that if the project is not substantially completed, according to the definition of "Substantial Completion" in Section B-1 hereinabove, or within such further time, if any, as in accordance with the provisions of the Contract Documents shall be

allowed for such substantial completion, the Contractor shall pay to Owner as liquidated damages for such delay, and not as a penalty, any and all actual costs and/or losses incurred by the Owner, as the result of the delay, for each and every calendar day elapsing between the date fixed for substantial completion above and the date such substantial completion shall have been fully accomplished. Said liquidated damages shall be payable in addition to any other excess expenses or costs payable by the Contractor to the Owner under the provisions of AIA Article 14 of the General Conditions, and shall not exclude the recovery of damages by the Owner under other provisions of the Contract Documents, except for Contractor's delay. This provision of liquidated damages for delay shall in no manner affect the Owner's right to terminate the contract as provided in Article 14 of the General Conditions or elsewhere in the Contract Documents. The Owner's exercise of the right to terminate shall not release the Contractor from his obligation to pay said liquidated damages in the amounts as provided for above.

The Owner is entitled to completion of the project within the time fixed above or within such further time, if any, as may be allowed in accordance with the provisions of the contract. In the event of termination of the contract by the Owner prior to completion as provided in Article 14.2 of the General Conditions or elsewhere in the Contract Documents, the Contractor shall be liable to the Owner for the expenses for additional managerial and administrative services provided in said Article 14 and also for the per diem liquidated damages as agreed to above.

1. For each day he is in arrears in his work at the time of said termination as determined by the Architect-Engineer, and

2. For each day of thirty (30) additional calendar days hereby stipulated and agreed to be the time it will require the Owner to affect another contract for completion of the project and for resumption of work thereon.

Provided, however, that the sum of 1 and 2 above shall not exceed the number of days beyond the original agreed completion date, or any extension thereof as herein provided, reasonably required for completion of the project.

It is further agreed that the Owner may deduct from the balance retained by the Owner, under the provisions above, the liquidated damages stipulated therein for delay or termination, as the case may be, or such portions thereof as the said retained balance will cover.

B-22 APPRENTICES

If the Contractor employs apprentices on the project, the behavior of the Contractor and the Owner shall be governed by the provisions of Chapter 446, Florida Statutes, and by applicable standards and policies governing apprentice programs and agreements established by the Division of Workforce Development of the Department of Education, State of Florida. The Contractor will include a provision similar to the foregoing sentence in each subcontract.

The Contractor shall have the option of listing all available job vacancies with the local Job Service Florida office in order to take advantage of local pools of unemployed qualified construction personnel.

SECTION C
CONDITIONS OF THE CONTRACT

C-1 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

On projects where the Contract Sum exceeds $100,000, the Contractor shall furnish the Owner with a 100% Performance Bond and 100% Labor and Material Payment Bond written by a Surety Company acceptable to the Owner and authorized to do business in the State of Florida and signed by a Florida Licensed Resident Agent. Contractor is required to furnish replacement bonds in the event of cancellation of the original Performance Bond and Labor and Material Payment Bond. Form of bond shall be as shown on forms Exhibits 7 and 8.

The cost of all Performance Bonds and Labor and Material Payment Bonds shall be borne by the Contractor. The Bonds shall be accompanied by a duly authenticated or certified document, in duplicate, evidencing that the person executing the Bonds on behalf of the Surety had the authority to do so on that date of the Bond. In the usual case, conferring of that authority has occurred prior to the date of the Bond, and the document showing the date of appointment and enumeration of powers of the person executing the Bond is accompanied by a certification that the appointment and powers have not been revoked and remain in effect. The date of that certification shall be dated the same date as the Bonds and the Bonds shall be dated the same date as

the Agreement. The Bonds must also be recorded in the same County of the project location.

C-2 EXECUTION OF AGREEMENT AND BONDS

Agreement between Owner and Contractor

The Contractor shall execute all required forms of the Agreement and return within ten (10) calendar days of their receipt. Failure to return all forms correctly executed within ten (10) calendar days of receipt, without written extension by the Owner otherwise, shall constitute an irregularity and deemed grounds, at the Owner's option, for rejection and forfeiture of the Bid Deposit or at the Owner's option, for the deduction on a day-for-day basis from the time allotted for completion of the work under Section B-21.

If the Contractor is a firm or company owned by an individual, the Agreement shall be executed in the name of the firm or company by the manual signature of the individual or sole proprietor.

If the Contractor is a partnership, the Agreement shall be executed in the name of the partnership by the manual signature of partner or partners.

If the Contractor is a corporation, the Agreement shall be executed in the name of the corporation and shall bear the corporate seal. It may be signed for the corporation by the president and attested by the corporate secretary; if signed for the corporation by any other officer than the president, the signature of such officer signing shall be attested by the secretary, and the executed Agreement shall be accompanied by a duly authenticated document bearing the seal of the corporation, quoting the section of the by-laws of the corporation authorizing the Board of Directors to designate such officer and copy of the resolution designating and authorizing him to execute on behalf of the corporation. That document must contain a statement that the authority is in effect on the date of the execution of the Agreement, and may not be dated earlier than the date of the execution of the Agreement. The same officer may not execute the Agreement and authenticate the document of authority.

Performance Bond & Labor and Material Payment Bond

These bonds shall be executed on behalf of the Contractor in the same manner and by the same person who executed the Agreement. A Notice to Proceed will **not** be issued to the Contractor until all bonds have been received and approved by the Contract Management Branch.

C-3 CONTRACTOR'S INSURANCE

The Contractor shall not commence any work in connection with this Agreement until he has obtained certain types of the following types of insurance and such insurance has been approved by the Owner, nor shall the Contractor allow any subcontractor to commence work on his subcontract until all similar insurance required of the subcontractor has been so obtained and approved. All insurance policies shall be with insurers qualified and doing business in Florida through an authorized licensed Florida Resident Agent, and shall include:

Worker’s Compensation Insurance

The Contractor shall take out and maintain during the life of this Agreement, Worker's Compensation Insurance for all of his employees connected with the work of this project and, in case any work is sublet, the Contractor shall require the subcontractor similarly to provide Worker's Compensation Insurance for all of the latter's employees unless such employees are covered by the protection afforded by the Contractor. Such insurance shall comply fully with the Florida Worker's compensation law. In case any class of employees engaged in hazardous work under this contract at the site of the project is not protected under the Worker's Compensation statute, the Contractor shall provide, and cause each subcontractor to provide, adequate insurance satisfactory to the Owner, for the protection of his employees not otherwise protected.

Contractor's Public Liability and Property Damage Insurance

The Contractor shall take out and maintain during the life of this Agreement Comprehensive General Liability and Comprehensive Automobile Liability Insurance as shall protect him from claims for damage for personal injury, including accidental death, as well as claims for property damages which may arise from operating under this Agreement whether such operations are by himself or by anyone directly or indirectly employed by him, and the amount of such insurance shall be the minimum limits as follows:

(1) Contractor's Comprehensive General Liability Coverages, Bodily Injury & Property Damage:
$300,000.00 Each Occurrence, Combined Single Limit

(2) Automobile Liability Coverages, Bodily Injury & Property Damage:
$100,000.00 Each Occurrence, Combined Single Limit

Insuring clause for both BODILY INJURY AND PROPERTY DAMAGE shall be amended to provide coverage on an OCCURRENCE BASIS.

Subcontractor's Public Liability and Property Damage Insurance
The Contractor shall require each of his subcontractors to procure and maintain during the life of this subcontract, insurance of the type specified above or insure the activities of his subcontractors in his policy, as specified above.

Owner's and Contractor's Protective Liability Insurance
The Contractor shall procure and furnish an Owner's and Contractor's Protective Liability Insurance Policy with the following minimum limits:

(1) Bodily Injury & Property Damage Liability:
$300,000.00 Each Occurrence, Combined Single Limit

"XCU" (Explosion, Collapse, Underground Damage)
The Contractor's Liability Policy shall include and provide "XCU" coverage for those classifications in which they are applicable.

Broad Form Property Damage Coverage, Products and Completed Operations Coverages
The Contractor's Liability Policy shall include and provide for Broad Form Property Damage Coverage, Products and Completed Operations Coverage.

Contractual Liability-Work Contracts
The Contractor's Liability Policy shall include Contractual Liability Coverage designed to protect the Contractor for contractual liabilities assumed by the Contractor in the performance of this Contract.

Indemnification Rider
To the fullest extent permitted by law, the Contractor's Liability Policy shall indemnify and hold harmless the Owner from and against claims, damages, loses and expenses, including but not limited to attorneys fees arising out of or resulting from negligent 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 (other than the work itself) including loss of use resulting therefrom, caused in whole or in part by negligent acts or omissions of the Contractor, a subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by the Owner. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity, which would otherwise exist as to the Owner.

Builder's Risk Coverage
The Contractor shall secure and maintain during the life of this Contract a "Builder's Risk Policy", All Risks Form, and issued on a completed valued basis. Installation Floaters and other Inland Marine Forms may be utilized where applicable and are in the best interest of the State of Florida.

Asbestos-Abatement Contractors Liability Insurance Pollution Endorsement

The asbestos-abatement Contractor shall procure a pollution endorsement to his public liability insurance, against claim or claims expenses arising from the abatement project, as required by Section 255.56 of the Florida Statutes. The coverage by the endorsement may be of the Claims-Made type.

Loss Deductible Clause
The State of Florida shall be exempt from, and in no way be liable for any sums of money, which may represent a deductible in any insurance policy. The payment of such deductible shall be the sole responsibility of the General Contractor and/or subcontractor providing such insurance.

Certificate of Insurance

The Owner shall be furnished proof of coverage of the above required insurance. Said proof shall be submitted on a form approved by the Department of Insurance (See Exhibit 2). Said certificate of insurance forms shall be completed, signed by the authorized licensed Florida Resident Agent and returned to the office of the Owner. These certificates shall be dated and show:

(1) The name of the insured contractor, the specific job by name and number, the name of the insurer, the number of the policy, its effective date, and its termination date.

(2) Statement that the Insured will mail notice to the Owner at least thirty (30) calendar days prior to any material changes in provisions or cancellation of the policy.

(3) Certificate of Insurance shall be in the form as approved by Insurance Standards Office (ISO) and such Certificate shall clearly state all the coverage's required in this Section.

(4) Certificate of Insurance shall state that the Owner and Agent are listed as additional insured on all appropriate policies.

(5) Copy of the endorsement or additional insured rider to the General Liability Policy.

C-4 PROGRESS SCHEDULE FOR PROJECTS WITH CONSTRUCTION COST BELOW $2,000,000.00

Within twenty (20) calendar days after the date of the Owner's issuance of a Notice to Proceed, the Contractor shall prepare and submit to the Architect-Engineer a construction schedule in quadruplicate graphically depicting the activities contemplated to occur as a necessary incident to performance of the work required to complete the Project, showing the sequence in which the Contractor proposes for each such activity to occur and the duration (dates of commencement and completion, respectively) of each such activity.

At least once each month, the Architect-Engineer will determine whether the construction schedule developed and submitted by the Contractor meets the requirements stated above and whether the progress of the work complies with the Contractor's schedule. The Contractor shall provide an up-dated schedule with each request for partial payment. Failure of the Contractor to develop and submit a construction schedule as aforesaid shall be sufficient grounds for the Architect-Engineer to find the Contractor in substantial default and certify to the Owner that sufficient cause exists to terminate the contract or to withhold any payment.

Following development and submittal of the construction schedule as aforesaid, the Contractor shall, at the end of each calendar month occurring thereafter during the period of time required to finally complete the subject project, or at such earlier intervals as circumstances may require, update and/or revise the construction schedule to show the actual progress of the work performed and the occurrence of all events which have affected the progress of performance of the work already performed or will affect the progress of performance of the work yet to be performed in contrast with the planned progress of performance of such work, as depicted on the original construction schedule and all updates and/or revisions thereto as reflected in the updated and/or revised construction schedule last submitted prior to submittal of each such monthly update and revision. Each such update and/or revision to the construction schedule shall be submitted to the Architect-Engineer in duplicate. Failure of the Contractor to update, revise and submit the Construction Schedule as aforesaid shall be sufficient grounds for the Architect-Engineer to find the Contractor in substantial default and certify to the Owner that sufficient cause exists to terminate the Contract or to withhold payment to the Contractor until a schedule or schedule update acceptable to the Architect-Engineer is submitted.

The Contractor shall have the option of scheduling a substantial completion date occurring earlier than the date established by the Contract Documents for substantial completion; provided, however, in such event, such earlier substantial completion date will be recognized by the Owner only as a matter of convenience to the Contractor and shall not change the date for substantial completion established by the Contract Documents or be otherwise binding on the Owner or anyone under the Owner's control; and provided further, however, in such event, should events occur during performance of the work necessary to complete the subject project which would justify the granting to the Contractor of an extension of the Contract Time pursuant to the provisions of Article 8 of the AIA General Conditions which form a part of the Contract Documents, the Contractor shall be entitled to receive only such an extension of Contract Time as is determined by the Architect-Engineer to be due the Contractor as follows:

(1) In the event the currently approved Contractor's schedule indicates completion ahead of the contractually established

date for substantial completion, the time extension to the contract shall only be determined, when the total time directly affecting the critical path of the schedule is added to the end date of the schedule thereby making a new end date beyond the contractual completion date. The time extension will only be for the time between the currently approved contractual completion date and the new schedule end date.

(2) In the event the currently approved Contractor's schedule indicates completion at or after the contractually established date for substantial completion, the time extension shall only be added to the contractually established date for the substantial completion and shall be determined by the Architect-Engineer as the portion of delay time directly affecting the critical path of the current approved contract schedule.

C-5 CONSTRUCTION SCHEDULE AND REQUIREMENTS FOR OVERTIME WORK FOR PROJECTS WITH CONSTRUCTION COSTS IN EXCESS OF $2,000,000.00

Within thirty (30) days after the date of the Owner's issuance of a Notice to Proceed, the Contractor shall prepare and submit to the Architect-Engineer a construction schedule in quadruplicate graphically depicting the activities contemplated to occur as a necessary incident to performance of the work required to complete the project, showing the sequence in which the Contractor proposes for each such activity to occur and the duration (dates of commencement and completion, respectively) of each such activity. An example of an acceptable form of such a construction schedule is contained in Appendix A of the Corps of Engineers' Regulation ER 1-1-11 entitled "Network Analysis System", a copy of which is available to the Contractor from the Architect/Engineer, upon request. Other forms of construction schedules, such as "Timeline", "Primavera", "Project Workbench", or "Super Project", which provide the same kind of information and employ the same basic principles as illustrated in Appendix A of the Corps of Engineers' Regulation ER 1-1-11 will be acceptable to the Owner if used by the Contractor; provided, however, that the Architect-Engineer shall determine whether the construction schedule developed and submitted by the Contractor meets the requirements stated above and such determination shall be binding on the Contractor. Failure of the Contractor to develop and submit a construction schedule as aforesaid shall be sufficient grounds for the Architect-Engineer to find the Contractor in substantial default and certify to the Owner that sufficient cause exists to terminate the contract or to withhold any payment.

Following development and submittal of the construction schedule as aforesaid, the Contractor shall, at the end of each calendar month occurring thereafter during the period of time required to finally complete the subject project, or at such earlier intervals as circumstances may require, update and/or revise the construction schedule to show the actual progress of the work performed and the occurrence of all events which have affected the progress of performance of the work already performed or will affect the progress of the performance of the work yet to be performed in contrast with the planned progress of performance of such work, as depicted on the original construction schedule and all updates and/or revisions thereto as reflected in the updated and/or revised construction schedule last submitted prior to submittal of each such monthly update and revision. Each such update and/or revision to the construction schedule shall be submitted to the Architect/Engineer in duplicate. Failure of the Contractor to update, revise, and submit the construction schedule as aforesaid shall be sufficient grounds for the Architect-Engineer to find the Contractor in substantial default and certify to the Owner that sufficient cause exists to terminate the Contract or to withhold payment to the Contractor until a schedule or schedule update acceptable to the Architect-Engineer is submitted.

The Contractor shall have the option of scheduling a substantial completion date occurring earlier than the date established by the Contract Documents for substantial completion; provided, however, in such event, such earlier substantial completion date will be recognized by the Owner only as a matter of convenience to the Contractor and shall not change the date for substantial completion established by the Contract Documents or be otherwise binding on the Owner or anyone under the Owner's control; and provided further, however, in such event, should events occur during performance of the work necessary to complete the subject project which would justify the granting to the Contractor of an extension of the contract time pursuant to the provisions

of Article 8 of the AIA General Conditions which form a part of the Contract Documents, the Contractor shall be entitled to receive only such an extension of contract time as is determined by the Architect-Engineer to be due the Contractor as follows:

(1) In the event the currently approved Contractor's schedule indicates completion ahead of the contractually established date for substantial completion, the time extension to the contract shall only be determined, when the total time directly affecting the critical path of the schedule is added to the end date of the schedule thereby making a new end date beyond the contractual completion date. The time extension will only be or the time between the currently approved contractual completion date and the new schedule end date.

(2) In the event the currently approved contractor's schedule indicates completion at or after the contractually established date for substantial completion, the time extension shall only be added to the contractually established date for substantial completion and shall be determined by the Architect-Engineer as the portion of delay time directly affecting

the critical path of the current approved contract schedule.

C-6 VERIFICATION OF OWNER'S SURVEY DATA

Prior to commencing any excavation or grading, the Contractor shall satisfy himself as to the accuracy of all survey data as indicated in these plans and specifications and/or as provided by the Owner. Should the Contractor discover any inaccuracies, errors, or omissions in the survey data, he shall immediately notify the Architect-Engineer in order that proper adjustments can be anticipated and ordered. **Commencement by the Contractor of any excavation or grading shall be held as an acceptance of the survey data by him after which time the Contractor has no claim against the Owner resulting from alleged errors, omissions or inaccuracies of the said survey data.**

C-7 CONSTRUCTION FACILITIES

Sanitary Provisions
The Contractor shall provide and maintain in a neat and sanitary condition such accommodations for the use of his employees as may be necessary to comply with regulations of the County or the Department of Health and Rehabilitative Services. No nuisance will be permitted.

Temporary Wiring
The Contractor shall meet all safety requirements of the National Electric Code, Florida Department of Commerce, Bureau of Worker's Compensation or local requirements. In addition, all wire shall be so sized that it is not over-loaded according to the National Electric Code, and any wire used shall be fused to adequately protect that wire according to the Code referred to.

The Contractor shall have an adequate number of outlets and each outlet shall be properly and clearly labeled with the maximum voltage and fuse protection.

Where temporary lighting is used, outlet shall consist of weatherproof socket insulated and provided with a locking type wire guard.

All devices shall be properly grounded.

Storage and Work Areas
Prior to the start of the operations the Contractor shall make arrangements with the Architect-Engineer's field representative and the Owner's representative for the assignment of storage and work areas. Storage site shall be established during the pre-construction meeting. During construction the Contractor shall maintain the areas in a neat condition.

Contractor's Field Offices
If project needs require, trailers may be used for field offices, but their use as living quarters for personnel shall be limited to one staff member such as a night watchman or a superintendent.

Underground Utilities
The Contractor shall meet all requirements of the United States Department of Labor Occupational Safety and Health Administration (OSHA) in the performance of work related to excavations for underground utilities, foundations and other subsurface work. The contractor shall conduct thorough training in OSHA standards and requirements on a continuing and regular basis throughout the execution of such work.

Additional instructions regarding Construction Facilities are set forth in the Section entitled "Special Conditions".

C-8 PROJECT DRAWINGS-COPIES FURNISHED TO CONTRACTORS

The Architect-Engineer will provide the Contractor with ten (10) sets of drawings and specifications upon contract award. If additional sets are required by the Contractor, they will be furnished upon request for the cost of printing and handling.

C-9 PROJECT DRAWINGS-CHANGES

The Contractor shall immediately indicate plainly and conspicuously on the field set of drawings and at appropriate paragraphs in the Specifications Manual, all changes or corrections made by Addenda and Change Orders as they are issued.

C-10 INSPECTIONS - ALL PROJECTS

All projects will require detailed code compliance inspections by the local authorities with jurisdiction over the area in which the project is located at the contractor's expense. The disciplines normally include, but are not necessarily limited to, structural, mechanical, electrical, plumbing and general building. The contractor shall make all permits, drawings, specifications, previous inspection reports, and change documents available to Code Inspectors. The contractor shall provide a copy of each inspection report to the Architect/Engineer in a timely fashion.

OTHER INSPECTIONS

1. The Department of Business and Professional Regulation has responsibility for elevator inspections.

2. The State Fire Marshal has responsibility for inspecting facilities in accordance with the Uniform Fire Safety Standards.

3. The Architect-Engineer may have responsibilities, relative to inspections.

4. The Owner and/or Using Agency representatives may also perform inspections at their discretion.

5. There may be other inspections required as specified elsewhere.

The Contractor has responsibilities relative to all types of inspections and is responsible for contacting all of the inspecting entities to determine his responsibilities. All of these inspecting entities have unique and separate responsibilities. One inspection from an entity will **not** substitute for an inspection from another entity.

C-11 SHOP DRAWINGS

Shop drawings shall be submitted for manufactured or fabricated materials as called for in the separate specification sections. Drawings shall be fully identified by project name, location, supplier's name, date, drawing number, specifications section reference, etc. The Contractor shall submit, with such promptness as to cause no delay in his work, or in that or any other Contractor, four (4) copies (in addition to those copies necessary for his own requirements) of all shop drawings, and schedules, required for the work of the various trades, to the Architect-Engineer for approval. The Contractor shall make no deviation from the approved drawings, and the changes made thereto by the Architect-Engineer, if any.

It shall be the responsibility of the Contractor to properly schedule the submission of shop drawings for approval to allow adequate time for checking of drawings, manufacture and shipment of items to job site in sufficient time to prevent delay in Progress Schedule.

It shall also be the responsibility of the Contractor to coordinate the preparation of shop drawings of items, which will be furnished by more than one manufacturer but are designed to interface when installed. Shop drawings submitted to the Architect-Engineer for his approval shall first be checked and approved by the Contractor, the prima facie evidence of which shall be a "checked" stamp marked "Approved", or "Approved as Noted" on each copy of each shop drawing, placed thereon by the Contractor. Shop drawings received without the Contractor's "checked" stamp will be cause for immediate return without further action. Each drawing correctly submitted will be checked by the Architect-Engineer and marked by him in one of the following ways:

(1) Approved as drawn.
(2) Approved as noted.
(3) Returned for correction.
(4) Not approved.

Submission and Approval of Shop Drawing & Sample Schedule

If and when required by the Architect-Engineer, the Contractor shall prepare and submit in triplicate to the Architect-Engineer a completely itemized Schedule of Shop Drawings, brochures and other descriptive literature, listing each and all such items as required under these specifications, which schedule shall indicate for each required item:

(1) Identification as to pertinent Specification Division.

(2) Item(s) involved.
(3) Name of pertinent subcontractor or supplier and the name of pertinent manufacturer.
(4) Schedule date of delivery of pertinent items to the project.

The subcontractors for all phases of the Contract shall submit through the General Contractor complete brochures covering all materials and/or equipment proposed for use in the execution of the work as required by their respective Divisions of the Specifications. These brochures shall be indexed and properly cross referenced to the plans and specifications for easy identification.

All shop drawings, setting drawings, material brochures, samples and/or color selection materials, which are required and are not included in the foregoing shall be submitted via the General Contractor. Insofar as is possible or practical, all shop drawings or descriptive literature of equipment for the mechanical or electrical trades shall be submitted in a complete brochure for each trade as soon as possible after Notice to Proceed is executed.

The Owner will not grant time extension based on delays due to improper scheduling of work; and the Owner, at his discretion, may withhold progress payments until such time as these requirements are fully satisfied.

C-12 REFERENCE TO A.S.T.M. OR FEDERAL SPECIFICATIONS

Where reference is made to the Standard Specifications of the American Society for Testing and Materials (A.S.T.M.): "United States Government Federal Specifications, or to other standard specifications of Associated Manufacturer's Organizations, or trades, in connection with the required quality of materials, methods, etc., then the applicable specifications shall be of the latest revised edition effective as of the date bids are opened by the Owner, unless otherwise expressly provided in the Contract Documents".

C-13 MANUFACTURER'S SPECIFICATIONS

Where the name of a concern or manufacturer is mentioned on drawings or in specifications in reference to his required service or product, and no qualifications or specification of such is included, then the material gauges, details of manufacture, finish, etc., shall be in accordance with his standard practice, direction or specifications. The Contractor shall be responsible for any infringement of patents, royalties, or copyrights, which may be incurred thereby.

C-14 APPROVAL OF MATERIALS

A list of all materials, equipment, etc., together with manufacturer's drawings and catalog information shall be submitted to the Architect-Engineer for approval prior to ordering material or equipment but not later than forty-five (45) calendar days after receipt of Notice to Proceed to Mobilize on Site and Proceed with Construction. Information submitted shall show the capacity, operating conditions and all engineering data and descriptive information necessary for comparison and to enable the Architect-Engineer to determine whether same meets specifications. The Architect-Engineer's approval will not relieve the Contractor of the responsibility for performance of any terms of the Agreement.

If the submittals reflect any changes from the plans or specifications, these changes should be clearly indicated by the Contractor.

C-15 SUBSTITUTIONS

Substitutions for a specified system, product or material may be requested of the Architect-Engineer and the Architect-Engineer's written approval must be obtained before substitutions will be allowed. All requests for substitutions should be submitted within forty-five (45) days after award of Contract. Substitutions requested after this date may receive no consideration.

In making requests for substitutions the Contractor shall list the particular system, product, or material he wishes to substitute, the justification for such a request, and the amount he will add or deduct from the contract sum if the substitution is authorized by the Owner and approved by the Architect-Engineer.

If no addition or deduction to the Base Bid is allowed by the Contractor for such substitution, it shall be so stated on the request. Request submitted shall include any and all adjustments of that and any other work affected thereby.

C-16 CONSTRUCTION CLIMATE CONTROL

It shall be the responsibility of the Contractor to provide at his expense, the power, fuel and equipment necessary to maintain climatic conditions and humidity when specified, required for work in progress, or required to protect materials, finishes, equipment or systems installed until the final acceptance of the project by the Owner.

C-17 AS-BUILT DRAWINGS

During the progress of the work, the Contractor shall require the plumbing, air conditioning, heating, ventilating, elevator, and electrical subcontractors to record on their field sets of drawings the exact locations, as installed, of all conduit, pipe and duct lines whether concealed or exposed which were not installed exactly as shown on the contract drawings. The Contractor shall also record all drawing revisions that have been authorized by change order that affect wall or partition locations, door and window locations and other template changes. The exact routing of conduit runs shall be shown on these drawings.

Contractor will provide two (2) CD-ROMs containing As-Built Drawings. Each CD shall contain one (1) set using AutoCAD 2006 (or newer), by Autodesk and one (1) set in PDF format. Each drawing shall be noted "As Built" and shall bear the date, name, and contact information of the subcontractors that performed the work. Where the work was installed exactly as shown on the contract drawings the sheets shall not be disturbed except as noted above.

The Contractor shall review the completed As-Built drawings and ascertain that all data furnished on the drawings are accurate and truly represent the work as actually installed. When manholes, boxes, underground conduits, plumbing, hot or chilled water lines, inverts, etc. are involved as part of the work, the Contractor shall furnish true elevations and locations, all properly referenced by using the original bench mark used for the institution or for this project. The CD-ROMS shall be submitted to the Architect-Engineer when completed, together with two sets of black-line prints for certification and forwarding to the Owner, at the time of final completion.

C-18 GUARANTEES AND OPERATING INSTRUCTIONS

The Contractor shall provide full cooperation to the Owner in the production of video tape instructions for the operation and maintenance of all HVAC, fire alarm, sprinkler, irrigation, computer and other systems essential to efficient utilization of the building grounds. Owner personnel or its agents shall perform the actual taping, editing and production of such instructional tapes. Cooperation of the on-site representative of the Contractor shall be the responsibility of the Contractor, whose representatives are to coordinate instructional activities with the Owner and its personnel or agents.

All work performed by the Contractor in completing the subject project shall be guaranteed by the Contractor against all defects resulting from the use of materials, equipment and workmanship for a period of one year from the date of Substantial Completion of the project.

If, within any guarantee period, repairs or changes are required in connection with the guarantee work, which in the opinion of the Architect-Engineer is rendered necessary as a result of the use of materials, equipment or workmanship which are defective or inferior or not in accordance with the terms of the Contract, the Contractor shall, promptly upon receipt of notice from the Owner and without expense to the Owner, proceed to:

> ***Place in satisfactory condition in every particular all of such guaranteed work, correct all defects therein and; make good all damages to the structure or site or equipment or contents thereof, which, in the opinion of the Architect-Engineer, is the result of the use of materials, equipment, or workmanship which are inferior, defective, or not in accordance with the terms of the Contract and; make good any work or materials or the equipment and contents of structures or site disturbed in fulfilling any such guarantee.***

If the Contractor, after receipt of any such written notice, fails within seventy-two (72) hours to commence at the job site with performance of the work necessary to remedy all defects in the work described in such notice so as to provide the Owner with the subject project completed in accordance with all requirements of the Contract Documents, or fails to complete the performance of such remedial work within a reasonable time after commencing same, the Owner shall be entitled to have such defective work remedied on the account of the Contractor and his Surety, in which event, the Contractor and his Surety shall be fully liable for all costs and expenses reasonably incurred by the Owner in having such defective work remedied.

The Contractor shall be responsible for collecting, identifying, indexing, and collating the following materials from the sub-

contractors, and will deliver four copies of the finished document to the Architect-Engineer for checking of correctness.

Complete equipment diagrams, operating instructions, maintenance manuals, parts lists, wiring diagrams, pneumatic and/or electrical control diagrams, test and balance reports, inspection reports, guarantees and warranties addressed to the State Agency for which the construction is being performed, as applicable, for each and every piece of Fixed Equipment furnished under this contract to be supplied in a ring binder, hard-cover book, properly indexed for ready reference. Also, specific information regarding manufacturer's name and address, nearest distributor and service representative's name, address, office and home phone numbers, make and model numbers, operating design and characteristics, etc., will be required. All information submitted shall be updated to reflect existing conditions.

Subsequent to the time of Substantial Completion and receipt of As-Builts, Operations and Maintenance Books but prior to the date of Final Acceptance, the Contractor and/or subcontractor shall provide a competent and experienced person (or persons) thoroughly familiar with the work for a reasonable period of time to instruct the State Agency personnel in operation and maintenance of equipment and control systems.

This instruction will include normal start-up, run, stop, and emergency operations, location and operation of all controls, alarms and alarm systems, etc. The instruction will include tracing the system in the field and on the diagrams in the instruction booklets so that operating personnel will be thoroughly familiar with both the system and the data supplied.

C-19 CLEANING

Entire area within scope of this work shall be completely cleaned, including all window glass, hardware, plumbing fixtures, electrical fixtures, tile work, etc., and shall be kept clean for the completion of this job. Replace all broken or defective glass within these areas. At the point in time of Substantial Completion, air conditioning filters shall be replaced, and fixed grills, and permanent filters shall be cleaned.

C-20 FINAL PAYMENT

Within twenty-five (25) business days if an Architect-Engineer is performing Construction Administration Services or twenty (20) working days if no Architect-Engineer is involved, the Department of Military Affairs from the date of Contract Completion, the Owner shall pay or cause to be paid to the Contractor, the entire unpaid balance of the then Contract Sum, less the amount of any sums which continue to be retained to satisfy the cost of performing any change in the Work which is the subject of any claim or dispute and which has not yet been satisfactorily performed by the Contractor, provided that the parties have not otherwise stipulated in the Certificate of Substantial Completion, and provided further that the Work has been satisfactorily completed, the Contractor's obligations under the Contract have been fully performed, and a final Certificate for Payment has been issued by the Architect-Engineer (See Section C-34, Progress Payments).

The Contractor's application for final payment shall be accompanied by the following:

1) Pay Request (3 copies with original signatures and original seals) noted as Final (Exhibit 10).
2) Final Schedule of Contract Values (Exhibit 11).
3) Consent of Surety to Make Final Payment (Signed & Sealed) (Exhibit 18)
4) Power of Attorney from Surety for Release of Final Payment (Signed, Sealed, and dated same as Consent of Surety) (Exhibit 19)
5) Contractor’s Affidavit of Contract Completion (Exhibit 12)
6) A/E Certificate of Contract Completion (Exhibit 12a)
7) Final Release of Liens & Claims (Exhibit 9) from each subcontractor/supplier who has filed a Notice to Owner
8) Contractor's Guarantee of Construction for one (1) year from the date of Substantial Completion.

9) Copy of the Approval by the Architect-Engineer and the transmittal to the State of Florida, Department of Military Affairs of Manuals, Shop Drawings, As-Builts (2 sets CD-ROMS as specified in Section C-17 and 2 sets of Black-Line Prints), Brochures, Warranties, and list of subcontractors including telephone numbers and addresses.
10) Verification that State Agency personnel have been trained in the operation of their new equipment for each system; HVAC, Controls, Fire Alarm, etc. (i.e. submittal of Attendance Lists).

11) Fully executed Roof Warranty (if applicable) in the name of The State of Florida, Department of Military Affairs. Warranty must be executed by Contractor and manufacturer.
12) Other special warranties as required by specifications, in the name of the State of Florida, Department of Military Affairs.

C-21 PUBLIC NOTICE

Immediately following receipt of Notice to Proceed to Mobilize on Site and Proceed with Construction as prescribed in Section B-21 hereinabove, the Contractor shall post a notice in the following form in a conspicuous place on the project site:

"Notice is hereby made to all those concerned and affected that (Contractor's Name) is performing (Project Number, Name and Location).

All parties furnishing labor, materials and/or equipment to said project are to provide notice of such in writing by certified mail to State of Florida, Department of Military Affairs, 2305 State Road 207, St. Augustine, Florida 32085 within twenty (20) calendar days of first providing such labor, materials and/or equipment."

C-22 INCLUSION OF AIA DOCUMENT A-201

The General Conditions of the Contract for Construction, American Institute of Architects Document A-201, 2007 Edition, as modified, shall apply to and form a part of this Section as if written in full herein.

C-23 SCOPE

The following Sections C-24 through C-32 set forth modifications and additions to the General Conditions described above.

C-24 ARTICLE 2, OWNER

Article 2.1.2 – NOT APPLICABLE
Article 2.2.1 – NOT APPLICABLE

C-25 ARTICLE 3, CONTRACTOR

Article 3.3.2 - Add the following: "Should the Architect-Engineer find any person(s) employed on the project incompetent, unfit or otherwise objectionable for his duties and so certifies the facts to the Contractor, the Contractor shall immediately cause the employee to be dismissed and said employee shall not be re-employed on this project without written consent of the Architect-Engineer."

Article 3.8.1 - Add the following: "If directed by the Architect-Engineer the Contractor shall solicit not less than three bids for the item(s), the cost of which is provided for by a specified allowance sum. The Contractor shall purchase the item(s) from one of the three Bidders as directed by the Architect-Engineer."

Article 3.10.1 – NOT APPLICABLE. Reference Sections C-4 and C-5 for progress scheduling.

Article 3.14.1 - Add the following: "All cutting, fitting and patching work shall blend in and be plumb and square. The quality of materials used shall be the same or surpass those used in the adjacent existing construction."

C-26 ARTICLE 4 ARCHITECT

Article 4.1.1 - Delete in its entirety and replace with the following: "The Architect-Engineer is the design professional identified in the Owner-Contractor Agreement. Throughout the contract documents, the Architect-Engineer is referred to as if singular in

number and masculine in gender. The terms Architect and Architect-Engineer mean the Architect-Engineer or his authorized representative."

Article 4.2.5. Add the following: "The authorized representatives and agents of the Architect-Engineer, Owner, and the United States Federal Agencies providing monies in the form of grant-funds or loans and such other persons as the Owner may

designate shall have access to and be permitted to inspect all work, materials, payrolls, records of personnel, invoices of materials, other relevant data and records wherever they are in preparation and progress. The Contractor shall provide proper facilities for such access, inspections and, when required, exact duplicate copies of the aforementioned data shall be furnished."

C-27 ARTICLE 5, SUBCONTRACTORS

Article 5.2.4 - Add the following: "The Contractor shall not remove or replace subcontractors listed in his bid subsequent to the lists being made public at the bid opening, except upon good cause shown and only when approved in writing by the Owner."

C-28 ARTICLE 7, CHANGES IN THE WORK

Omit all references to “Construction Change Directive”.

C-29 ARTICLE 8, TIME

Article 8.3.1 - Delete the words "or by delay authorized by the Owner pending mediation and arbitration."
Article 8.3.3 – NOT APPLICABLE

C-30 ARTICLE 9, PAYMENTS AND COMPLETION

Article 9.3.1.1 – NOT APPLICABLE

Article 9.7 – NOT APPLICABLE. Reference Section C-36 for Progress Payments

Article 9.9.1 - Delete the words "provided such occupancy or use is consented to by the insurer as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the Project."

C-31 ARTICLE 11, INSURANCE AND BONDS

Articles 11.2 through 11.3 - Delete in their entirety and insert in their place:

Article 11.2.1, Owner's Liability Insurance - The Contractor shall be responsible for purchasing and maintaining an Owner's Protective Liability Insurance Policy with minimum limits as described in Section C-3 Contractor’s Insurance.

Article 11.3.1, Property Insurance - The Contractor shall purchase and maintain property insurance upon the entire work at the site of the full insurable value thereof.

Article 11.3.2 - Any insured loss is to be adjusted with the Owner and made payable to the Owner as trustee for the insured, as their interests may appear.

Article 11.3.3 - If the Contractor requests in writing that insurance for special hazards are included in the property insurance policy, the Owner shall permit the Contractor to purchase such insurance, but the cost thereof shall be paid for by the Contractor.

Article 11.3.4 - The Owner and Contractor waive all rights against each other for damages caused by fire or other perils to the extent covered by insurance provided under Article 11.3.1, except such rights as they may have to the proceeds of such insurance held by the Contractor as trustee. The Contractor shall require similar waivers by subcontractors and sub-subcontractors.

Article 11.3.5 - If required in writing by any party in interest, the Contractor, as trustee shall, upon the occurrence of an insured loss, give bond for the proper performance of his duties. He shall deposit in a separate account any money so received, and he shall distribute it in accordance with such agreement as the parties in interest may reach. If after such loss no special agreement is made, replacement of damaged work shall be covered by an appropriate change order.

Article 11.3.6 - The Owner, as trustee shall have power to adjust and settle any loss with the insurers.

Article 11.3.7 - If the Owner finds it necessary to occupy or use a portion or portions of the work prior to Substantial Completion thereof, such occupancy shall not commence prior to a time mutually agreed to by the Owner and Contractor and to which the

insurance company or companies providing the property insurance once have consented by endorsement to the policy or policies. This insurance shall not be cancelled or lapsed on account of such partial occupancy. Consent of the Contractor and the insurance company or companies to such occupancy or use shall not be unreasonably withheld.

Article 11.3.8 Loss of Use Insurance - The Owner, at his option, may purchase and maintain such insurance as will insure him against loss of use of his property due to fire or other hazards, however caused.

C-32 ARTICLE 13, MISCELLANEOUS PROVISIONS

Article 13.5.1 - Delete in last sentence: "The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded.", and add;

"The Architect-Engineer shall designate the tests which shall be made, and the Contractor shall not obligate the Owner for tests without the Architect-Engineer's approval.

Testing Costs Paid For by the Contractor

Certain tests of materials, equipment and systems are required as part of the contract and shall be paid for by the Contractor. These are specifically named in the technical specifications and the types of tests are as follows:

1) Where tests are required by the technical specifications for materials, methods or equipment, the Contractor shall pay the cost of initial tests to prove qualities and determine conformance with specification requirements, e.g., mill tests on cement and steel; load testing of piling; sieve analysis and calorimetric tests on sand; strength tests for determining proportions of materials or concrete, moisture content and sound transmission tests of concrete blocks, etc;

2) If substitute materials or equipment are proposed by the Contractor, he shall pay the cost of all tests which may be necessary to satisfy the Architect-Engineer that specification requirements are satisfied;

3) If materials or workmanship are used which fail to meet specification requirements the Contractor shall pay the costs of all coring or other tests deemed necessary by the Architect-Engineer to determine the safety or suitability of the material or element;

4) The Contractor shall pay for all testing costs, including but not limited to; power, fuel, equipment and systems for proper operation such as electrical, plumbing, heating ventilation, air conditioning, elevator, dumbwaiters and conveyors, etc.

Testing Costs Borne by the Owner
All other tests performed at the direction of the Architect-Engineer or the Owner shall be paid for by the Owner, except to the extent that the costs of performing such tests are otherwise chargeable to the Contractor under provisions of the Contract Documents."

Article 13.6 – NOT APPLICABLE

Article 13.7 – NOT APPLICABLE

C-33 CHANGES IN THE WORK, DELAYS & EXTENSIONS OF TIME, CLAIMS

CHANGES IN THE WORK
During the course of the Contractor's performance of the work necessary to complete the subject Project, certain events may occur which have the effect of changing the conditions under which the work is to be performed as specified and described in the Bidding Documents, and/or the nature and extent of the work as specified and described in the Bidding Documents. The occurrence of such events may cause the Contractor to incur greater or less cost and expense to perform the work required to complete the subject Project than planned to be incurred in the Contractor's successful bid, in which event the Contractor or the Owner shall respectively be entitled to either an increase or decrease in the Contract Sum, whichever is the case, to the extent such greater or less cost and expense results, and in which event the party entitled to the benefit of any such adjustment to the Contract Sum shall, within twenty-one (21) calendar days from the first occurrence of such event(s), present written demand on a Proposed Change Order Summary Form **(**Exhibit 16**)** therefore on the other party through the Owner. Should the Contractor

and Owner be unable to settle and dispose of such demand within thirty (30) calendar days from the date any such claim is presented, upon terms and conditions mutually agreeable to the Contractor and the Owner, then such demand shall be referred to the Owner for determination, which determination shall be final and binding upon the Contractor, unless appealed in accordance with applicable provisions of the Contract Documents, and if the Owner, upon considering any such demand, determines that the Contract Sum should be increased or decreased, the determination of the amount of any such increase or decrease in the Contract Sum shall be governed and controlled by strict adherence to the following described guidelines and limitations, and neither the Contractor or the Owner shall be entitled to receive any monetary consideration beyond that which is authorized herein below.

All adjustments to the Contract Sum resulting from a change in the work shall be determined by the measure of actual or estimated as the case may be, out-of-pocket costs and expenses incurred or spared by the Contractor for labor, materials, equipment, and equipment rental, plus overhead and profit thereon, for performing the changed work.

A. Labor costs shall be inclusive of all direct job site cost for estimation, laying out, mechanics' wages and laborers' wages, together with all payroll taxes, payroll assessments, and insurance premiums paid for such labor.

B. All material costs, equipment costs and equipment rental costs shall be trade discount rates, plus State Sales Tax, where applicable.

C. Overhead and profit shall be inclusive of all project management, project administration, superintendence, project coordination, project scheduling and other administrative support functions and services, whether performed on the job site or off the job site and general support equipment. Overhead and profit shall be determined as follows:

    1. Overhead and profit shall be calculated at the rate of 15% of the Contractor's labor, material, equipment and equipment rental costs, incurred or spared, as measured under the preceding paragraphs for changes in the work performed by the officers, employees or subsidiaries of the Contractor.
    2. Overhead and profit shall be calculated at the rate of 7 1/2 percent of the Contractor's sub-contractors' actual labor, material, equipment and equipment rental costs, incurred or spared, as measured under the preceding paragraphs, plus 15% of all such costs, as overhead and profit to the Contractor's subcontractors, for all changes in the work performed by the officers, employees or subsidiaries of the Contractor's sub-contractors.

D. In addition to the foregoing, all adjustments to the Contract Sum resulting from a change in the work shall include all out-of-pocket expenses, incurred or spared, in performing the changes in the work for:

    1. Paying the premiums required to obtain Performance Bonds and Labor and Material Payment Bonds called for by the Contract Documents;

    2. Paying the fee(s) required for licenses or permits called for by changes in the work;

    3. Paying for delivery of materials or equipment to the job site;

    4. Paying for storage of materials or equipment before use thereof in performing changes in the work, and

    5. Paying for testing required by the changes in the work.

E. In the event Contractor demands an adjustment in the Contract Sum, such demand shall be accompanied by paid receipts or other such written evidence satisfactory to the Owner itemizing the costs and expenses incurred as a result of the event(s) constituting the changes in the work on a Proposed Change Order Summary Form **(**Exhibit 16**)**.

DELAYS & EXTENSIONS OF TIME

Article 8.3.3 of the AIA General Conditions is not applicable and Contractor's remedies for delays in the progress of the Work, or for changes in the Work, shall be limited to those provided in this Section. The contractor's exclusive remedy for delays in performance of the contract caused by events beyond its control shall be a claim for equitable adjustment in the contract time; provided, however, inasmuch as the parties expressly agree that overhead cost incurred by Contractor for delays in performing the Work cannot be determined with any degree of certainty, it is hereby agreed that in the event the Contractor is delayed in the progress of the Work after Notice to Proceed to Mobilize on Site and to Proceed with Construction for causes beyond its control and attributable only to acts or omissions of Owner, Contractor shall be entitled to compensation for overhead cost and profit

either (a) as a fixed percentage of the actual cost of the change in the Work, if the delay results from a change in the Work, as calculated in Section C, "Conditions of the Contract", or (b) if the delay results from other than a change in the Work, at an amount for each day of delay calculated by dividing an amount equal to a percentage of the original contract sum determined on the graph enclosed as Exhibit 13 by the number of calendar days of the original contract time.

In the event of a change in the Work, Contractor's claim for adjustments in contract sum are limited exclusively to its actual costs for such changes plus fixed percentages for overhead, additional profit and bond costs, as specified in herein.

The forgoing remedies for delays and changes in the Work are to the exclusion of, and thus eliminate, the total cost concept [(that is, computing Contractor's additional costs for changes in Work or the costs of a delay in the progress of the Work by comparing Contractor's total actual costs with its original estimate, see McDevitt & Street Company v. Department of Management Services State of Florida, 377 So.2d 191, (Fla. 1st-DCA 1979)] as the method of determining Contractor's costs associated with a change in the Work or with delay in the progress of the Work.

No provision of this contract shall be construed as a waiver of sovereign immunity by the Owner.

CLAIMS AND DISPUTES

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money and extension of time or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. Claims must be made by written notice. The responsibility to substantiate Claims shall rest with the party making the claim.

No provision of the Contract Documents makes or is intended to make provision for recovery by Contractor of damages for delay or for breach of contract. All claims, disputes or controversies under this contract shall be determined and settled as provided in Section C-39 hereinafter. No claim for breach of contract shall be submitted, determined or settled under Section C-39 hereinafter.

A. TIME LIMITS ON CLAIMS -- Claims by either party must be made within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Claims must be made by written notice. An additional Claim made after the initial Claim has been implemented by Change Order will not be considered unless submitted in a timely manner.

B. CONTINUING CONTRACT PERFORMANCE --Pending final resolution of a Claim unless otherwise agreed in writing the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

C-34 PROGRESS PAYMENTS

A. Contractor should note that the Client Agency is the Agency that will occupy and use the project upon substantial completion, and that all or a portion of the funding for this project may have been appropriated by the State Legislature or furnished by Federal Grant to the Client Agency and that payment to the contractor may be made by the Client Agency based on approval of each payment by the Owner.

The Owner will at intervals pay or cause to be paid to the Contractor as follows:

PAYMENTS TO CONTRACTOR

Thirty (30) calendar days shall be allowed for the Owner's inspection and approval of the goods and services for which any Application for Payment is made.

1. Progress Payments against Contract Sum
Based upon Application for Payment submitted to the Architect-Engineer by the Contractor and Certificates of Payment issued by the Architect-Engineer and accepted by the Owner, the Owner shall make progress payments to the Contractor against the account of the Contract Sum in accordance with the following:

(a) Within twenty (20) Department of Military Affairs working days from the Owner's receipt and acceptance of a

certificate of payment, the Owner shall pay, or cause to be paid to the Contractor, 90% of the portion of the contract sum properly allocable to labor, materials and equipment incorporated into the work, and 90% of that portion of the contract sum properly allocable to materials and equipment suitably stored at the site or bonded warehouse agreed upon in writing by all parties, less the aggregate of previous payments. 10% retainage is held by Owner until work has been completed and all final documentation has been delivered satisfactorily to Project Manager.

(1) The Contractor shall promptly pay each subcontractor in accordance with Section 287.0585, Florida Statutes, upon receipt of payment from the Owner out of the amount paid to the Contractor on account of such subcontractor's Work, the amount to which said subcontractor is entitled, reflecting the percentage actually retained, if any, from payments to the Contractor on account of such subcontractor's work. Starting with pay application number two Waiver and Release of Lien Upon Progress Payment from each subcontractor (if applicable) shall accompany each progress payment (Exhibit 20). Referenced document is included in the Contractor Workbook, furnished by the Contract Management Branch during or prior to the Pre-Construction Conference

(2) The Architect-Engineer may, on request at his discretion, furnish to a subcontractor, if practical, information regarding the percentages of completion of the amount applied for by the Contractor and the action taken thereon by the Architect-Engineer on account of work done by such subcontractor.

(3) Neither the Owner nor the Architect-Engineer shall have any obligation to pay or to see to the payment of any monies to any subcontractor except as may otherwise be required by law.

(4) No Certificate for a progress payment nor any progress payment, nor any partial or entire use of occupancy of the project by the Owner, shall constitute an acceptance of any work not in accordance with the Contract Documents.

B. The Contractor shall request such compensation by submitting:

1. A properly completed Application for Progress Payment on the form FNG 4012E (Exhibit 10).

2. A properly completed Contractor’s Minority Business Enterprises Status Report of Partial Payment (Exhibit 15). This form must be submitted even if no minorities were utilized.

3. A Schedule of Contract Values for FNG 4015E (Exhibit 11) as described below.

   The Contractor shall, within ten (10) calendar days from date of Notice to Secure Permits letter, submit to the Architect-Engineer and Project Manager for review and approval three copies of a Schedule of Contract Values which will reflect the estimated cost of each subdivision of work of each specification section, further detailed by subcontractor item, and utilizing the Construction Specification's Institute "Master Format Broad Scope Section Numbers". The value of each item shall include a true proportionate amount of the Contractor's overhead and profit. The sum of all such scheduled values shall equal the Contract Sum as evidenced by the Agreement.

   The approved Schedule of Contract Values will accompany and support the Contractor's periodic Applications for Payment and shall indicate the value of suitably stored material as well as labor performed and materials incorporated into the work for each subdivision of the schedule during the period for which the requisition is prepared.

   The Schedule of Contract Values form enclosed as Exhibit 11 will be utilized to present this and other pertinent information which will facilitate the checking and processing by the Owner's representatives of the Contractor's Application for Payment.

4. Waiver and Release of Lien Upon Progress Payment from each subcontractor, dated and notarized.

C-35 EXCLUSION OF OWNER FROM LIABILITY

Notwithstanding any other provision of the Contract Documents, should the Contractor sustain loss or be damaged by act or omission of a separate Contractor, the Owner shall not be liable for any such loss or damage and the Contractor shall not be entitled to obtain any monetary relief from the Owner to compensate for any such loss or damage, but shall be limited to such

recovery as is otherwise available at law from persons and/or entities other than the Owner.

C-36 DUTIES OF ARCHITECT-ENGINEER'S REPRESENTATIVE (If one is authorized by the Owner)

A. The Duties of the Architect-Engineer's Representative(s) shall include but not be limited to the following:

1. Assist the Contractor in obtaining interpretation of the Contract Documents from the Architect-Engineer.

2. Conduct on-site observations for determining conformance to the Contract Documents in regard to work, materials, equipment, etc.

3. Request additional details and/or information from the Architect-Engineer when needed by the Contractor.

4. Evaluate suggestions and/or modifications submitted by the Contractor and transmit these to the Architect-Engineer with recommendations.

5. Anticipate problems, which may create delays and problems in construction and report these to the Contractor and Architect-Engineer for solution.

6. Maintain official relationship only with the General Contractor Job Superintendent(s) and communicate problems to him regardless of which sub-contractor(s) work is involved.

7. Attend all required construction conferences and participate actively in discussions of the project.

8. When authorized by the Architect-Engineer conduct tests and inspections as required by the Contract Documents and record results of such tests and inspections.

9. Maintain a daily log of project activity including but not limited to: hours on the job site, weather conditions, daily construction activity, number of men in each trade on the site, general observations, written and verbal directives to Contractor and visits of governmental officials.

10. If, upon inspections or observations, work is found not to be in accordance with Contract Documents, advise the Architect-Engineer verbally and in writing. Consult with the Architect-Engineer for further directions if the Contractor does not correct work as directed by the Architect-Engineer.

11. Check that tests and inspections to be performed by others, in addition to those performed by Architect-Engineer's Representatives and/or the Architect-Engineer, are actually performed; in accordance with the Contract Documents.

12. When requested, accompany all State and or Federal officials on inspections of construction and record the inspection in the log.

13. Cooperate with Owner's Project Director or Inspectors and provide them with all requested information about the project.

14. Maintain in an orderly manner, files of correspondence, reports of job conferences, shop drawings and samples, copies of contract documents, change orders, addenda, supplementary drawings, and job log.

15. Review requisitions for payment submitted by the Contractor and transmit to the Architect-Engineer with recommendations.

16. Participate in the inspections of construction with the Architect-Engineer and Owner's Project Director at regular intervals and at Substantial Completion and provide Architect-Engineer with information as to work which is not complete, defective, or not in accordance with Contract Documents.

17. Refer all communications from State Agencies to the Owner's Project Director and to the Architect-Engineer.

18. Copy the Owner's Project Manager on all correspondence related to the project.

19. Review plans, specifications and shop drawings on a regular basis. Be alert to errors and omissions on the Contract Documents and construction problems before they occur and advise the Architect-Engineer when discovered.

20. Advise Contractor and Architect-Engineer of work being performed with unapproved shop drawings or without shop drawings when such shop drawings are required by specifications.

21. Check materials and equipment delivered to the job site against specifications, approved samples, shop drawings and related correspondence. If in conflict, advise Contractor and/or Architect-Engineer.

22. Check that Contractor is maintaining a record of notated drawings of As-Built conditions, when As-Built drawings are specified to be provided.

23. When necessary, act as liaison between the Contractor and the State Agency who will occupy the project in the coordination of the State Agency's requirements to the Contractor(s) schedule.

B. The Architect-Engineer's Representative is **not** authorized to do the following:

1. Authorize deviations from the Contract Documents (unless approved by Architect-Engineer).

2. Expedite the work for the Contractor(s).

3. Advise the Contractor on building techniques or scheduling.

4. Approve Shop Drawings.

5. Issue Certificate for Payment.

6. Approve substitutions.

7. Interpret the Contract Documents except when obviously clear.

C. The Architect-Engineer's Representative should **not**:

1. Get involved in disputes or problems between subcontractor and subcontractor.

2. Get involved in disputes or problems between General Contractor and subcontractor.

3. Offer gratuitous advice to Contractor or subcontractors on how to perform the work whether solicited from Contractors or not.

4. Communicate with State Agency's representative in any official way except as noted in Item A-23 above.

5. Make vague and unclear log entries as to the acceptability of the Contractor's work. If log entries are deemed unacceptable and not corrected properly and in a timely way, the condition should be entered into the job log clearly as a statement made with follow-up written communication to the Architect-Engineer.

6. Order a work stoppage except in extreme emergencies or except under conditions authorized by the Architect-Engineer only.

C-37 DUTIES OF THE OWNER'S STATE CONSTRUCTION REPRESENTATIVE (If one is authorized by the Owner)

NOTE: This Representative is NOT a State Building Code Inspector

A. The duties of the Owner's State Construction Representative shall include but not be limited to the following:

1. Be present at the site at all times when construction is being performed and conduct daily on-site observations for determining conformance to the Contract Documents in regard to work, materials, equipment, etc.

2. Anticipate problems, which may create delays and problems in construction, and report these to the Owner's Project Director for solution.

3. Attend all construction conferences.

4. When authorized by the Owner's Project Director, conduct inspections as required by the Contract Documents and record results of such inspections.

5. Maintain a daily log of project activity including but not limited to: hours on the job site, weather conditions, daily construction activity, number of men in each trade on the site, general observations, written and verbal directives to the Contractor and visits of governmental officials and the Architect-Engineer.

6. If, upon inspection or observations, work is believed not to be in accordance with Contract Documents, advise the Owner's Project Director verbally and in writing.

7. Check that tests and inspections to be performed by others, in addition to those performed by Architect-Engineer's Representative and/or the Architect Engineer, are actually performed in accordance with the Contract Documents.

8. When requested, accompany all State and/or Federal officials on inspections of construction and record the inspection in the log.

9. Cooperate with the Owner's Project Director and provide them with all requested information about the project that he can provide or direct them to the Architect-Engineer for assistance where appropriate.

10. Maintain in an orderly manner, files of correspondence, reports of job conferences, shop drawings and samples, copies of contract documents, change orders, addenda, supplementary drawings and job log.

11. Review requisitions for payment submitted by the Contractor via the Architect-Engineer and transmit to the Owner's Project Director with recommendations.

12. Participate in the inspections of construction with the Owner's Project Director at regular intervals and at substantial completion and provide the Owner's Project Director with information as to work which he feels is not complete, defective, or not in accordance with Contract Documents.

13. Refer all communications from State Agency that will occupy the project to the Owner's Project Director.

14. Copy the Owner's Project Director on all correspondence related to the Project.

15. Review plans, specifications and shop drawings on a regular basis. Be alert to errors and omissions on the Contract Documents and construction problems before they occur and advise the Owner's Project Director when he feels problems exist.

16. Advise the Owner's Project Director when he observes work being performed with unapproved shop drawings or without shop drawings when such shop drawings are required by specifications.

17. Check materials and equipment delivered to the job site against specifications, approved samples, shop drawings and related correspondence. If believed to be in conflict, advise the Owner's Project Director.

18. Check that Contractor is maintaining record notated drawings of as-built conditions, when as-built drawings are specified to be provided.

B. The Owner's State Construction Representative is **not** authorized to do the following:

1. Authorize deviations from the Contract Documents.

2. Expedite the work for the Contractor.

3. Advise the Contractor on building techniques or scheduling.
4. Approve Shop Drawings.

5. Issued Certificate for Payment.

6. Approve Substitutions.

7. Interpret the Contract Documents for the Contractor.

C. The Owner's State Construction Representative should **not**:

1. Get involved in disputes or problems between subcontractor and subcontractor.

2. Get involved in disputes or problems between General Contractor and subcontractor.

3. Offer gratuitous advice to Contractor and subcontractors on how to perform the work whether solicited from Contractors or not.

4. Communicate with State Agency's representative in any official way.

5. Make vague and unclear log entries as to the acceptability of the Contractor's work. If log entries are deemed unacceptable and not corrected properly and in a timely way, the conditions should be entered into the job log clearly as a statement made with follow-up written communications to the Owner's Project Director.

6. Order a work stoppage except in extreme emergencies affecting Life Safety.

C-38 PROHIBITED MATERIALS - ASBESTOS

Per Section 255.40, Florida Statutes, the use of asbestos or asbestos-based fiber materials is prohibited in any buildings, construction of which is commenced after September 30, 1983, which is financed with public funds or is constructed for the express purpose of being leased to any governmental entity.

C-39 CLAIMS AND DISPUTES

The provisions of Chapter 28-106, Florida Administrative Code to the extent not inconsistent with this Article are referred to and adopted by reference and shall govern procedures for claims.

Under the terms of this Agreement, the Contractor shall not have any right to compensation other than, or in addition to, that provided by this Agreement, to satisfy any claim for costs, liabilities or debts of any kind whatever resulting from any act or omission attributable to the Owner unless the Contractor has provided notice as required by Section C-35 and unless the claim therefore is delivered to the Owner. All such claims shall be set forth in a petition stating:

1. Name and business address of the claimant,

2. A concise statement of the ultimate facts, including the statement of all disputed issues of material fact, upon which the claim is based.

3. A concise statement of the provisions of the contract together with any federal, state and local laws, ordinances or code requirements or customary practices and usages in the industry asserted to be applicable to the questions presented by the claim and a demand for the specific relief believed to be due the claimant, and

4. The date of the occurrence of the event giving rise to the claim and the date and manner of Contractor's compliance with the notice requirements of Section C-33.

Within thirty (30) calendar days from the date any such claim is received, the Owner shall deliver to the Contractor its written determination on the claim. Unless the Owner's determination is agreed to by the Contractor and a consent order adopting the determination is entered within thirty (30) days of receipt of the Owner's determination, the Owner shall designate a hearing officer who shall conduct a proceeding in accordance with Chapter 28-106, F.A.C.

The Contractor shall carry on the Work and maintain the progress schedule during any administrative proceeding unless otherwise agreed by the Contractor and the Owner in writing.

The venue for all civil and administrative actions against the department shall be in Leon County, unless otherwise agreed by the parties.

C-40 INTEREST PROVISIONS

Any monies not paid when due to either party under this Agreement shall not bear interest except as may be required by Section 215.422, Florida Statutes.

C-41 HARMONY

Contractor is advised and hereby agrees that he will exert every reasonable and diligent effort to assure that all labor employed by Contractor and his subcontractors for work on the project shall work in harmony with and be compatible with all other labor being used by building and construction contractors now or hereafter on the site of the project.

Contractor further agrees that this provision will be included in all subcontracts of the subcontractor as well as in the Contractor's own contract; provided, however, that this provision shall not be interpreted or enforced so as to deny or abridge, on account of membership or non-membership in any labor union or labor organization, the right of any person to work as guaranteed by Article 1, Section 6 of the Florida Constitution.

C-42 CONTRACTOR'S REPRESENTATION

The Contractor represents and warrants that the information provided by the Contractor on Owner's Form DBC-5085 "Experience Questionnaire and Contractor's Financial Statement" (Exhibit 3), which was submitted by the Contractor to qualify for award of this contract, and is hereby made a part of this Agreement by reference, is true, accurate and correct. The Contractor understands and agrees that materially inaccurate information may result in termination of this contract at the Owner's option.

C-43 CONTRACTOR'S WORK FORCE

The Contractor agrees to perform no less than 15% of the project construction work utilizing his own employees. The percentage shall be calculated on the basis of the cost of materials and labor utilized by the prime Contractor's own forces in relation to the original contract amount.

C-44 CONTRACTOR'S SUPERVISION OF PROJECT

The Contractor must provide, as a minimum, field (on-site) supervision (through a named superintendent) of each of the general, concrete forming and placement, masonry, mechanical, plumbing, electrical and roofing trades, either through the use of his employees, or in the instance of mechanical, plumbing and electrical trades through the use of employees of the subcontractor as shown in Items 55 and 56 of the Documents entitled "Experience Questionnaire and Contractor's Financial Statement", and Item (2)(b)1I Supervisor, as required in Rule 60D-5.004 displayed in Paragraph B-2 of the Specifications. These Documents by reference form part of this Agreement. The Contractor shall not change or deviate from these principal and supervisory personnel without the written consent of the Owner.

C-45 TERMINATION FOR CAUSE OR MUTUAL AGREEMENT

This Agreement may be terminated by either party upon seven (7) days' notice by mutual agreement, or should one party fail substantially to perform in accordance with its terms through no fault of the other. Also, this Agreement may be unilaterally terminated by the Owner for refusal by the Contractor to allow public access to all documents, papers, letters, or other material

subject to the provisions of Chapter 119, Florida Statutes, and made or received by the Contractor in conjunction with this Agreement. In the event of termination, due to the fault of others than the Contractor, the Contractor shall be paid for services performed to termination date, including reimbursements then due plus terminal expense.

C-46 TERMINATION FOR CONVENIENCE

The performance of work under this contract may be terminated by the Owner in accordance with this clause in whole, or from time to time in part, whenever the Owner shall determine that such termination is in the best interest of the Owner. Upon termination, the Contractor shall be entitled to payment and profit for work completed to the time of termination only. The percentage of completion shall be determined by the Architect-Engineer, based upon the approved Schedule of Values.

C-47 CONTRACTOR PAYMENT RIGHTS

Contractors providing goods and services to the Owner should be aware of the following time frames: Upon receipt, the Owner has thirty (30) days to inspect and approve the goods and services. The Owner (Department of Military Affairs) has fifteen (15) business days to deliver a request for payment (voucher) to the Department of Financial Services. The fifteen (15) business days are measured from the latter of the date the Pay Request is stamped as received or the goods or services are received, inspected and approved.

If payment is not available to the Owner for transmittal to the Contractor within twenty-five (25) business days, a separate interest penalty of .03333 percent per day will be due and payable, in addition to the Pay Request amount, to the vendor. The twenty-five (25) business days are also measured from the latter of the date the invoice is stamped as received or the goods or services are received, inspected and approved. Interest penalties of less than one (1) dollar will not be enforced unless the Contractor requests payment. Pay Requests which have to be returned to a Contractor because of Contractor preparation errors will result in a delay in the payment. The Pay Requests payment requirements do not start until a properly completed Pay Request is provided to the Owner, has been approved and stamped as received.

C-48 PUBLIC ENTITY CRIME INFORMATION STATEMENT

A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a bid on a contract to provide any goods or services to a public entity, may not submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids on leases of real property to a public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity, and may not transact business with any public entity in excess of the threshold amount provided in Section 287.017, for Category Two for a period of 36 months from the date of being placed on the convicted vendor list.

C-49 DISCRIMINATION, DENIAL OR REVOCATION FOR THE RIGHT TO TRANSACT BUSINESS WITH PUBLIC ENTITIES

An entity or affiliate who has been placed on the discriminatory vendor list may not submit a bid on a contract to provide any goods or services to a public entity, may not submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids on leases of real property to a public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity, and may not transact business with any public entity.

C-50 UNAUTHORIZED ALIENS

The Department shall consider the employment by any contractor of unauthorized aliens a violation of section 274(e) of the Immigration and Nationalization Act. Such violation shall be cause for unilateral cancellation of this contract.

Unauthorized Aliens Checks Through E-Verify System:

Pursuant to the State of Florida, Office of the Governor, Executive Order Number 11-02 entered on January 4, 2011, Contractor will utilize the U.S. Department of Homeland Security's E-Verify system to verify the employment eligibility of: (a) all persons employed during the term of the Contract by Contractor to perform employment duties within Florida within 3 business days after the date of hire; and (b) all persons (including subcontractors) assigned by Contractor to perform work pursuant to the Contract with the Department within 90 calendar days after the date the Contract is executed or within 30

days after such persons are assigned to perform work pursuant to the Contract, whichever is later.

C-51 ELECTRONIC MAIL CAPABILITIES

The Contractor must have electronic mail capabilities through the World Wide Web. It is the intention of the Department of Military Affairs to use electronic communication for all projects whenever possible. The Contractor shall provide their electronic mail address and the name of a contact person responsible for their electronic communications.

C-52 ASSIGNMENT

For and in recognition of good and valuable consideration, receipt of which is hereby acknowledged, the Contractor hereby conveys, sells, assigns and transfers to the State of Florida all rights, title and interest in and to all causes to action it may now or hereafter acquire under the antitrust laws of the United States and the State of Florida for price fixing, relating to the particular goods or services purchased or acquired by the State of Florida pursuant to this Agreement.

C-53 BUILDINGS PLANS EXEMPTION POLICY

Pursuant to Section 119.071(3)(b), Florida Statutes, all building plans, blueprints, schematic drawings, and diagrams, including draft, preliminary, and final formats, which depict the internal layout and structural elements of a building, arena, stadium, water treatment facility, or other structure owned or operated by an agency are exempt from inspection or disclosure under Florida's Sunshine laws. The Architect-Engineer/Contractor agrees to protect and ensure the confidentiality of such documents under its custody or control in conformance with the requirements of Section 119.071(3), Florida Statutes, and all applicable laws. At a minimum, all such documents shall be prominently marked, directly or on an attached cover page, with the following statement: ***"All plans contained herein are confidential and exempt from public inspection or disclosure pursuant to Section 119.071(3(b), Florida Statutes."*** Any violation of this paragraph or Chapter 119, Florida Statutes, may result in immediate termination of the contract by Owner.

SECTION D
SPECIAL CONDITIONS

D-1 ARCHITECT-ENGINEER'S FIELD OFFICE – NOT REQUIRED FOR THIS PROJECT

If required by Project constraints, Contractor shall provide and maintain a watertight office at the project for the exclusive use of the Architect-Engineer and his representatives, not less than 12' x 12' in size, one room with at least one window in each exterior wall and an independent outside entrance door fitted with hardware and lock, artificial light, a bench with one drawer, a blueprint rack, a heater and a window air conditioner. This office and equipment shall become the property of the Contractor upon completion of the contract.

D-2 VOICE/DATA/FAX – NOT REQUIRED FOR THIS PROJECT

If required by Project constraints, voice/data/fax capability shall be installed in the Architect-Engineer's field office, at the contractor's expense, and it shall remain until the full completion of the project. Charges for long distance calls shall be paid for by the person making the calls. All other charges in connection with the telephone shall be paid for by the Contractor.

D-3 WATER

Water necessary for construction of the building and testing its plumbing and mechanical systems shall be furnished by the Contractor. He shall make all connections, install a meter, take out and pay for all permits necessary, do all piping and clear away all evidence of same after the job is completed; as well as pay for usage of water.

D-4 ELECTRICITY

All electricity for light and power necessary for the construction of the building and testing of its electrical and mechanical systems shall be paid for by the Contractor. He shall make all necessary arrangements for this service and perform the work required at contractor expenses; as well as pay for usage of electricity.

D-5 PROJECT SIGN

A sign shall be erected at the site by the Contractor and shall consist of 4' X 8' X 3/4" exterior grade plywood mounted on 4" x 4" wood posts (pressure treated.), located in a prominent location approved by the Architect-Engineer and Owner. Sign shall conform to the design as illustrated on enclosed Exhibit 14.

D-6 PRE-CONSTRUCTION CONFERENCE

Prior to starting construction, the Owner's Contract Manager will arrange a meeting with the Project Manager, Architect-Engineer, Occupant Representative that will occupy the project, General Contractor, Federal Representatives if involved, Bureau of Apprenticeship and other interested parties. The purpose of this meeting shall be to discuss requirements and responsibilities of the various parties involved with the objective of expeditious handling of the construction contract. The Owner's Project Manager will chair this meeting.

D-7 SITE SECURITY

The Contractor shall pay for and be responsible to secure the site and the project against theft, vandalism, fire, and for public safety at all times (24 hours per day) from Notice to Proceed until Substantial Completion.

EXHIBIT 1

PROPOSALS ARE REQUESTED FROM QUALIFIED, LICENSED (GENERAL) CONTRACTORS BY THE State of Florida, Department of Military Affairs HEREINAFTER REFERRED TO AS OWNER, FOR CONSTRUCTION OF:
PROJECT NUMBER: 120193

PROJECT NAME & LOCATION: Live Fire Shoot House, Camp Blanding Joint Training Center, Starke, FL

FOR: **The Florida Army National Guard, Construction & Facility Management Office**

POTENTIAL RESPONDENTS TO THE SOLICITATION ARE ENCOURAGED TO CAREFULLY REVIEW ALL THE MATERIALS CONTAINTED HEREIN AND PREPARE RESPONSES ACCORDINGLY.

FOR: PROJECT DESCRIPTION: This project is for the construction of a Live Fire Shoot House (LFSH) with required supporting Facilities for support of training requirements of the Army National Guard. This facility will be used to train and test individuals, teams, sections or squads on the skills necessary to conduct individual and collective tasks of building clearing and/or occupying. This facility is an Army National Guard Facility and is designated as a new construction project.

The facility will be constructed on State land at Camp Blanding Joint Training Center (CBJTC) in Starke, Florida. The project site consists of approximately 11 acres. The site will include gravel surface parking and access drives, concrete sidewalks, shallow dry storm water retention areas, a dumpster enclosure, warning flag and pole, and fencing.

The primary facility for this project will be the Live Fire Shoot House (LFSH). The support Facilities for this project will be the Ammunition Breakdown Building, After Action Review/Operations/Storage/Latrine Building, and Bleacher Enclosure/Live Fire Shoot House Mock-Up. Specific information is provided in the detailed narratives for each structure below.

The Intent of this Project is to Attain LEED Silver Certification.

Site Description:
The buildings for the LFSH have been designed in a pin-wheel arrangement , all centered around the Ammunitions Building with a minimum clearance of 50 feet to comply with the intraline explosive safety distance from this building. Each building is located a minimum of 33 feet away from the parking to comply with UFC 4-010-01. Each building is connected to each other and the parking area via concrete sidewalks. The Live Fire Shoot House is separated from the remainder of the buildings via a six foot tall chain link fence with lockable gates located directly adjacent to the Ammunitions Building for control purposes. All parking areas and drives will consist of gravel parking with the exception of the handicap parking. The parking will consist of 39 standard parking spaces, two handicap parking spaces, and four bus parking spaces.

Live Fire Shoot House (LFSH):
The 4,500 sq. ft. Shoot House is a pre-engineered, pre-manufactured building and consists of eight rooms and two corridors with four entrances/exists. A catwalk is provided around the perimeter. Bullet absorbing walls, in each room, are designed to stop and contain bullets. The roof structure consists of a steel frame structure with a metal roof. The underside of the roof structure will be covered with bullet resistant sheeting to prevent bullets escaping the LFSH. A network of cameras will record training activity for after action reviews.

Ammunition Breakdown Building:
This 136 sq. ft. building is used to receive ammunition in bulk, store bulk ammunition, and stage ammunition for the trainees to retrieve enroute to the LFSH and to return the empty and unused clips after completion of the exercise in the LFSH. This single story, unconditioned, building with sloping metal roof will be constructed with reinforced concrete masonry units.

After Action Review/Operations/Storage/ Latrine Building:
This 2,147 sq. ft. building contains the classroom, electronic control room (digital), maintenance and storage, and latrines to support the LFSH training complex. This single story building with metal hip roof will be constructed with reinforced concrete masonry units.

Bleacher Enclosure/Mockup:
The 729 sq. ft. Bleacher Enclosure Structure will be used to provide weather protection for the trainees. This pre-engineered metal enclosure is single story with metal sloped roof.
The 2,070 sq. ft. Mock-up will be used as an instructional area to familiarize the trainees with the LFSH building configuration. The Mock-up walls will be constructed of two foot tall reinforced masonry concrete units on a monolithic concrete slab.

Building must meet Florida Building Code, State Fire Marshall, local Authorities Having Jurisdiction and Area Water Management requirements, and any other permits and fees required by other county, local or state authorities.

Regulatory permitting to include the preparation, submittal, payment and review coordination of the Water Management District, Environmental Resource Permit (including permit fees), Florida Department of Environmental Protection (FDEP) Notice of Intent (including filing fees), Clay County Review Permit Fee, and any other permits and fees required by other county, local or state authorities.

REQUIRED SUBMITTALS – INITIAL SCREENING: Per Chapter 60D-5.004(2)(a), each bidder whose field is governed by Chapter 399, 455, 489, and 633 of the Florida Statutes for licensure or certification must submit pre-qualification of their eligibility prior to or at the Mandatory Pre-Bid Meeting the following documents:

1. Proof of Contractor license from Florida Department of Business and Professional Regulation (www.myfloridalicense.com)
2. Proof of Corporate Charter license (if a corporation) from Florida Department of State, Division of Corporation (www.sunbiz.org)
3. Registration in www.myflorida.com.

Contractors that fail to submit pre-qualification data will be disqualified from bidding on this project. If providing this information prior to the pre-bid meeting, Contractor's may submit by Facsimile: (904) 823-0189 or Email Address: cfmocontracting@ng.army.mil.

CONTRACTOR QUALIFICATIONS - BIDDING DOCUMENTS

The Requirement of this project is to attain LEED Silver Certification. Refer to Exhibit A below for required General Contractor LEED Qualification Criteria.

Exhibit A - Specific Sustainable Design Qualifications:

The sustainable initiatives of this project will be scored according to USGBC LEED for New Construction. The requirement for this project is to successfully be awarded LEED Silver or better. As a result, it is imperative to have a contractor that is experienced with LEED for New Construction and is committed to the successful achievement of LEED Silver. To support these goals, the following are the minimum requirements the contractor must meet in order to be qualified to bid on this project:

· Contractor must have successfully completed at least one project with a contract amount that is not less than $2,000,000 and this project must have been award LEED Silver or better.

· Contractor shall provide proof of the award of LEED Silver or better by providing the actual documentation in the form of the award certificate or award notification from the USGBC. This information must be included with the contractors bid.

· Contractor must have at least one employee that is a registered LEED Accredited Professional with the USGBC. This person's accreditation must be current and valid at the time of bidding. The contractor shall provide resumes for the LEED Accredited Professionals and shall designate the LEED Accredited Professional that will be responsible for this project. This information shall be provided before the issuance of the Intent to Award.

· The project has already been registered with USGBC LEED-NC v2009 and the registration fee has been paid. The contractor will be responsible for all LEED construction and registration related costs required for the pursuit of LEED Silver or better.

After the bid opening, the low bidder must qualify in accordance with Chapter 60D-5.004(2)(b). Contractors must present Form FNG 5085 Contractor's Experience Questionnaire **with their bid** at the time of the bid opening. A copy of the requirements is included in the Non-Technical Specifications Level IV/V, Instructions to Bidders under Section B-2 "Bidder Qualification Requirements and Procedures." Note: An Exhibit 3 FNG 5085 (in word document format) experience questionnaire and financial statement form may be obtained from the Contracting Branch at cfmocontracting@ng.army.mil. The Department of Military Affairs will qualify no less than the three lowest bidders.

Prior to contract award, the Department reserves the right to perform or have performed, an on-site review of the proposer's facilities and qualifications. This review will serve to verify data and representations submitted by the proposer and may be used to determine whether the proposer has an adequate, qualified, and experienced staff, and can provide overall management facilities. The review may also serve to verify whether the proposer has a financial capability adequate to meet the contract requirements. Should the Department determine that the bid/proposal has material misrepresentations or that the size or nature of the proposer's facilities or the number of experienced personnel (including technical staff) are not adequate to ensure satisfactory contract performance, the Department has the right to reject the bid/proposal.

The respondent shall warrant that it has not employed or retained any company or person, other than a bona fide employee working solely for the respondent to solicit or secure the award for this project and that it has not paid or agreed to pay any person, company corporation, individual or firm other than a bona fide employee working solely for the respondent any fee, commission, percentage, gift or other consideration contingent upon or resulting from the award.

The respondent shall warrant that it presently has no interest and shall not acquire any interest which would conflict in any manner or degree with the performance of services required.

The respondent will comply with all applicable federal, state and local rules and regulations in providing services to the Department under this solicitation if awarded.

The STATE OF FLORIDA requires all Contractors to implement a drug free workplace program as defined in 287.087, Florida Statutes.

PUBLIC ENTITY CRIME INFORMATION STATEMENT: A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a bid on a contract to provide any goods or services to a public entity, may not submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids on leases of real property to a public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity, and may not transact business with any public entity in excess of the threshold amount provided in Section 287.017, for Category Two for a period of 36 months from the date of being placed on the convicted vendor

list.

DISCRIMINATION; DENIAL OR REVOCATION FOR THE RIGHT TO TRANSACT BUSINESS WITH PUBLIC ENTITIES: An entity or affiliate who has been placed on the discriminatory vendor list may not submit a bid on a contract to provide any goods or services to a public entity, may not submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids on leases of real property to a public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity, and may not transact business with any public entity.

BID SECURITY: Bids/Proposals in total excess of $100,000.00, the bidder must provide with bid, a good faith deposit in the amount of 5% of the bid by way of a bid bond from a surety insurer authorized to do business in the STATE OF FLORIDA as surety or a certified check or cashier's check accompanying the bid.

PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND'S are required from any persons or parties entering into a formal contract with the STATE OF FLORIDA for contracts in total excess of $100,000.00 for construction, additions, renovations, repairs, or demolition of any public building pursuant to Florida Statute 255.05(1)(a). The contractor must provide the owner with proof of Bonds within 10 days of contract award.

CONTRACTOR INSURANCE: The contractor must provide the owner with proof of insurance within 10 days of contract award. NO work may commence in connection with the contract until he has obtained all insurance as specified in the Non-Technical Specifications Level III, Section C-4 or the Non-Technical Specifications Level IV & V, Section C-3 and such insurance has been approved by the Owner, nor shall the contractor allow any subcontractor to commence work on his subcontract until all similar insurance required of the subcontractor has been so obtained and approved by owner. All insurance policies shall be with insurers qualified and doing business in Florida through an authorized licensed Florida Resident Agent. The insurance requirements shall be completed in a timely manner in order not to delay the construction schedule.

All questions regarding this procurement will be accepted in writing via facsimile or email to Department of Military Affairs - CFMO, Attention: Contracting Branch: Facsimile: (904) 823-0189 or Email Address: cfmocontracting@ ng.army.mil.

Any questions from proposers concerning this solicitation shall be submitted in writing, identifying the submitter, to the Contracting Branch listed above at the address specified above by email or by facsimile no later than the date specified below. E-mail inquiries are preferred; however a hard copy or facsimile is acceptable.

INFORMATION WILL NOT BE AVAILABLE BY TELEPHONE. All information received through any oral communication shall not be binding on the Department of Military Affairs and shall not be relied upon by a Bidder.

Pursuant to Section 287.057(26), Florida Statutes, Respondents to this solicitation of persons acting on their behalf may not contact, between the release of the solicitation and the end of the 72-hour period following the agency posting the notice of intended award, excluding Saturdays, Sundays, and state holidays, any employee or officer of the executive or legislative branch concerning any aspect of this solicitation, except in writing to the procurement officer or as provided in the solicitation documents. Violation of this provision may be grounds for rejecting a response.

All questions and answers/changes to the solicitation will be provided in Addenda Form and posted on the DMS Vendor Bid System (VBS). It is the prospective contractor's responsibility to check periodically for any information updates, to the solicitation, which is posted to the VBS. The Department of Military Affairs bears no responsibility for any delays, or resulting impacts, associated with a prospective contractor's failure to obtain information made available through the DMS Vendor Bid System.

CONFLICT OF INTEREST: This solicitation is subject to chapter 112 of the Florida Statutes. Respondents shall disclose with their response the name of any officer, director, employee or other agent who is also an employee of the

State. Respondents shall also disclose the name of any State employee who owns, directly or indirectly an interest of five percent (5%) or more in the respondent or its affiliates.

MANDATORY SITE VISIT AND PRE-BID MEETING: 16 March 2012

DATE AND TIME: 10:00 AM Local Time

PLACE: Camp Blanding Joint Training Center, RTI Auditorium. Security Personnel at the Main Gate will direct you to the site.

All General Contractors interested in bidding on this project are required to attend this pre-bid meeting. Subcontractor participation is highly encouraged. No later dates for site visits will be scheduled.

SEALED BIDS WILL BE RECEIVED, PUBLICLY OPENED AND READ ALOUD ON:

DATE AND TIME: 10, April 2012 @ 2:00 PM local time

PLACE: Robert F. Ensslin, Jr, National Guard Armory, 2305 State Road 207, St. Augustine, Florida 32086. (Drill Hall Floor)

MARK ENVELOPES: SEALED BID-DO NOT OPEN for Project Number/Name: 120193, LFSH, Department of Military Affairs, Robert F. Ensslin National Guard Armory, 2305 State Road 207, St. Augustine, Florida 32086, Attn: Contracting Department.

BIDS/RESPONSES TRANSMITTED ELECTRONICALLY WILL NOT BE CONSIDERED. BIDS/RESPONSES RECEIVED AT THE LOCATION DESIGNATED AFTER THE EXACT TIME SPECIFIED FOR RECEIPT WILL NOT BE CONSIDERED.

Bids submitted via courier or mail must be delivered to the above address, please do not send Sealed Bids to the project location or any other Department of Military Affairs location. The Department of Military Affairs will not assume receipt of any sealed bid unless delivered to the address and room listed in this solicitation.

BID/PROPOSAL: All responses must be submitted in a sealed package and shall be clearly marked on the outside of package with the above information. Department of Military Affairs is not responsible for the opening of any solicitation package which is not properly marked. Bids will be time stamped on the official time clock upon delivery. It is the respondent's responsibility to assure its response is submitted in the place and time indicated in this solicitation. Also, all responses must be in full accordance with the requirements of the Drawings, Specifications, Bidding Conditions and Contractual Conditions, and Non-Technical Specifications, which have been prepared by the Engineer as listed, and may be obtained as follows:

FINAL QUESTIONS FROM BIDDERS: 29 March 2012 before 4:00 PM Local Time
Any questions from proposers concerning this solicitation shall be submitted in writing, identifying the submitter, to the contacts listed by email or fax only.

Questions submitted after this date will not be answered. All technical questions regarding this procurement will be accepted via email ONLY to the A/E listed below. All questions will be answered in addendum form. Addenda will be published in the Vendor Bid System. It is Contractor's responsibility to obtain all addenda published on the VBS. All addenda MUST be acknowledged on Exhibit 4.

ARCHITECT-ENGINEER: Ebert Norman Brady Architects

TELEPHONE: 904-241-9997, Fax 904-241-7526

EMAIL ADDRESS: tnorman@enbarchitects.com

Make all checks or money orders payable to: Ebert Norman Brady Architects. No credit cards are accepted.

FULL SETS of drawings and specifications may be purchased by payment of the printing and handling cost at the rate of **$150.00** per set, or **$50.00** for CD. Sets are NON-REFUNDABLE. CD's and Prints may be available at the Pre-Bid Meeting for purchase upon prior notification. Hard copies require 24 hour notice if picking up at Ebert Norman Brady Architects.

Note:
1. General Contractors are limited to 2 sets only.
2. Only Full Sets of documents will be issued.
3. Shipping Costs for Documents is not included in the above deposit price.

CONTRACT AWARD: Contract award will be given to the lowest responsive and responsible bidder. The lowest bid will be the bid from the responsive bidder that has submitted the lowest price for the base bid or the base bid plus the additive alternates or less the deductive alternates chosen by the Agency to be included in or excluded from the proposed contract, taken in numerical order listed in the bid documents. The order of the alternates may be selected by the Agency in any sequence so long as such acceptance out of order does not alter the designation of the low bidder. Failure to file a protest within the time prescribed in Section 120.57(3), Florida Statutes, shall constitute a waiver of proceedings under Chapter 120, Florida Statutes. If no protest is filed, the contract will be awarded to the qualified, responsible and responsive low bidder in accordance with Chapter 60D-5 by the Owner.

The official Notice of Award Recommendation will be by electronic posting on the Department's website at **http://fcn.state.fl.us/owa_vbs/owa/vbs_www.main_menu**.

INABILITY TO POST ELECTRONICALLY: If the Department is unable to post (due to technical difficulties) as defined above, the Department will notify all proposers via the Point of Contact and electronic address provided to the Department by the proposer at the Mandatory Pre-Bid meeting. Notice will be posted as defined above once the technical difficulties have been rectified; however, the official posting time will be that time at which the last proposer was electronically notified.

MINORITY PROGRAM: Minority Business Enterprises (MBE) are encouraged to participate in this Invitation to Bid. Utilization of MBE participation is highly encouraged from all Bidders. MBE's must be certified by the Office of Supplier Diversity.

CLARIFICATIONS/REVISIONS: Before award, the Owner reserves the right to seek clarifications or request any information deemed necessary for proper evaluation of submissions from all respondents deemed eligible before Contract award. Failure to provide requested information may result in rejection of the response.

The Department reserves the right to accept or reject any or all proposals received and reserves the right to make an award with or without further discussion of the proposals submitted or accept minor informalities or irregularities in the best interest of the State of Florida, which are considered a matter of form and not substance, and the correction or waiver of which is not prejudicial to other proposers. Minor irregularities are defined as those that will not have an adverse effect on the Department's interest and will not affect the price of the proposal by giving a proposer an advantage or benefit not enjoyed by all other proposers. It is understood the proposal will become a part of the Department's official file, without obligation to the Department. Proposals may be rejected if found to be irregular or not in conformance with the requirements and instructions contained herein. A proposal may be found to be irregular or non-responsive by reasons that include, but are not limited to failure to utilize or complete in their entirety prescribed forms, conditional proposals, incomplete proposals, ambiguous proposals, and improper, missing and/or undated signatures.

The State of Florida, Department of Military Affairs, objects to and shall not consider any additional terms or conditions submitted by a respondent, including any appearing in documents attached as part of a respondent's response. In submitting its response, a respondent agrees that any additional terms or conditions; whether

submitted intentionally or inadvertently, shall have no force or effect. Failure to comply with terms and conditions, including those specifying information that must be submitted with a response, shall be grounds for rejecting a response.

The Non-Technical Specifications Level IV & V are considered to be applicable to this solicitation and award of contract when made and are made a part hereof.

The State of Florida, through the Department of Management Services, has instituted MyFloridaMarketPlace, a statewide e-procurement system. Pursuant to rule 60A-1.032(1), Florida Administrative Code, this contract shall be exempt from the one percent (1%) transaction fee. Prior to entering into a contract with the State of Florida, Department of Military Affairs, the selected contractor must be registered with the Florida Department of Management Services (DMS) MyFloridaMarketPlace Vendor Registration System. Information about the registration process is available, and registration must be completed at the MyFloridaMarketPlace website (link available under BUSINESS at (www.myflorida.com). Prospective contractors who do not have Internet access may request assistance from the MyFloridaMarketPlace Customer Service at (866) 352-3776.

The State of Florida's performance and obligation to pay under this contract is contingent upon availability of funding and an annual appropriation by the Legislature.

For the purposes of this solicitation, the terms proposer, respondent, offerer, bidder and contractor/vendor are used interchangeably and mean a person(s) or firm(s) submitting a response to this solicitation, including joint ventures.

The employment of unauthorized aliens by any contractor/vendor is considered a violation of Section 274A(e) of the Immigration and Nationality Act. If a contractor/vendor employs unauthorized aliens, such violation shall be cause for rejection of bid/unilateral cancellation of a contract if awarded.

Order Number 11-02: E-verify System: Department of Homeland Security:

Pursuant to the State of Florida, Office of the Governor, Executive Order Number 11-02 entered on January 4, 2011, Contractors will utilize the U.S. Department of Homeland Security's E-Verify system to verify the employment eligibility of: (a) all persons employed during the term of the Contract by Contractor to perform employment duties within Florida within 3 business days after the date of hire; and (b) all persons (including subcontractors) assigned by Contractor to perform work pursuant to the Contract with the Department within 90 calendar days after the date the Contract is executed or within 30 days after such persons are assigned to perform work pursuant to the Contract, whichever is later.

Effective March 5, 2012, State of Florida agencies will not be permitted to place orders for goods and services or make payments to any vendor that does not have a verified Substitute W-9 on file with the Department of Financial Services. Vendors are required to register and submit a Form W-9 on the State's Vendor Website at http://flvendor.myfloridacfo.com .

NO VERBAL STATEMENTS MADE BY ANY STATE OF FLORIDA EMPLOYEE OR AGENCY REPRESENTATIVE WILL OPERATE TO SUPERSEDE INFORMATION PUBLISHED IN THIS SOLICITATION. ONLY WRITTEN ADDENDA ISSUED BY THE DEPARTMENT OF MILITARY AFFAIRS CONSTRUCTION AND FACILITY MANAGEMENT OFFICE OR ITS REPRESENTATIVES WILL OPERATE TO ALTER OR OTHERWISE AMEND THIS SOLICITATION.

FNG 4010B

EXHIBIT 2

ACORD CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YY): Current Date

PRODUCER	THIS CERTIFICATE ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.
Abc Insurance 6789 Surety Street City, State Zip	**INSURERS AFFORDING COVERAGE**
INSURED	INSURER A: Worldwide Insurance Co.
Def Contractors 12345 Building Way Anytown, FL 30000	INSURER B: INSURER C: INSURER D: INSURER E:

COVERAGES **SAMPLE COPY / SAMPLE COPY / SAMPLE COPY**

THE POLICES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INS LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXP DATE (MM/DD/YY)	LIMITS	
	GENERAL LIABILITY ☒ COMMERCIAL GENERAL LIABILITY ☐ CLAIMS MADE ☒ OCCUR ☒ Blanket Additional Insured ☒ Contractual Liability GEN'L AGGREGATE LIMIT APPLIES PER: ☐ POLICY ☒ PROJECT ☐ LOC				EACH OCCURRENCE	$ 1,000,000
					FIRE DAMAGE (any 1 fire)	$ 300,000
					MED EXP (any 1 person)	$ 10,000
					PERSONAL & ADV INJURY	$ 1,000,000
					GENERAL AGGREGATE	$ 2,000,000
					PRODUCTS – COMP/OP AGG	$ 2,000,000
					DAMAGE TO PREMISES (ea occur)	
	AUTOMOBILE LIABILITY ☒ ANY AUTO ☐ ALL OWNED AUTOS ☐ SCHEDULED AUTOS ☒ HIRED AUTOS ☒ NON OWNED AUTOS ☐ _____ ☐ _____				COMBINED SINGLE LIMIT (Ea Accident)	$ 100,000
					BODILY INJURY (per person)	$
					BODILY INJURY (per accident)	$
					PROPERTY DAMAGE (Per accident)	$
	GARAGE LIABILITY ☐ ANY AUTO ☐ _____				AUTO ONLY – EA ACCIDENT	$
					OTHER THAN AUTO ONLY: EA ACC	$
					OTHER THAN AUTO ONLY: AGG	$
	EXCESS/UMBRELLA LIABILITY ☒ OCCUR ☐ CLAIMS MADE ☐ DEDUCTIBLE ☐ RETENTION $_____				EACH OCCURRENCE	$1,000,000
					AGGREGATE	$1,000,000
						$
						$
						$
	WORKER'S COMPENSATION AND EMPLOYER'S LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? If yes, describe under SPECIAL CONDITIONS below				☒ WC Statutory Limits ☐ Other	
					E.L. EACH ACCIDENT	$ As Law Req's
					E.L. DISEASE –EA EMPLOYEE	$ As Law Req's
					E.L. DISEASE –POLICY LIMIT	$ As Law Req's
	OTHER **Owners and Contractors Protective Liability**				**$1,000,000 each occurrence $2,000,000 per aggregate**	

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/EXCLUSIONS ADDED BY ENDORSEMENT/SPECIAL PROVISIONS:

CFMO Project # _____ for _____ (Project Name)
State of Florida, Department of Military Affairs is named as additional insured. All policies include a waiver of Subrogation in favor of the additional insured.

CERTIFICATE HOLDER	CANCELLATION
State of Florida **Department of Military Affairs** **Construction & Facility Management Office** **2305 State Road 207** **St. Augustine, Florida 32086**	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL _____ DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KINDUPON THE INSURER, ITS AGENTS OR REPRESENTATIVES. AUTHORIZED REPRESENTATIVE ALFRED JONES

EXHIBIT 3

OWNER'S INSTRUCTIONS FOR
EXPERIENCE QUESTIONNAIRE AND CONTRACTOR'S FINANCIAL STATEMENT

The information listed in the Experience Questionnaire and Contractor's Financial Statement Forms is required to be filed with soliciting agencies prior to award of any contract. In order to expedite the processing of contracts, please complete the enclosed forms in accordance with these instructions.

The bidder is required to complete all the attached forms. If the bidder is a Joint Venture, then each Corporation, Partnership or Individual that is a party to the Joint Venture must complete, individually, each form.

Heading

Project Title - Indicate title of project as shown in the solicitation/specifications.

Project Number – State/Federal project number assigned see original solicitation/specifications.

Location - Project location as shown in the solicitation/specifications.

Sections 1 & 2

Trades or Trades Being Bid

Insert in box(es) on Page 1 the code number(s) listed below which represent the trade(s) for which you are qualified to bid:

Trade	Code Number
Building Construction	1
Electrical	2
Elevator	3
Food Service	4
Heating, Ventilating & Air Conditioning	5
Laboratory Equipment	6
Landscaping	7
Plumbing	8
Power Plants (Boilers, Equipment & Piping)	9
Refrigeration	10
Roofing	11
Sanitary (Sewage Treatment Plants, Pumping Stations, etc.)	12
Other_____	13

Section 6. Complete with name of Point of Contact including email address & phone number.

Sections 3-53

Complete in accordance with form. NOTE: SECTION "A" Financial Statement - Do not attach current company financial statement, use this form only. If current financial statement is dated over 90 days from date of this submittal, See letter "Attesting to liquid assets" Section number 64 (complete only if needed). *In accordance with Florida Administrative Code (FAC) 60D-5.004 Bidder's Qualification Requirements and Procedures, Paragraph (2)(a)4(b)1e, "The value of liquid assets must be no less than one-twentieth of the amount of the base bid".
Liquid assets shall include cash, stocks, bonds, pre-paid expenses and receivables, but shall not include the value of the equipment."

Section 54

Under "c", list previous business name or names and the number of years you have done business under these names within the past 10 years.

Section 55

From your present payroll indicate the number of individuals in each category in the "Current" column.

Estimate the maximum and minimum number of employees over the previous 3 fiscal years in each category.

Sections 56-64

Complete in accordance with form.

Section 60, list projects of comparable size, scope and complexity to subject project. NOTE: See LEED Silver qualifications in solicitation/specifications.

EXHIBIT 3 CONTINUED

Section 63

1) In Section 63, Column C insert "S" if a subcontractor or "P" if a prime-contractor. The balance of section to be completed in accordance with form.
2) Billings for 3 fiscal years - insert year and amount.
3) Work in progress at the end of the past 3 fiscal years - same as above.

Section 64. Complete in accordance with form.

If additional space is required, please attach supplementary pages.
FNG-5085 CFMO Revised Nov 2011

ADDITIONAL QUALIFICATION REQUIREMENTS/INSTRUCTIONS
The following must be included with packet-use as check list

1. Copy of Florida State Contractor License.

2. Corporate Charter Number. See Section #7

3. Proof of Contractor's active office within 300 road miles of project. (Map Quest or like)

4. Contractor agreement to perform no less than 15% of project work itself, on company letterhead.

5. Resumes of experience for Project Manager and Project Superintendent.

6. At least three references with current contact name/numbers of projects completed within last 5 years.

7. Proof Contractor has successfully completed no less than two projects of similar size, scope, & complexity within the last three years, see Section 60. Complete as instructed, do not use other forms or alter our format. Additional information may be included with pictures.

8. Proof of registration in MyFlorida e-pro system on www.myflorida.com.

9. Financial statement- must be within the current year. See instruction Sections 3-53.

10. Letter of Confirmation from your bonding company stating that you can bond or have bonded with this company.

11. Confirmation that contractor has successfully completed a project that attained LEED Silver Certification Per Exhibit A.

EXHIBIT 3 CONTINUED

OWNER'S
EXPERIENCE QUESTIONNAIRE
AND
CONTRACTOR'S FINANCIAL STATEMENT

Project Title _____

Project Number_____

Location _____

Insert code number of trade or trades for which you are qualified to bid on the basis of previous experience and license(s)in accordance with attached detailed instructions, each in its respective box below:

1. ☐

2. ☐

3. Is your organization currently pre-qualified with any governmental agency?_____ If so, please list.

_____

_____

4. Have you, in the previous five years, been denied a contract award on which you submitted the low bid in competitive bidding, or been refused prequalification?

If so, please list and describe_____

_____

5. Have you, in the previous five years, ever not been able to achieve substantial or final completion within the number of contract specified calendar days?

If so, please list, provide Owner's POC with phone number, and describe project and problems encountered_____

_____

6. Submitted by_____

Address_____

Date_____

Phone_____

_____
POC Email Address

7. (Check below)

A Corporation	( ) Corporate Charter Number
A Co-partnership	( )
An Individual	( )
A Joint Venture	( )

The contractor acknowledges that this Experience Questionnaire and Financial Statement is made for the express purpose of introducing the Owner to whom it is submitted to award a contract to the contractor. Further, the contractor acknowledges that the agency may at its discretion, by which means the Owner may choose, determine the truth and accuracy of all statements made by the contractor herein. Please list any additional contact information of personnel available for corrections/actions pertaining to qualifications.

EXHIBIT 3 CONTINUED

SECTION "A". FINANCIAL STATEMENT
Reflecting financial position as of close of most recent operating year

As of_____
(Date)

ASSETS

8.	CASH*	$_____
	ACCOUNTS RECEIVABLE	
9.	From Government Contracts Completed	_____
10.	From Non-Government Contracts Completed	_____
11.	Claims included in 8 and 9 not yet approved or in litigation	$_____
12.	From Government Contracts in Process	_____
13.	From Non-Government Contracts in Process	_____
14.	Claims included in 11 and 12 not yet approved or in litigation	_____
15.	Retainage included in 11 and 12	_____
16.	Other** (list)	
	_____	_____
	_____	_____
	NOTES RECEIVABLE	
17.	Due within 90 days**	_____
18.	Due after 90 days**	_____
	INVESTMENTS	
19.	Listed securities - present market value	_____
20.	Unlisted securities - present value	_____
	BID DEPOSITS	
21.	Recoverable within 90 days	_____
22.	Recoverable after 90 days	_____
	ACCRUED INTEREST	
23.	Receivable on notes	_____
24.	Receivable on Investments	_____
25.	Other (list)	
	_____	_____
	_____	_____
26.	REAL ESTATE (BOOK VALUE OR MARKET, WHICHEVER IS LESS)	_____
27.	INVENTORIES (NOT INCLUDED IN RECEIVABLE BILLING AND AT PRESENT VALUE)	_____
28.	EQUIPMENT-NET BOOK VALUE (SUPPLY LIST BY COST, DEPRECIATION, NET BOOK VALUE)	_____
	OTHER ASSETS	
29.	Contract Costs in excess of Billings	$_____
30.	Cash Surrender Value of Life Insurance	_____
31.	Receivables from Officers and Employees	_____
32.	Other (list)	
	_____	_____
	_____	_____
	_____	_____

EXHIBIT 3 CONTINUED

33. TOTAL ASSETS $_____
*Do not include deposits for bids or other Guarantees
**Do not include receivables from officers and employees

ACCOUNTS PAYABLE
34. Due within l year _____
35. Due after l year _____

NOTES PAYABLE
36. Due within l year _____
37. Due after l year _____
38. Officers and Employees _____

39. TAXES PAYABLE _____

40. ACCRUED AND ACTUAL PAYROLL PAYABLE _____

41. MORTGAGES PAYABLE _____

OTHER LIABILITIES
42. Federal Income Tax Provision _____
43. Deferred Income _____
44. Other (list) _____
_____ _____
_____ _____

NET WORTH
45. (If individual proprietorship or partnership) _____

CAPITAL STOCK
46. Common Issued and Outstanding _____
47. Preferred Issued and Outstanding _____
48. Treasury Stock $_____

CAPITAL SURPLUS
49. Earned Surplus Prior Years _____
50. Earned Surplus Current Year _____

51. TOTAL LIABILITIES AND NET WORTH $_____

NOTE: IF ADDITIONAL SPACE IS REQUIRED, PLEASE NOTE AND ATTACH SCHEDULE TO STATEMENT

52. Dated this_____ of _____, _____
day month year

_____
Name of Organization

By: _____
Title

FEIN:_____

EXHIBIT 3 CONTINUED

SECTION 'B'. EXPERIENCE QUESTIONNAIRE

53. If a Corporation, answer this:

Date of incorporation_____

In what State_____

Name of Officers:

President_____

Vice President_____

Vice President_____

Secretary_____

Treasure_____

If a Partnership or Individual Proprietorship, answer this:

Date of organization_____

If a partnership, state whether partnership is general, limited association _____

Name and Address of Partners:

54. a. How many years has your organization been in the construction business?_____

b. How many years under your present business name?_____

c. How many years under previous business name? (List other names)

SUBSIDIARY OR AFFILIATED COMPANIES
IN WHICH PRINCIPALS HAVE FINANCIAL INTEREST

NAME AND ADDRESS OF SUBSIDIARY OR AFFILIATED COMPANIES	EXPLAIN IN DETAIL THE PRINCIPAL'S INTEREST IN THIS COMPANY AND NATURE OF BUSINESS

EXHIBIT 3 CONTINUED

NUMBER OF FULL TIME PERSONNEL WITHIN YOUR ORGANIZATION

	Current	Maximum	Minimum
55. a. Clerical Personnel	_____	_____	_____
b. Engineers & Architects	_____	_____	_____
c. Supervisors, Foremen, or Superintendents	_____	_____	_____
d. Skilled Employees including Technicians	_____	_____	_____
e. Unskilled Employees	_____	_____	_____
f. Estimators	_____	_____	_____
g. Total number of full time personnel	_____	_____	_____

56. WHAT IS THE CONSTRUCTION EXPERIENCE OF THE PRINCIPALS AND SUPERVISORY PERSONNEL OF YOUR ORGANIZATION? (Asterisk any personnel likely to be assigned to project being bid.)

PRINCIPAL'S NAME	TITLE	YEARS OF CONSTRUCTION EXPERIENCE	IN WHAT CAPACITY AND WITH WHOM
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

57.

SUPERVISORY PERSONNEL	TITLE	YEARS OF CONSTRUCTION EXPERIENCE	IN WHAT CAPACITY AND WITH WHOM
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

58. Within the previous three fiscal years has your organization or predecessor organizations ever failed to complete a project? If so, state name of organization and reason thereof.

_____

_____

59. Within the previous three fiscal years has your organization been involved in litigation? _____. If so, please list and explain nature and current status.

_____

EXHIBIT 3 Continued

60. List all contracts comparable in size and scope completed by your organization in the previous 36 months. (If more than 10, list the 10 most recently completed.) Projects MUST be listed in spaces below. Additional information may be attached if desired.

Name of Owner (Include POC & phone numbers)	A Name, Location & Description of Project	B Type of Work (Renovation or New Construction)	Name of Design Architect and/or Design Engineer (Include POC & phone numbers)	C. Original Contract Price / D. Final Contract Price	Completion Dates: E. Original	F. Revised	G. Actual

EXHIBIT 3 CONTINUED

With reference to all contracts completed by your organization in the previous fiscal years, as listed on Page 6, answer the following questions:

61. Explain differences in original contract price and in completion dates, if any.

62. Were there any liquidated damages, penalties, liens, defaults or cancellations imposed or filed against your organization?

    If so, list the name and location of the project, as shown in Column A, explain.

EXHIBIT 3 CONTINUED

STATUS OF UNCOMPLETED CONTRACTS

As of_____
(DATE)

63. Give full information about all of your present contracts. In Column C insert "S" if a subcontractor or "P" if a prime contractor, whether in progress or awarded but not yet begun; and regardless of with whom contracted.

A	B	C	D	E
Project Description Location & Owner	Design Architect And/Or Design Engineer	Total Amount of Your Contract (Or Subcontract)	Amount In Column C Sublet To Others	Uncompleted Amount of Contract
Total				

COMPLETE THE FOLLOWING:

Net Total Billings for Previous 3 Fiscal years:

Year Dollar Amount

_____ $_____

_____ $_____

_____ $_____

Average Backlog for Previous 3 Fiscal Years: (Estimated total value of uncompleted work on outstanding contract)

Year Dollar Amount

_____ $_____

_____ $_____

_____ $_____

EXHIBIT 3 CONTINUED

COMPANY LETTERHEAD

64. Attesting to liquid assets.

DATE

RE: PROJECT TITLE AND NUMBER

"I hereby certify that the liquid assets of this firm have not decreased by more than ten percent in the time that has passed between the closing period of the financial statement attached, and the date on which our submittal was provided"

-S-
CORPORATE OFFICER'S SIGNATURE

EXHIBIT 4

PROPOSAL FORM

SUBMIT ORIGINAL PROPOSAL FORM IN DUPLICATE ON CONTRACTOR'S LETTERHEAD AND INCLUDE BUSINESS NAME, ADDRESS, FEDERAL ID NUMBER, TELEPHONE, FACSIMILE AND SIGNATURE

Note: NO conditional, incomplete, unsigned, undated, ambiguous, or improper bids/proposals will be accepted.

DATE: _____

TIME: _____

TO: State of Florida, Department of Military Affairs
Attention: Construction & Facility Management Office (Contract Management Branch)
2305 State Road 207
Saint Augustine, Florida 32086

Gentlemen:

The undersigned, hereinafter called "Bidder" having visited the site of the proposed project and familiarized himself with the local conditions, nature, and extent of the work, and having examined carefully any drawings or specifications, the Form of Agreement, and other Contract Documents with the Bond Requirements, therein, proposes to furnish all labor, materials, equipment, and other items, facilities, and services for the proper execution and completion of **Project Number 120193,Live Fire Shoot House** , in full accordance with any drawings and specifications prepared by Ebert Norman Brady Architect, in full accordance with the advertisement for bids, Instruction to Bidders, Agreement, and all other documents relating thereto on file in the Construction & Facility Management Office (CFMO) and if awarded the contract, to complete the said work within the time limit specified for the following bid price:

Base Bid: $ _____

Add/Alt #1 Ballistic Material on Catwalk Beams $_____

Add/Alt #2 Parking Area - Lighting/Electrical $_____

Enclosed is certified check, cashier's check, treasurer's check, bank draft, or Bid Bond in the amount of not less than five percent of the Bid, payable to the Owner as a guarantee for the purpose set out in Instructions to Bidders. **(If the bid amount is equal to or less than $100,000 this sentence should be left out).**

MARK ENVELOPES: ATTN: SEALED BID for Project Number120193, LFSH

ADDRESSED TO: Department of Military Affairs, ATTN: CFMO-Contract Management Branch, 2305 State Road 207, St. Augustine, Florida 32086

The Bidder hereby agrees that:

a. The above proposal shall remain in full force and effect for a period of 40 calendar days after the time of the opening of this proposal and that the Bidder will not revoke or cancel this proposal or withdraw from the competition within the said 40 calendar days.

b. In the event the contract is awarded to this Bidder, he will abide by and fulfill all requirements as specified in the Non-Technical Specifications provided with the Invitation to Bid.

c. In the event the contract is awarded to this Bidder, he will enter into a formal written Agreement with the Owner in accordance with the accepted bid within 10 calendar days after said contract is submitted to him and, (if requirement is not deleted per Section C-2 of the Conditions of the Contract), will furnish to the Owner a Contract Performance Bond and a Labor and Material Payment Bond with good and sufficient sureties, satisfactory to the Owner, in the amount of 100% of the accepted bid, the form of which is shown by Exhibits 7 and 8 of the Conditions of the Contract and terms of which shall fully comply with Section 255.05, Florida Statutes. The Bidder further agrees that in the event of the Bidder's default or breach of any of the agreements of this proposal, the said bid deposit shall be forfeited as liquidated damages.

d. In the event the contract is awarded to this Bidder, he will not commence any work in connection with the contract until he has obtained all insurance as specified in the Non-Technical Specifications, and such insurance has been approved by the Owner, nor shall the contractor allow any subcontractor to commence work on his subcontract until all similar insurance required of the subcontractor has been so obtained and approved by Owner. All insurance policies shall be with insurers qualified to do business in Florida through an authorized licensed Florida Resident Agent. The insurance requirements shall be completed in a timely manner in order not to delay the construction schedule.

e. In the event the contract is awarded to this Bidder, he will (if requested by Owner) complete and submit a preliminary and final Bid Breakout Form supplied by the Department of Military Affairs, Construction & Facility Management Office.

Acknowledgement is hereby made that this proposal includes required permit fees as directed in the Non-Technical Specifications.

Acknowledgement is hereby made of receipt of the following addenda issued during the bidding period.

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

Florida Construction Industries Licensing Board Certification.

_____ _____

(Name of Holder) (Certificate No.)

In witness whereof, the Bidder has hereunto set his signature and affixed his seal this _____ day of _____
(Month) (Year)

(SEAL)

By: _____ Address: _____

_____

Title: _____ _____

Company: _____ Telephone No: _____

Tax ID No: _____ Facsimile No: _____

E-mail: _____

EXHIBIT 5
LIST OF SUBCONTRACTORS

(To be submitted in duplicate on the Bidder's letterhead and attached to Contractor's proposal.)

DATE: _____

THIS LIST IS ATTACHED TO, AND IS AN INTEGRAL PART OF THE BID SUBMITTED BY:

_____

_____

_____

FOR THE CONSTRUCTION OF: PROJECT NUMBER: 120193

PROJECT NAME & LOCATION: Live Fire Shoot House, Camp Blanding Joint Training Center, Starke, FL

THE UNDERSIGNED, HEREINAFTER CALLED "BIDDER", LISTS BELOW THE NAME OF EACH SUBCONTRACTOR WHO WILL PERFORM THE PHASES OF THE WORK INDICATED. FAILURE OF THE BIDDER TO SUPPLY SUFFICIENT INFORMATION TO ALLOW VERIFICATION OF THE CORPORATE AND DISCIPLINE LICENSE STATUS OF THE SUBCONTRACTOR MAY DEEM THE BID AS BEING NON-RESPONSIVE.

SUBCONTRACT	NAME OF SUBCONTRACTOR
1. Concrete	_____ (Name) _____ (Telephone No.) _____ (Sub License #.)
2. Masonry	_____ (Name) _____ (Telephone No.) _____ (Sub License #.).)
3. Roofer	_____ (Name) _____ (Telephone No.) _____ (Sub License #.).)
4. Doors	_____ (Name) _____ (Telephone No.) _____ (Sub License #.).)
5. Windows	_____ (Name) _____ (Telephone No.) _____ (Sub License #.)
6. Interior Framing	_____ (Name) _____ (Telephone No.) _____ (Sub License #.)

7. Ceramic Tile

(Name)

(Telephone No.) (Sub License #.)

8. Painting

(Name)

(Telephone No.) (Sub License #.)

9. Shooting Range Equipment Manufacturer

(Name)

(Telephone No.) (Sub License #.)

10. Bullet Resistant Fiberglass Manufactuer

(Name)

(Telephone No.) (Sub License #.)

11. Metal Building Manufacturer

(Name)

(Telephone No.) (Sub License #.)

12. Metal building Erector

(Name)

(Telephone No.) (Sub License #.)

13. Plumbing

(Name)

(Telephone No.) (Sub License #.)

14. HVAC

(Name)

(Telephone No.) (Sub License #.)

15. Electrical

(Name)

(Telephone No.) (Sub License #.)

16. Sitework

(Name)

(Telephone No.) (Sub License #.)

By_____ (Signature)

EXHIBIT 6

AGREEMENT BETWEEN OWNER AND CONTRACTOR

This Agreement between Owner and Contractor made this _____day of _____in the year Two Thousand Eleven.

MCCA Number: 0
Project Number 0 Project Location: 0
Project Name: 0
AMSCO: 0 FUNDING: 0

BY AND BETWEEN: The Department of Military Affairs (DMA), 2305 State Road 207, St. Augustine, FL 32086, hereinafter called the OWNER, and

Contractor Name: 0
Address: 0 0
POC: 0 FEIN: 0
Phone/Fax: 0 Email: 0

hereinafter called the CONTRACTOR. The Owner and Contractor agree as set forth below:

ARTICLE 1. THE CONTRACT DOCUMENTS - The Contract Documents consist of the Agreement, the Contractor's proposal, conditions of the Contract (General, Supplementary and other conditions), Specifications, Drawings, all Addenda issued prior to execution of the Agreement, the Non-Technical Specifications as provided, and all Modifications to the above, issued subsequent thereto. These form the Contract, and all are as fully a part of the Contract as if attached to this Agreement or repeated herein. An emumeration of the specifications, drawings, and addenda is as follows:

Specifications and Drawings prepared By: 0
Address: 0 0
POC: 0 Phone/Fax 0
Email: 0

Addenda:

In the event of conflict in the provisions of said Contract Documents, the provisions of the basic Agreement which immediately precedes the signatures of the Parties shall control over the Specifications, the General Conditions and Supplementary General Conditions; and the Supplementary General Conditions shall control over the General conditions of said Stardard Form A201 of the American Institute of Architects.

ARTICLE 2. THE WORK - The Contractor shall perform all work required by the Contract Documents for items as specified in the Scope of Work. No alteration of the original scope shall be accepted in the Bidder's proposal unless approved in writing by the DMA.

ARTICLE 3. CONTRACT SUM - The Owner shall pay the Contractor for the performance of the work, subject to additions and deductions by Change Order as provided in the Conditions of the Contract, in current funds, the

Contract Sum: 0
Contract Amount: $0.00
Days in Contract: 0

ARTICLE 4. FUNDING - The State of Florida's performance and obligation to pay under this contract is contingent upon availability of funding and an annual appropriation by the State Legislature.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement the day and year first written above.

CONTRACTOR		OWNER	
APPROVED:		APPROVED:	
By Corporate President's Signature	Date Signed	By Owner's Signature	Date Signed
ATTEST:		AS WITNESSED:	
By Corporate Secretary's Signature	Date Signed	By Witness' Signature	Date Signed
AS WITNESSED:		APPROVED AS TO FORM AND LEGALITY	
By Witness' Signature	Date Signed	By Office of the General Counsel	Date Signed

CORPORATE SEAL:

EXHIBIT 7

PERFORMANCE BOND
THIS BOND IS ISSUED SIMULTANEOUSLY WITH LABOR AND MATERIAL
PAYMENT BOND IN FAVOR OF THE OWNER CONDITIONED ON THE FULL AND FAITHFUL
PERFORMANCE OF THE CONTRACT

KNOW ALL MEN BY THESE PRESENT THAT: as Principal, hereinafter called Contractor, and, as Surety, hereinafter called Surety, are held and firmly bound unto the Department of Military Affairs as Obligee, hereinafter called Owner, in the amount of $_____for the payment whereof Contractor and each individual named Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has by written agreement, dated_____, entered into a contract with the Owner for **(project title)**___, Project Number - _____, in accordance with Drawings and Specifications prepared by_____ which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Contractor shall promptly and faithfully perform said Contract and all obligations thereunder, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the Owner.

Whenever Contractor shall be, and declared by Owner to be in default under the Contract, the Owner having performed Owner's obligations thereunder, the surety may promptly remedy the default, in accordance with Section 255.05, Florida Statutes, or shall promptly

1) Complete the Contract in accordance with its terms and conditions, or 2) Obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible Bidder or, if the Owner elects, upon determination by the Owner and the Surety jointly of the lowest responsible Bidder, arrange for a Contract between such Bidder and Owner, and make available as work progresses (even though there should be a default or a succession of defaults under the Contract or Contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the Contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the Contract price", as used in this paragraph, shall mean the total amount payable by Owner to Contractor under the Contract and any amendments thereto, less the amount properly paid by Owner to Contractor.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the Owner named herein or the heirs, executors, administrators or successors of the Owner. The time within which the Owner can institute an action on this bond against the Surety or Contractor or shall be determined by the pertinent Florida Statutes.

SIGNED AND SEALED THIS (Date)

_____	_____
(Signature of Witness)	(Signature of Contractor) (Seal)
_____	_____
(Signature of Witness)	(Signature of Attorney-In-Fact) (Seal)
	_____
	(Type Name)
_____	_____
(Signature of Witness)	(Signature of Florida Resident Agent) (Seal)
	_____
	(Type Name & Social Security Number)

Power of Attorney attached hereto.

EXHIBIT 7 CONTINUED

NOTES CONCERNING SURETY AND EXECUTION

A. SURETY COMPANY REQUIREMENTS

To be acceptable to the Owner, a Surety Company shall comply with all of the requirements of Article B-12 of the Conditions of the Contract.

B. EXECUTION OF BOND

1. Enter the Surety Company's name and address on each copy of the Bond in the space provided.

2. Enter the date shown on page 1 of the Agreement in the space provided on each copy of the Bond.

3. Enter the date of execution on each copy of the Bond in the space provided. This date must be the same as the date shown on the Agreement.

4. Have each copy of the Bond signed by the same person that signed the Agreement on behalf of the Contractor. Type in that person's name and title in the place provided on each copy of the Bond, and have one other individual witness that person's signature on each copy of the Bond. Also, have the Contractor's Corporate Seal affixed to each copy of the Bond beside that person's signature (No Facsimiles are acceptable).

5. Have each copy of the Bond signed by the person authorized to sign on behalf of the Surety Company. Type in that person's name in the place provided on each copy of the Bond and have one other individual witness that person's signature on each copy of the Bond. Also, have the Surety Company's Corporate Seal affixed to each copy of the Bond beside that person's signature (No Facsimiles are acceptable).

6. Have each copy of the Bond signed by a Florida Resident Agent (Reference Chapters 624.425 and 624.426 of the Florida Statutes). Type in that person's name and Social Security number in the place provided on each copy of the Bond and have one other individual witness that person's signature on each copy of the Bond. This may be the same person indicated in B.5 above, if this person is a Florida Resident Agent and is also authorized to sign on behalf of the Surety Company as Attorney-In-Fact.

7. Each copy of the Bond must have a Power of Attorney attached indicating that the person in B.5 above is authorized to sign on behalf of the Surety Company.

8. Each copy of the Power of Attorney must have the Surety Company's Corporate Seal and a Notary Seal either manually affixed or they may utilize facsimile reproductions of the same.

9. If the date of execution of the Power of Attorney is not the same as the date shown on the Agreement, then the Power of Attorney must be certified to still be in effect on the date shown on page 1 of the Agreement.

10. If the Bond is being backed by the Small Business Administration, then a certified true and correct copy of the Surety Bond Guarantee Agreement, SBA Form 990, must be attached to each copy of the Bond.

EXHIBIT 8

LABOR AND MATERIAL PAYMENT BOND
THIS BOND IS ISSUED SIMULTANEOUSLY WITH PERFORMANCE BOND IN FAVOR OF THE OWNER CONDITIONED ON THE FULL AND FAITHFUL PERFORMANCE OF THE CONTRACT

KNOW ALL MEN BY THESE PRESENTS: that as Principal, hereinafter called Contractor, and, as Surety, hereinafter called Surety, are held and firmly bound unto the **Department of Military Affairs** as Obligee, hereinafter called Owner, for the use and benefit of claimants as hereinbelow defined, in the amount of $_____for the payment whereof Contractor and each individual named Surety bind themselves, their heirs, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has by written agreement dated _____, entered into a contract with Owner for (project title), Project Number _____ in accordance with drawings and Specifications prepared by _____ which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

THE CONDITIONS OF THIS BOND ARE AS FOLLOWS:

1. Contractor shall promptly make all payments owing when due to all persons who are defined in Section 713.01, Florida Statutes, whose claims derive directly or indirectly from the prosecution of the work provided for in the contract, then this bond is void; otherwise, it remains in full force and effect.

2. Each said claimant shall have a right of action against the Contractor and Surety for the amount due him. No such action shall subject the Obligee to any cost, expense, loss or damage, and Contractor shall promptly pay Obligee for the full measure of all cost, expense, loss, damage, and attorneys fees sustained by Obligee as a result of any default by Contractor under the contract.

3. Pursuant to Section 255.05, Florida Statutes, a claimant, except a laborer, who is not in privity with the Contractor and who has not received payment for his labor, materials, equipment or supplies shall, within forty five (45) days after beginning to furnish labor, materials, equipment or supplies for the prosecution of the work furnish the Contractor with a notice that he intends to look to the bond for protection. A claimant who is not in privity with the Contractor and who has not received payment for his labor, materials, equipment or supplies shall, within ninety (90) days after completing performance of the labor or after completing delivery of the materials, equipment or supplies, deliver to the Contractor and to the Surety written notice of the performance of the labor or delivery of the materials, equipment or supplies and of the nonpayment. No action for the labor, materials, equipment or supplies may be instituted against the Contractor or the Surety after one year from the date performance of the labor is completed or delivery of the materials, equipment or supplies is completed.

4. An action against the Surety or the Contractor or both, may be brought in the county in which the public building or public work is being constructed or repaired or in any other place authorized by the provisions of Chapter 47, Florida Statutes.

5. The amount of this bond shall be changed only to the extent that the Contract Sum is changed in accord with applicable provisions of the Contract for Construction.

6. Neither any change in or under the contract documents, nor any compliance or noncompliance with any formalities provided in the contract or the change shall relieve the Surety of its obligations under this bond.

7. This bond incorporates by reference all the requirements of Section 255.05, Florida Statues, including, but not limited to, all notice and time limitation provisions therein. This bond shall be construed and deemed a statutory bond issued pursuant to Section 255.05, Florida Statutes, and not a common law bond.

SIGNED AND SEALED THIS (Date).

(Signature of Witness)	(Signature of Contractor) (Seal)
(Signature of Witness)	(Signature of Attorney-In-Fact) (Seal)
	(Type Name)
(Signature of Witness)	(Signature of Florida Resident Agent) (Seal)
Power of Attorney attached hereto.	(Type Name & Social Security Number)

EXHIBIT 8 CONTINUED

NOTES CONCERNING SURETY AND EXECUTION

A. SURETY COMPANY REQUIREMENTS

To be acceptable to the Owner, A Surety Company shall comply with all of the requirements of Article B-12 of the Conditions of the Contract.

B. EXECUTION OF BOND

1. Enter the Surety Company's name and address on each copy of the Bond in the space provided.

2. Enter the date shown on page 1 of the Agreement in the space provided on each copy of the Bond.

3. Enter the date of execution on each copy of the Bond in the space provided. This date must be the same as the date shown on the Agreement.

4. Have each copy of the Bond signed by the same person that signed the Agreement on behalf of the Contractor. Type in that person's name and title in the place provided on each copy of the Bond, and have one other individual witness that person's signature on each copy of the Bond. Also, have the Contractor's Corporate Seal affixed to each copy of the Bond beside that person's signature (No Facsimiles are acceptable).

5. Have each copy of the Bond signed by the person authorized to sign on behalf of the Surety Company. Type in that person's name in the place provided on each copy of the Bond, and have one other individual witness that person's signature on each copy of the Bond. Also, have the Surety Company's Corporate Seal affixed to each copy of the Bond beside that person's signature (No Facsimiles are acceptable).

6. Have each copy of the Bond signed by a Florida Resident Agent (Reference Chapters 624.425 and 624.426 of the Florida Statutes). Type in that person's name and Social Security number in the place provided on each copy of the Bond and have one other individual witness that person's signature on each copy of the Bond. This may be the same person indicated in B.5 above, if this person is a Florida Resident Agent and is also authorized to sign on behalf of the Surety Company as Attorney-In-Fact.

7. Each copy of the Bond must have a Power of Attorney attached indicating that the person in B.5 above is authorized to sign on behalf of the Surety Company.

8. Each copy of the Power of Attorney must have the Surety Company's Corporate Seal and a Notary Seal either manually affixed or they may utilize facsimile reproductions of the same.

9. If the date of execution of the Power of Attorney is not the same as the date shown on the Agreement, then the Power of Attorney must be certified to still be in effect on the date shown on page 1 of the Agreement.

10. If the Bond is being backed by the Small Business Administration, then a certified true and correct copy of the Surety Bond Guarantee Agreement, SBA Form 990, must be attached to each copy of the Bond.

EXHIBIT 9

FINAL RECEIPT OF PAYMENT AND RELEASE OF ALL LIENS & CLAIMS

Contract Number: Date of Contract Award:

Project No.: Project Title:

KNOW ALL MEN BY THESE PRESENTS: In consideration of the premise and total sum of **$**_____ & 00/100, lawful money of the United States of America, State of Florida (hereinafter called the "Owner") of which of $_____& 00/100 of the total amount has been paid by the Owner under the above noted contract, the undersigned contractor does hereby:

1. ACKNOWLEDGE that he/she has been PAID IN FULL all sums due for work and materials contracted, or done by his/her subcontractors, material vendors, equipment and fixture suppliers, agents and employees, or otherwise in the performance of the work called for by the aforesaid contract and all modifications or extras or additions thereto, for the construction of said project or otherwise.

2. Remise, release and fully, finally and forever discharge the Owner, its officers, agents and employees of and from all liabilities, obligations and claims whatsoever in law and equity under, arising out of or by virtue of said contract, and from any and all suites, actions, claims and demands for payment for work performed or materials supplied by subcontractor in accordance with the requirements of the above referenced contract.

3. Represent that all of his/her employees, subcontractors, material vendors, equipment and fixture suppliers and everyone else has been paid in full all sums due them to date, or any of them, in connection with performance of said work, or anything done or omitted by them or any of them in connection with the construction of said improvements, or otherwise.

IN WITNESS WHEREOF, this release has been executed this _____ day of _____ 2010.

FIRM NAME: _____

_____ BY: _____
(First Witness Signature) (Signature)

_____ TITLE: _____
(Second Witness Signature)

CERTIFICATE

I, _____, certify that I am the _____ of the
(Type Name of Certifier below) (Position)
corporation named as contractor in the foregoing release; that _____ who signed
(Type Name of Signature for Release above)
said release on behalf of the contractor was then _____ of said corporation; that
(Title)
said release was duly signed for and in behalf of said corporation by authority of its governing body and is within the

scope of its corporate powers.

Corporate Seal or

Notary Seal

_____
(Signature)

EXHIBIT 10

Department Of Military Affairs
Construction & Facility Management Office
CERTIFICATE OF PARTIAL PAYMENT

CFMO Transmittal No.: _____

Contractor Name:	0	Pay Request No:	
Contractor Address:	0	For Period Ending:	
	0	Project Name:	0
POC / Telephone Number:	0	FEIN Number:	0
Facsimile Number:	0	Notice to Proceed Date:	
State Project Number:	0	Substantial Completion Date:	
Federal Project Number:	N/A	Final Completion Date:	

	ADDITIONS $	DEDUCTIONS $		
			Original Contract Sum	$0.00
			Change Orders (Net)	$0.00
Change Orders approved			Contract Sum to Date	$0.00
In previous months by			**Completed To Date**	
Owner – TOTAL			**Materials Stored**	
			Total Completed & Stored	$0.00
			Total Retainage 10%	$0.00
Subsequent Change Orders				
for this month			Total Earned Less Retainage	$0.00
Number / Approved (Date)			**Less Previous Certificates**	
			Less Material Purchased	
			Directly By Owner	$0.00
TOTALS	$0.00	$0.00	**TOTAL THIS CERTIFICATE**	**$0.00**
			Balance To Finish Incl. Retainage	$0.00
Net Change by Change Orders $	$0.00		Retainage REFUND Requested	

SHOW INDIVIDUAL MBE PAYMENTS SEPARATELY ON CONTRACTOR'S MINORITY BUSINESS ENTERPRISES STATUS REPORT OF PARTIAL PAYMENT

TOTAL AMOUNT PAID THIS CERTIFICATE TO MBE SUBCONTRACTORS: $0.00

CERTIFICATION BY THE CONTRACTOR: According to the best of my knowledge and belief, I certify that all items and amounts shown on the face of this application are true and correct, that all work has been performed and material supplied in full accordance with the terms and conditions of the Contract, and that all materialmen, laborers and subcontractors, as defined in Chapter 713.01, Florida Statutes, have been paid the amounts due them out of any previous payments made to the contractor by the Owner. Further, I agree to promptly pay each materialman, laborer and subcontractor, as defined in Chapter 713.01, Florida Statutes, upon receipt of payment from the Owner, out of the amount paid to me on account of such materialman's, laborer's or subcontractor's work, the amount to which said materialman, laborer and subcontractor is entitled, reflecting the percentage actually retained, if any, from payments to myself on account of such materialman's, laborer's and subcontractor's work.

Signature _____ Printed Name, Title _____ Date _____

CERTIFICATION BY THE ARCHITECT / ENGINEER: I certify that I have checked and verified this Partial Payment Application; that to the best of my knowledge and belief, the above application is a true and correct statement of the value of the work performed and the materials suitably stored on the site; that all work and materials included in this Certificate have been inspected by me or by my authorized assistants; that all work has been performed and material supplied in full accordance with the terms of this Contract; and I approved for payment the amount noted above.

Signature _____ Printed Name, Company _____ Date _____

I certify by evidence of my signature below the above information is true and correct; the goods and services have been satisfactorily received and payment is now due. I understand that the office of the State Chief Financial Officer reserves the the right to require additional documentation and/or to conduct periodic post-audits of any agreements.

0 0
Contract Manager Name (Printed) Telephone Number

Contract Manager Signature Date

APPROVED FOR PAYMENT - SERVICES RECEIVED

Project Manager: 0
Directorate: 0
Telephone Number: 0
Date:
Signature:
Amount Certified:

DMA use only--REPLACES FORM DBC 5025, ENG 93 and AIA Document G702

FNG Form 4012-E, JUL 10

EXHIBIT 10 CONTINUED

Chapter 713.01, Florida Statues, defines Laborers, Materialmen and Subcontractors as follows:

(1) "Laborer" means any person other than an architect, landscape architect, engineer, land surveyor, and the like who, under properly contract, personally performs on the site of the improvement labor or services for improving real property authorized and does not furnish materials or labor service of others.

(2) "Materialman" means any person who furnishes materials under contract to the owner, contractor, subcontractor, or sub-subcontractor on the site of the improvement or for direct delivery to the site of the improvement or for specially fabricated materials, off the site of the improvement for the particular improvement, and who performs no labor in the installation thereof.

(3) "Subcontractor" means a person other than a materialman or laborer who enters into a contract with a contractor for the performance of any part of such contractor's contract.

EXHIBIT 11- SCHEDULE OF CONTRACT VALUES FORM

CONTRACTOR: _____ PAGE: _____ OF _____

PROJECT #: _____ PAY REQUEST NO.: _____ DATE: _____

PROJECT NAME: _____ PROJECT MGR: _____

LOCATION: _____ SCHEDULED SUB. COMPL. DATE: _____

TOTAL WORK COMPLETED THIS PERIOD AS OF DATE: _____ FUNDING TYPE: FARP TRUST FUND FEDERAL R-POM

A		B		C	D	E	F	G		H	I
Item Number		Description of Work		Scheduled Value	Work Completed		Materials Stored (Not in D or E)	Total Completed & Stored to Date (D+E+F)	Percentage Completed & Stored (G:C)	Balance to Finish (C-G)	Retainage (10%)
					Previous Application Columns D+E	This Period					
		PAGE TOTAL:		$0.00	$0.00	$0.00	$0.00	$0.00	N/A	0.00	0.00

EXHIBIT 11 CONTINUED

CONTRACTOR: _____ PAGE: _____ OF _____

PROJECT #: _____ PAY REQUEST NO.: _____ DATE: _____

PROJECT NAME: _____ PROJECT MGR: _____

LOCATION: _____ SCHEDULED SUB. COMPL. DATE: _____

TOTAL WORK COMPLETED THIS PERIOD AS OF DATE: _____ FUNDING TYPE: FARP TRUST FUND FEDERAL R-POM

A		B		C	D	E	F	G		H	I
Item Number		Description of Work		Scheduled Value	Work Completed		Materials Stored (Not in D or E)	Total Completed & Stored to Date (D+E+F)	Percentage Completed & Stored (G:C)	Balance to Finish (C-G)	Retainage (10%)
					Previous Application Columns D+E	This Period					
		PAGE TOTAL:		0.00	0.00	0.00	0.00	0.00	N/A	0.00	0.00
		GRAND TOTAL:		$0.00	$0.00	$0.00	$0.00	$0.00	0.00	$0.00	$0.00

EXHIBIT 12

State of Florida,
Department Of Military Affairs
Construction & Facility Management Office

CONTRACTOR'S AFFIDAVIT OF CONTRACT COMPLETION

PROJECT NO: _____ PROJECT MANAGER: _____

PROJECT NAME: _____

CONTRACTOR: _____

CONTRACT DATE: _____ CONTRACT AMOUNT: _____

CONTRACTOR'S AFFIDAVIT

I solemnly swear and affirm; that the work under the above named contract and all amendments thereto have been completed in accordance with the requirements of said contract; that all costs incurred for equipment, materials, labor, and services against the project have been paid; that no liens have been attached against the project; that no suits are pending by reason of work on the project under the contract; that all Workmen's Compensation claims are covered by Workmen's Compensation insurance as required by law; that all public liability claims are adequately covered by insurance, and that the Contractor shall save, protect, defend, indemnify, and hold the Owners harmless from and against any and all claims which arise as a direct or indirect result of any transaction, event or occurrence related to performance of the work completed under said contract.

Company: _____

Name: _____

Title: _____

Date: _____

Company Seal

STATE OF _____
COUNTY OF _____

The foregoing instrument was acknowledged before me this (date), _____ , by

_____ of _____
(name & title of officer or agent) (name of corporation acknowledging)

a _____ corporation, on behalf of the corporation. He/She is personally known
(state/place incorporated)

to me or has produced _____ as identification.
(type of identification)

_____
(Signature of person taking acknowledgment)

_____
(Name typed printed or stamped)

_____

EXHIBIT 12a

A/E CERTIFICATE OF CONTRACT COMPLETION

PROJECT NO:_____
PROJECT TITLE:_____
CONTRACTOR:_____
CONTRACT DATE:_____ DATE OF FINAL COMPLETION:_____

CERTIFICATE OF ARCHITECT/ENGINEER

I CERTIFY: That the work under the above contract has been satisfactorily completed on the date set forth in accordance with the terms of the contract; that the contractor has submitted his sworn affidavit as evidence that he has paid all labor, materials and other charges against the project in accordance with the terms of the contract.

A/E Firm Name: _____ Date_____
By_____

TO BE COMPLETED BY ARCHITECT/ENGINEER

THROUGH THE SUBSTANTIAL COMPLETION PHASE	DATE	DAYS		
1. Notice to Proceed (N.T.P.)	_____	_____		
2. Time Specified in Original Contract for Substantial Completion (S.C.)	XXXXXX	_____		Liquidated Damages to be completed by the Dept. of Military Affairs
3. Extension Granted by Change Orders (Days Between Original Contract S.C. and Final Contract S.C.)	XXXXXX	_____		
4. Total Days Allowable to Substantial completion (Add Lines 2 and 3)	XXXXXX	_____		
5. Project Substantially Completed as Certified by A/E (Total Days from N.T.P. through Date certified by A/E)	_____	_____		
6. Substantial Completion Overrun (Subtract Line 4 from 5 and Enter Overrun)	_____	_____	@$	Per Day=$

THROUGH THE FINAL COMPLETION PHASE

1. Time Specified in Contract, Between Substantial & Final Completion	XXXXXX	_____		
2. Extensions Granted by Change Orders (Days Between S.C. & Final Completion	XXXXXX	_____		
3. Total Days Allowable Between Substantial & Final Completion (Add Lines 1 & 2)	XXXXXX	_____		
4. Date Actually Completed and Total Days Between Actual S.C. & Date Certified by A/E as Actually being Finally Completed.	_____	_____		
5. Final Completion Overrun (Subtract Line 3 & 4 and Enter Overrun)	XXXXXX	_____	@$	Per Day=$

TOTAL LIQUIDATED DAMAGES $ _____

Project Director_____ Date_____
Project Development Manager_____ Date_____

EXHIBIT 13

PERCENTAGE FACTOR TO BE USED IN SECTION C-33 OF THE CONSTRUCTION CONTRACT CONDITIONS

The following graph lists dollar amounts, percentages and types of construction. The proper percentage shall be used to determine compensation for (b), in Section C-33 on the "Conditions of the Contract", "Changes in the Work", subparagraph “Delays & Extensions of Time”.

In order to select the proper percentage, the user should find the estimated construction amount on the top horizontal scale, drop to the sloped line, and read horizontally the applicable percentage on either the right hand or left hand vertical scale, depending on the type of construction project.

AMOUNT IN DOLLARS OF CONTRACT CONSTRUCTION COST

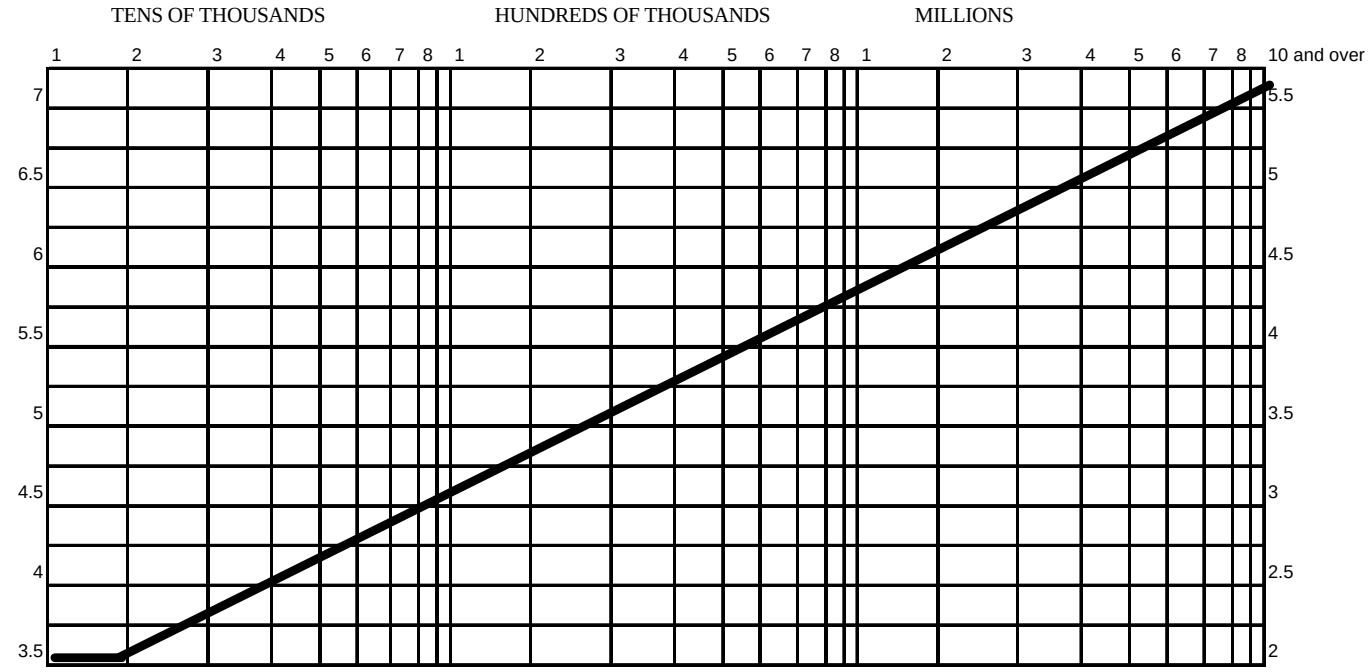

EXHIBIT 14 – PROJECT SIGN

(PROJECT NUMBER)

(NAME OF PROJECT)

(NAME OF INSTITUTION)

STATE OF FLORIDA

BEING CONSTRUCTED BY
FLORIDA DEPARTMENT OF MILITARY AFFAIRS

RICK SCOTT
GOVERNOR

CONSTRUCTION AND FACILITY MANAGEMENT OFFICE
LIEUTENANT COLONEL MARK M. WIDENER

FOR

FLORIDA DEPARTMENT OF MILITARY AFFAIRS

EBERT NORMAN BRADY ARCHITECTS
1361 13 TH AVENUE SOUTH SUITE 230
JACKSONVILLE BEACH, FLORIDA 32250
PHONE 904-241-9997
WWW.ENBARCHITECTS.COM
AA00002986

(NAME OF CONTRACTOR)
(ADDRESS OF CONTRACTOR)

Revised May 2011

EXHIBIT 15

CONTRACTOR'S Status Report of Minority & Disabled Vetran's Business Enterprise
Report of Partial Payment

EXHIBIT 15

Contractor's Name: 0

Address: 0

City, State and Zip: 0

Contract Amount: $0.00

MBE Participation Amount: MBE %

DV Participation Amount DV %

CFMO Project Name: 0

CFMO Project No.: 0

Date:

Draw Amount:

Draw Request #:

Minority Business Enterprise (MBE)

Full Name of Minority Business Enterprise:	Description of Trade or Service	MBE Status Hispanic Woman African American Asian/Other	State Certified MBE Yes/No	MBE Contract Amount	Amount Paid to MBE This Draw	Total Paid This Contract To Date	Contract Balance Due	Project Type Local Government or State Project
TOTALS							$	

** Certified MBE: H - African American I - Hispanic J- Asian/Hawaiian K - Native American M - American Woman W - Servic Disabled Vetran Business

Non-Certified MBE: N - African American O--Hispanic P - Asian/Hawaiian Q - Native American R - American Women Y - Service-Disabled Veteran Business

Service Disabled Vereran's (DV) Business Enterpirse

*Service Disabled Vereran's Business Enterprise	Description of Trade or Service	Certified DV Business "W" (Yes or NO)	Non-Certified DV Business MBE Yes/No	DV Contract Amount Amount $	Amount Paid to DV This Draw	Total Paid on This Contract To Date	Contract Balance Due	Project Type Local Government or State Project
TOTALS							$	

Include this form with DMA FNG 4013E

*Include all subcontractors and material handlers.

MBE Form dtd 4/2011

EXHIBIT 15

EXHIBIT 16 – PROPOSED CHANGE ORDER SUMMARY FORM

Contractor Name
Address

POC
Phone: *Fax:*

[1] **Proposed Change Order #**

[2] C/O Date:

[3] C/O Title:

Project No.:

Project Name:

Architect (A/E):

CFMO POC:[A]
Address: 2305 State Road 207
St. Augustine, FL 32086
Phone:
Fax: (904) 823-0189

A/E POC:
Address:

Phone:
Fax:

Item	Description	[5] Net Amount
0001	[4] Additional Charge For: (List credit allowances here--if applicable) See attached subcontractor back-up documentation for reference [B]	
0002	General/Prime Contractors Overhead & Profit	
	TOTAL:	

[7] Additional Days Requested by Contractor:

Days Approved by CFMO:

SIGNATURES:

	[8] Title	[9] Date
Contractor Recommendation		
A/E Recommendation (if required by CFMO)	Title	Date
CFMO Project Manager Approval	Title	Date

FUNDING: RM Approval: Source:
Account: Org Code:

INSTRUCTIONS FOR FNG FORM 4016-E

1. Enter Proposed Change Order Number (kept in sequential order by General/Prime Contractors).
2. Date Change Order is being submitted to A/E or CFMO for recommendation and approval.
3. Enter Title for Change Order (i.e., Unforeseen Conditions, Under Ground Stumps, Dishwasher Hood, etc.)
4. Below Additional Charge For: Describe the change being requested in summary, list the RFI number associated with change, list any credit allowances, and include any subcontractor mark-up.
5. Enter "NET" amount for Change Order Request.
6. Enter additional days general contractor is requesting to be granted for this change.
7. Type in Title of the authorized signer from General/Prime Contractor's company.
8. Enter date of General/Prime Contractors signature.
9. Forward this Change Order Request Summary to either the A/E or the CFMO Project Manager.

NOTES:

[A] Questions regarding this form can be directed to your CFMO Project Manager or the CFMO Business Management Section at (904) 823-0255 or (904) 823-0256.

[B] Attach all back-up documentation for this Change Order Request in an orderly and understandable format to ensure timely processing.

EXHIBIT 17

State of Florida / Department Of Military Affairs
Construction & Facility Management Office

ESTIMATED PAYMENT DRAW SCHEDULE

(Form is to be completed by Contractor and submitted to CFMO Project Manager within 10 days of Pre-Construction Meeting date)

Contractor Name:	0	Funding Type:	0
Contractor Address:	0	Acctg or CAT Code:	0
City, State, Zip	0	Org Code:	0
Point of Contact:	0	MCCA Number:	0
Facsimile Number:	0	Contract Term:	0
		Contract Amount:	$0.00
State Project Number:	0	Notice to Proceed Date:	
Federal Project Number:	0	Substantial Completion Date:	
CFMO Project Manager:	0	Final Completion Date:	

Draw #	Month	Year	Est. Monthly Draw Amount
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			

Contractor Signature | Printed Name, Title | Date

DATE STAMPED RECEIVED:

ROUTING

CFMO Proj. Mgr.
Resource Mgmt.
USPFO
SQM

FNG Form 4020, OCT 06

EXHIBIT 18

SAMPLE

CONSENT OF SURETY TO FINAL PAYMENT

Conforms with the American Institute of Architects, AIA Document G707

BOND NO.

OWNER ☐
ARCHITECT ☐
CONTRACTOR ☐
SURETY ☒
OTHER ☐

TO OWNER: *(Name and address)*
STATE OF FLORIDA
DEPARTMENT OF MILITARY AFFAIRS
CONSTRUCTION & FACILITY MANAGEMENT
OFFICE
P. O. Box 1008
St. Augustine, FL 32085-1008

ARCHITECT'S PROJECT NO.:

CONTRACT FOR:

PROJECT: *(Name and address)*

CONTRACT DATED:

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the *(Insert name and address of Surety)*

HARTFORD FIRE INSURANCE COMPANY
Hartford Plaza
Hartford, CT 06115

, SURETY,

on bond of *(Insert name and address of Contractor)*

, CONTRACTOR,

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety of any of its obligations to *(Insert name and address of Owner)*
STATE OF FLORIDA
DEPARTMENT OF MILITARY AFFAIRS
CONSTRUCTION & FACILITY MANAGEMENT
OFFICE
P. O. Box 1008
St. Augustine, FL 32085-1008

, OWNER,

as set forth in said Surety's bond.

IN WITNESS WHEREOF, the Surety has hereunto set its hand on this date: April 7, 2011
(Insert in writing the month followed by the numeric date and year.)

HARTFORD FIRE INSURANCE COMPANY
(Surety)

(Signature of authorized representative)

Attest:
(Seal):
, Witness

Tom S. Lobrano, IV, Attorney-In-Fact
(Printed name and title)

S-2134/GEEF 10/01

FRP

EXHIBIT 19

SAMPLE

POWER OF ATTORNEY

Direct Inquiries/Claims to:
THE HARTFORD
BOND, T-4
P.O. BOX 2103, 690 ASYLUM AVENUE
HARTFORD, CONNECTICUT 06115
call: 888-266-3488 *or fax:* 860-757-5835
Agency Code: 21-222192

KNOW ALL PERSONS BY THESE PRESENTS THAT:

- [X] **Hartford Fire Insurance Company**, a corporation duly organized under the laws of the State of Connecticut
- [X] **Hartford Casualty Insurance Company**, a corporation duly organized under the laws of the State of Indiana
- [X] **Hartford Accident and Indemnity Company**, a corporation duly organized under the laws of the State of Connecticut
- [ ] **Hartford Underwriters Insurance Company**, a corporation duly organized under the laws of the State of Connecticut
- [ ] **Twin City Fire Insurance Company**, a corporation duly organized under the laws of the State of Indiana
- [ ] **Hartford Insurance Company of Illinois**, a corporation duly organized under the laws of the State of Illinois
- [ ] **Hartford Insurance Company of the Midwest**, a corporation duly organized under the laws of the State of Indiana
- [ ] **Hartford Insurance Company of the Southeast,** a corporation duly organized under the laws of the State of Florida

having their home office in Hartford, Connecticut, (hereinafter collectively referred to as the "Companies") do hereby make, constitute and appoint, ***up to the amount of unlimited:***

James C. Congelio, Tom S. Lobrano III, Tom S. Lobrano IV, James N. Congelio
of
Jacksonville, FL

their true and lawful Attorney(s)-in-Fact, each in their separate capacity if more than one is named above, to sign its name as surety(ies) only as delineated above by ☒, and to execute, seal and acknowledge any and all bonds, undertakings, contracts and other written instruments in the nature thereof, on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

In Witness Whereof, and as authorized by a Resolution of the Board of Directors of the Companies on January 22, 2004 the Companies have caused these presents to be signed by its Assistant Vice President and its corporate seals to be hereto affixed, duly attested by its Assistant Secretary. Further, pursuant to Resolution of the Board of Directors of the Companies, the Companies hereby unambiguously affirm that they are and will be bound by any mechanically applied signatures applied to this Power of Attorney.

Scott Sadowsky, Assistant Secretary

M. Ross Fisher, Assistant Vice President

STATE OF CONNECTICUT }
COUNTY OF HARTFORD } ss. Hartford

On this 3rd day of March, 2008, before me personally came M. Ross Fisher, to me known, who being by me duly sworn, did depose and say: that he resides in the County of Hartford, State of Connecticut; that he is the Assistant Vice President of the Companies, the corporations described in and which executed the above instrument; that he knows the seals of the said corporations; that the seals affixed to the said instrument are such corporate seals; that they were so affixed by authority of the Boards of Directors of said corporations and that he signed his name thereto by like authority.

CERTIFICATE

Scott E. Pascka
Notary Public
My Commission Expires October 31, 2012

I, the undersigned, Assistant Vice President of the Companies, DO HEREBY CERTIFY that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies, which is still in full force effective as of **April 7, 2011**
Signed and sealed at the City of Hartford.

Gary W. Stumper, Assistant Vice President

EXHIBIT 20

SAMPLE

WAIVER AND RELEASE OF LIEN UPON PROGRESS PAYMENT

The undersigned lienor, in consideration of the sum of _____, hereby waives and releases its lien and right to claim a lien for labor, services or materials furnished through ____(date)_____ to ____(contractor)_____ on the job of ____(job title)_____ to the following described property:

(Project name) _____
(Project location) _____

This waiver and release does not cover any retention or labor, services or materials furnished after the date specified.

DATED on _____

Lienor's Name _____
Address _____
_____
_____

By _____
Printed Name _____
Title _____

STATE OF _____

COUNTY OF _____

BEFORE ME, the undersigned officer, personally appeared _____ as _____ of _____, who is personally known to me or presented _____ as identification, and who did _____ take an oath, and who is known to be the person described in and who executed the foregoing instrument, and acknowledged to and before me that he/she executed said instrument in the capacity and for the purposes therein expressed.

Signatue of Notary: _____

Commission Expiration Date: _____

UNIVERSAL
ENGINEERING SCIENCES

REPORT OF A LIMITED GEOTECHNICAL EXPLORATION

Live Fire Shoot House
Camp Blanding
Clay County, Florida

December 20, 2010

PROJECT NO. 0930.1000130.0000
REPORT NO. 873519

Prepared For:

Ebert Norman Brady Architects
1361 13th Avenue South – Suite 230
Jacksonville Beach, Florida 32250

Prepared By:

UNIVERSAL ENGINEERING SCIENCES
5561 Florida Mining Boulevard South
Jacksonville, Florida 32257-3648
(904) 296-0757

UNIVERSAL
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• Palm Coast, FL
• Panama City, FL
• Pensacola, FL
• Rockledge, FL
• Sarasota, FL
• St. Augustine, FL
• Tampa, FL
• West Palm Beach, FL

December 20, 2010

Ebert Norman Brady Architects
1361 13th Avenue South – Suite 230
Jacksonville Beach, Florida 32250

Attention: Mr. Tom Norman, A.I.A

Reference: **REPORT OF A LIMITED GEOTECHNICAL EXPLORATION**
Live Fire Shoot House
Camp Blanding
Clay County, Florida
UES Project No. 0930.1000130.0000 and Report No. 873519

Dear Mr. Norman:

Universal Engineering Sciences, Inc. has completed a limited geotechnical exploration at the site of the proposed Live Fire Shoot House at Camp Blanding in Clay County, Florida. These services were provided in general accordance with our Proposal No. 2010J-024 dated January 18, 2010. Authorization for our services was provided by Mr. Tom Norman of Ebert Norman Brady Architects on May 27, 2010. This report contains the results of our exploration, an engineering evaluation with respect to the project characteristics described to us, and recommendations for groundwater control, foundation design, pavement design and site preparation. A summary of our findings is as follows:

- Beneath a thin layer of topsoil, the borings generally encountered very loose to medium dense light brown to brown, grey to light grey and grey brown fine sand (SP) and slightly clayey fine sand (SP-SC) to a depth of 12 to 17 feet. Medium dense grey to grey brown and dark brown fine sand (SP) then extended to the deepest boring termination depths of 25 feet.

- We estimated the groundwater level at a depth of approximately 22 feet below the existing ground surface. We estimate the normal seasonal high groundwater level will occur 10 or more feet below the existing ground surface encountered during our exploration.

- Assuming the building and pavement areas will be constructed in accordance with our Site Preparation Recommendations, we have recommended the

proposed structures be supported on conventional, shallow spread foundations with an allowable soil bearing pressure of 2,500 pounds per square foot.

- Pavements should be designed as a function of the anticipated traffic loadings. Either flexible or rigid pavement systems may be used at this site.

- We recommend normal, good practice site preparation techniques to prepare the existing subgrade to support the proposed structure and pavements. These techniques include stripping the construction areas of topsoils and vegetation, compacting the subgrade with a large vibratory roller and placing engineered fill to the desired grades.

We trust this report meets yours needs and addresses the geotechnical issues associated with the proposed construction. We appreciate the opportunity to have worked with you on this project and look forward to a continued association. Please do not hesitate to contact us if you should have any questions, or if we may further assist you as your plans proceed.

Respectfully submitted,

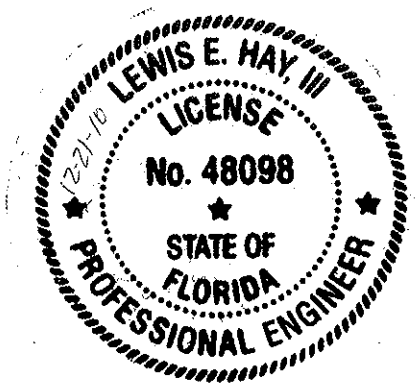
UNIVERSAL ENGINEERING SCIENCES, INC.

Lewis E. Hay, P.E.
Senior Geotechnical Engineer
FL P.E. No. 48098

Steve Weaver, P.E.
Senior Geotechnical Engineer
FL P.E. Number 37389

LEH/SRW

CC: Mr. Ed Goodson
Goodson, Nevin & Associates



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APPENDIX A

Boring Location Plan
Boring Logs
Double Ring Infiltrometer Test Results
Key to Boring Logs
Field and Laboratory Procedures

APPENDIX B

Important Information About Your Geotechnical Engineering Report
Constraints and Restrictions

1.0 INTRODUCTION

1.1 GENERAL

In this report, we present the results of the subsurface exploration of the site for the proposed Live Fire Shoot House located at Camp Blanding in Clay County County, Florida. We have divided this report into the following sections:

- SCOPE OF SERVICES - Defines what we did
- FINDINGS - Describes what we encountered
- RECOMMENDATIONS - Describes what we encourage you to do
- LIMITATIONS - Describes the restrictions inherent in this report
- APPENDICES - Presents support materials referenced in this report

2.0 SCOPE OF SERVICES

2.1 PROJECT DESCRIPTION

Project information was provided Mr. Tom Norman of Ebert Norman Brady Architects through recent emails and verbal discussions. We were provided with a copy of an aerial photograph of the site which shows the site location, proposed site layout, and requested auger boring locations. In addition, we were provided a recent survey map (undated) which shows all of the boring locations.

We understand the project will consist of a shoot house facility at Camp Blanding. The facility will include a 65 by 80 foot shoot house structure, a 40 by 70 foot latrine, a 15 by 30 foot ammo building, and adjacent pavement areas. A retention area is included for storm water management. We were not provided with detailed loading information, therefore we assume maximum load bearing wall and column loads will not exceed 3 klf and 50 kips, respectively. We assume elevating fill heights will not exceed 2 feet to reach final site grades.

Our recommendations are based upon the above considerations. If any of this information is incorrect, or if you anticipate any changes, please inform Universal Engineering Sciences so that we may review our recommendations.

2.2 PURPOSE

The purposes of this limited geotechnical exploration were:

- to explore the general subsurface conditions at the site;

- to interpret and evaluate the subsurface conditions with respect to the proposed construction; and

- to provide geotechnical engineering recommendations for groundwater control, foundation design, pavement design, and site preparation.

This report presents an evaluation of site conditions on the basis of traditional geotechnical procedures for site characterization. The recovered samples were not examined, either visually or analytically, for chemical composition or environmental hazards. Universal Engineering Sciences would be pleased to perform these services, if you desire.

Our exploration was confined to the zone of soil likely to be stressed by the proposed construction. Our work did not address the potential for surface expression of deep geological conditions. This evaluation requires a more extensive range of field services than performed in this study. We will be pleased to conduct an exploration to evaluate the probable effect of the regional geology upon the proposed construction, if you desire.

2.3 FIELD EXPLORATION

A field exploration was performed on December 8 and 9, 2010. The approximate boring locations are shown on the attached Boring Location Plan in Appendix A. The boring locations were determined in the field and were staked by the project surveyor. Samples of the soils encountered will be held in our laboratory for your inspection for 60 days unless we are notified otherwise.

2.3.1 SPT Borings

To explore the subsurface conditions within the area of the various proposed structures, we drilled four (4) Standard Penetration Test (SPT) borings to a depth of approximately 25 feet below the existing ground surface in general accordance with the methodology outlined in ASTM D 1586. A summary of this field procedure is included in Appendix A. Split-spoon soil samples recovered during performance of the borings were visually classified in the field and representative portions of the samples were transported to our laboratory for further evaluation.

2.3.2 Auger Borings

To explore the subsurface conditions within the proposed pavement, septic drainfield and storm water retention areas, we drilled seven (7) auger borings (A1 thru A6 and DR-1) to a depth of approximately 6 feet below the existing ground surface. The auger borings were drilled in general accordance with the methodology outlined in ASTM D

1452. A summary of this field procedure is included in Appendix A. Representative soil samples recovered from the auger borings were returned to our laboratory for further evaluation.

2.3.3 Double Ring Infiltration Testing

To help establish an infiltration rate for the near surface soils, we conducted one (1) double ring infiltration test (DR-1) in the storm water retention pond area at a depth of 2 feet below the existing grade. The test location was established in the field by the project surveyor. The test location is shown on the Boring Location Plan in Appendix A. The test was conducted in general accordance with ASTM D3385, "Infiltration Rate of Soils using Double Ring Infiltrometers." The result of this test is presented on the Double Ring Infiltrometer Test Results sheet in Appendix A. The procedure for this test is also described in the Field Exploration and Laboratory Testing Procedures section of Appendix A.

2.4 LABORATORY TESTING

Representative soil samples obtained during our field exploration were returned to our office and examined by a geotechnical engineer. The samples were visually classified in general accordance with ASTM D 2488 (Unified Soil Classification System). In the laboratory we conducted six (6) water content tests, four (4) fines content tests and one (1) organic content test. The results of the laboratory tests are presented on the Boring Logs in Appendix A. A brief description of the laboratory testing procedures used is included in the Laboratory Testing Procedures section of Appendix A.

3.0 FINDINGS

3.1 SOIL SURVEY

Based on the September 1989 Soil Survey for Clay County, Florida, as prepared by the US Department of Agriculture Soil Conservation Service, the predominant soil type at the site is identified as Penny Fine Sand. A summary of characteristics of this soil series was obtained from the Soil Survey and is included in Table 1.

TABLE 1
Summary of Soil Survey Information

Soil Type	Constituents	Hydrologic Group	Natural Drainage	Soil Permeability (Inches/Hr)	Seasonal High Water Table
Penny Fine Sand (5)	0 – 3" Fine Sand 3"–57" Sand, Fine Sand 57"-80" Sand, Fine Sand	A	Excessively Drained	0-5" 6.0 - 20 5"-15" 6.0 - 20 15"-25" 6.0 - 20	>6.0 Ft.

3.2 SURFACE CONDITIONS

The site of the proposed Shoot House facility is located on the northwest side of State Road 21 at Camp Blanding in Clay County, Florida. At the time of our visit, the site had been cleared and roughly stripped. It appeared that the previous site vegetation included pine and small oak trees. The site topography was relatively level and no surface water was observed on the site at the time of our visit. The surface soils consisted of light brown to grey and grey brown fine sands.

3.3 SUBSURFACE CONDITIONS

The boring locations and detailed subsurface conditions are presented in Appendix A: Boring Location Plan and Boring Logs. The classifications and descriptions shown on the logs are based upon visual characterizations of the recovered soil samples. Also, see Appendix A: Key to Boring Logs, for further explanation of the symbols and placement of data on the Boring Logs.

3.3.1 Soil Conditions

The SPT borings initially penetrated 12 feet of very loose to loose light brown to brown, grey brown and light grey fine sand (SP). The standard penetration test values (or "N" values) in this upper zone ranged from 1 to 10 blows per foot. Loose to medium dense light brown to brown and grey brown slightly clayey fine sand (SP-SC) was then encountered to a depth of 17 feet. The standard penetration test values in this zone ranged from 9 to 13 blows per foot. Medium dense grey to grey brown and dark brown fine sand (SP) then extended to the boring termination depths of 25 feet. The standard penetration test values in this lower zone ranged from 22 to 28 blows per foot.

The soils encountered by the auger borings to depths of 6 feet were consistent with the SPT borings. For more detailed soils information at specific boring locations please refer to the Boring Logs in Appendix A.

3.3.2 Groundwater Conditions

The groundwater level was estimated at a depth of approximately 22 feet below the existing ground surface. The groundwater level is expected to fluctuate with seasonal climatic changes, construction activity, rainfall events and other site specific factors.

The seasonal high groundwater level was estimated to occur below a depth of 10 feet at the SPT boring locations using physical indicators in the soil profile along with information from the USDA Soil Conservation Service Soil Survey for Clay County, Florida.

4.0 RECOMMENDATIONS

4.1 GENERAL

In this section of the report, we present our detailed recommendations for groundwater control, building foundation design, pavement design, site preparation, and construction related services. The following recommendations are made based upon a review of the attached soil test data, our understanding of the proposed construction, and experience with similar projects and subsurface conditions. We recommend that UES be provided the opportunity to review the project plans and specifications to confirm that our recommendations have been properly interpreted and implemented. If the structural loadings or the building locations change significantly from those discussed previously, we request the opportunity to review and possibly amend our recommendations with respect to those changes. The discovery of any subsurface conditions during construction which deviate from those encountered in the borings should be reported to us immediately for observation, evaluation and recommendations.

4.2 GROUNDWATER CONTROL

The groundwater table will fluctuate seasonally depending upon local rainfall. The rainy season in Northeast Florida is normally between June and September. Based upon our review of U.S.G.S. data, Clay County Soils Survey, and regional hydrogeology, it is our opinion the seasonal high water level will occur at a depth of 10 or more feet below the existing ground surface encountered at the time of our exploration. We do not anticipate that groundwater control will be a significant issue for the construction of this project.

Note: it is possible the estimated seasonal high groundwater levels will temporarily exceed these estimated levels during any given year in the future. Should impediments to surface water drainage exist on the site, or should rainfall intensity and duration, or total rainfall quantities exceed the normally anticipated rainfall quantities, groundwater levels may exceed our seasonal high estimates. In addition, temporary perched groundwater conditions may develop just above the slightly clayey fine sand soils encountered at a depth of 12 feet.. We recommend positive drainage be established and maintained as needed on the site during construction. We further recommend permanent measures be constructed to maintain positive drainage from the site throughout the life of the project.

We recommend all foundation and pavement grade designs be based on the seasonal high groundwater conditions.

4.3 BUILDING FOUNDATIONS

Based on the results of our exploration, we consider the subsurface conditions at the site adaptable for support of the proposed structures when constructed on properly designed conventional shallow foundation systems. Both spread footing and monolithic slab foundations are considered appropriate. Provided the site preparation and earthwork construction recommendations outlined in Section 4.5 of this report are performed, the following parameters may be used for foundation design.

4.3.1 Bearing Pressure

The maximum allowable net soil bearing pressure for use in shallow foundation design should not exceed 2,500 psf. Net bearing pressure is defined as the soil bearing pressure at the foundation bearing level in excess of the natural overburden pressure at that level. The foundations should be designed based on the maximum load which could be imposed by all loading conditions.

4.3.2 Foundation Size

The minimum widths recommended for any isolated column footings and continuous wall footings are 24 inches and 18 inches, respectively. The turned down edges of monolithic slabs should have a minimum width of 16 inches. Even though the maximum allowable soil bearing pressure may not be achieved, these width recommendations should control the minimum size of the foundations.

4.3.3 Bearing Depth

The exterior foundations should bear at a depth of at least 18 inches below the finished exterior grades and the interior foundations should bear at a depth of at least 12 inches below the finish floor elevation to provide confinement to the bearing level soils. Monolithic slabs should bear at a depth of at least 12 inches below the finished exterior grades. It is recommended that stormwater be diverted away from the building exteriors to reduce the possibility of erosion beneath the exterior footings.

4.3.4 Bearing Material

The foundations may bear in either the compacted suitable natural soils or compacted structural fill. The bearing level soils, after compaction, should exhibit densities equivalent to at least 95 percent of the Modified Proctor maximum dry density (ASTM D 1557) to a depth of at least one foot below the foundation bearing level.

4.3.5 Settlement Estimates

Post-construction settlements of the structures will be influenced by several interrelated factors, such as (1) subsurface stratification and strength/compressibility characteristics; (2) footing size, bearing level, applied loads, and resulting bearing pressures beneath the foundations; and (3) site preparation and earthwork construction techniques used by the contractor. Our settlement estimates for the structures are based on the use of site preparation/earthwork construction techniques as recommended in Section 4.5 of this report. Any deviation from these recommendations could result in an increase in the estimated post-construction settlements of the structures.

Due to the sandy nature of the near-surface soils, we expect the majority of settlement to occur in an elastic manner and fairly rapidly during construction. Using the recommended maximum bearing pressure, the assumed maximum structural loads and the field data which we have correlated to geotechnical strength and compressibility characteristics of the subsurface soils, we estimate that total settlements of the structure should be on the order of one inch or less.

Differential settlements result from differences in applied bearing pressures and variations in the compressibility characteristics of the subsurface soils. Because of the general uniformity of the subsurface conditions and the recommended site preparation and earthwork construction techniques outlined in Section 4.5, we anticipate that differential settlements of the structure should be within structurally tolerable magnitudes (½ inch or less); however, aesthetic cracking may occur and the project budget should account for some repairs.

4.3.6 Floor Slab

The floor slabs can be constructed as slab-on-grade members using a modulus of subgrade reaction (K) of 150 pci provided the subgrade materials are compacted as outlined in Section 4.5. It is recommended the floor slab bearing soils be covered with an impervious membrane to reduce moisture entry and floor dampness. A 10-mil thick plastic membrane is commonly used for this purpose. Care should be exercised not to tear large sections of the membrane during placement of reinforcing steel and concrete.

4.4 PAVEMENTS

4.4.1 General

A rigid or flexible pavement section could be used on this project. Flexible pavement combines the strength and durability of several layer components to produce an appropriate and cost-effective combination of available construction materials. Concrete pavement has the advantage of the ability to "bridge" over isolated soft areas, it requires less security lighting, and it typically has a longer service life than asphalt

pavement. Disadvantages of rigid pavement include an initial higher cost and more difficult repair procedures (compared to flexible pavement) should pavement distress occur.

4.4.2 Asphalt (Flexible) Pavements

We have recommended a flexible pavement section with a 20-year design life for use on this project. Because traffic loadings are unavailable, we have generalized our pavement design into two groups. The group descriptions and the recommended component thicknesses are presented in Table 2: Summary of Pavement Component Recommendations. The structural numbers in Table 2 are based on a structural number analysis with the stated estimated daily traffic volume for a 20-year replacement design life.

TABLE 2
Summary of Pavement Component Recommendations

Traffic Group	Structural Number	Component Thickness (inches)		
		Stabilized Subgrade	Base Course	Surface Course
Automobile parking lots and driveways -**standard duty**	2.7	12	6	1.5
Truck parking lots and driveways - **heavy duty**	3.3	12	8	2.0

The Design Traffic Groups are defined below:

- Automobile Parking lots and driveways – **standard duty:**

  1,000 cars and light panel / pickup trucks per day, (average gross weight of 4,000 pounds), two tractor-trailer trucks per week (H-20 loading), and two trash trucks per week (46,000 pound gross weight)

- Truck Parking and driveways – **heavy duty:**

  Standard duty loading plus; twenty 18-wheel tractor-trailer trucks per day (H-20 loading)

4.4.2.1 Stabilized Subgrade

We recommend that subgrade materials be compacted in place according to the requirements in the "Site Preparation" section of this report. Further, beneath limerock

base course, stabilize the subgrade materials to a minimum Limerock Bearing Ratio (LBR) of 40, as specified by Florida Department of Transportation (FDOT) requirements for Type B Stabilized Subgrade. The subgrade material should be compacted to at least 98 percent of the Modified Proctor maximum dry density (ASTM D 1557, AASHTO T-180) value.

The stabilized subgrade can be a blend of existing soil and imported material such as limerock. If a blend is proposed, we recommend that the contractor perform a mix design to find the optimum mix proportions.

The primary function of stabilized subgrade beneath the base course is to provide a stable and firm subgrade so that the limerock can be properly and uniformly placed and compacted. Depending upon the soil type, the subgrade material may have sufficient stability to provide the needed support without additional stabilizing material. Generally, sands with silt or clay should have sufficient stability and may not require additional stabilizing material. Conversely, relatively "clean" sand will not provide sufficient stability to adequately construct the limerock base course. Based on the relatively clean fine sands encountered by the borings, we anticipate that subgrade stabilization will be required for this project. Universal Engineering Sciences should observe the soils exposed on the finish grades and help evaluate stabilization alternatives.

4.4.2.2 Base Course

We recommend the base course consist of limerock. The limerock base course should have a minimum Limerock Bearing Ratio (LBR) of 100 and should be compacted to 98 percent of the Modified Proctor maximum dry density (ASTM D 1557, AASHTO T-180) value. The bottom of the pavement base should be separated from the estimated wet season groundwater level by at least 24 inches.

As an alternative base course, crushed concrete could be used. An advantage to using crushed concrete is a lower sensitivity to water than what occurs with limerock. The minimum separation between the bottom of the crushed concrete base and the estimated typical wet season groundwater level can be reduced to 18 inches. The main disadvantage is that crushed concrete may not be available at the time of construction. Crushed concrete should be supplied by an FDOT approved plant with quality control procedures. The crushed concrete stockpile should be free of sandy pockets, foreign materials, or uncrushed particles. We recommend the following specifications be enforced.

1. Crushed concrete shall not contain extremely hard pieces, lumps, balls or pockets of sand or clay sized material in sufficient quantity as to be detrimental to the proper binding, finishing or strength of the crushed concrete base.

2. Samples of base course materials shall be supplied to the engineer prior to use in the work. Additional samples shall be furnished during construction, as necessary.

3. At least 97 percent (by weight) of the material shall pass a 3-1/2 inch sieve and the material shall be graded uniformly down to dust. The fine material shall consist entirely of dust or fracture. All crushing or breaking-up which might be necessary in order to meet such size requirements shall be done before the material is placed within the area to be paved.

4. The base shall be bladed and shaped to conform to the typical sections shown on the plans. Then the base shall be compacted by rolling with a combination of steel wheel and rubber tired rollers until a minimum density of at least 98 percent of the maximum density obtainable under AASHTO Method T-180 is reached. The base shall have an average LBR of not less than 100. The LBR value of material produced at a particular source shall be determined in accordance with an approved quality control procedure.

5. Testing shall be performed at the following frequencies:

   - Perform in-place density on crushed concrete base at a frequency of 1 test per 300 linear foot of roadway or 5,000 square feet of pavement.

   - Perform Limerock Bearing Ratio tests at a frequency of 1 test per visual change in material and a minimum of 1 test per 15,000 square feet of pavement.

   - Engineer should perform a final visual base inspection prior to placement of prime or tack coat and paving.

4.4.2.3 Wearing Surface

The wearing surface should consist of Florida Department of Transportation (FDOT) Type S asphaltic concrete having a minimum Marshall Stability of 1,500 lbs and a flow range of 0.07 to 0.12 inches. Specific requirements for Type S asphaltic concrete wearing surface are outlined in the Florida Department of Transportation, Standard Specifications for Road and Bridge Construction, 2000 Edition.

After placement and field compaction, the wearing surface should be cored to evaluate material thickness and to perform laboratory densities. Cores should be obtained at frequencies of at least one core per 10,000 square feet of placed pavement or a minimum of two cores per day's production.

4.4.3 Concrete (Rigid) Pavements

Concrete pavement is a rigid pavement that transfers much lighter wheel loads to the subgrade soils than a flexible asphalt pavement. For a concrete pavement subgrade, we recommend using the existing surficial sands or recommend clean fine sand fill (SP), densified to at least 98 percent of Modified Proctor test maximum dry density (ASTM D 1557) without additional stabilization, with the following stipulations:

1. Subgrade soils must be densified to at least 98 percent of Modified Proctor test maximum dry density (ASTM D 1557) to a depth of at least 2 feet prior to placement of concrete.

2. The surface of the subgrade soils must be smooth, and any disturbances or wheel rutting corrected prior to placement of concrete.

3. The subgrade soils must be moistened prior to placement of concrete.

4. Concrete pavement thickness should be uniform throughout, with exception to thickened edges (curb or footing).

5. The bottom of the pavement should be separated from the estimated typical wet season groundwater level by at least 18 inches.

Our recommendations for slab thickness for standard duty and heavy duty concrete pavements are based on a) subgrade soils densified to 98 percent of the Modified Proctor maximum dry density (ASTM D 1557) b) modulus of subgrade reaction (k) equal to 200 pounds per cubic inch, c) a 20 year design life, and 3) previously stated traffic conditions in Section 4.4.2, we recommend using the design shown in Table 3 for standard duty concrete pavements.

TABLE 3
Standard Duty (Unreinforced) Concrete Pavement

Minimum Pavement Thickness	Maximum Control Joint Spacing	Minimum Sawcut Depth
5 Inches	10 Feet x 10 Feet	1¼ Inches

Our recommended design for heavy duty concrete pavement is shown in Table 4 below.

TABLE 4
Heavy Duty (Unreinforced) Concrete Pavement

Minimum Pavement Thickness	Maximum Control Joint Spacing	Minimum Sawcut Depth
6 Inches	12 Feet x 12 Feet	1½ Inches

We recommend using concrete with a minimum 28-day compressive strength of 4000 psi and a minimum 28-day flexural strength (modulus of rupture) of at least 650 pounds per square inch, based on 3rd point loading of concrete beam test samples. Layout of the sawcut control joints should form square panels, and the depth of sawcut joint should be at least ¼ of the concrete slab thickness. The joints should be sawed within six hours of concrete placement or as soon as the concrete has developed sufficient strength to support workers and equipment. We recommend allowing Universal to review and comment on the final concrete pavement design, including section and joint details (type of joints, joint spacing, etc.), prior to the start of construction.

For further details on concrete pavement construction, please reference the "Guide to Jointing on Non-Reinforced Concrete Pavements" published by the Florida Concrete and Products Associates, Inc., and "Building Quality Concrete Parking Areas", published by the Portland Cement Association.

4.4.4 Effects of Groundwater

One of the most critical factors influencing pavement performance in Northeast Florida is the relationship between the pavement subgrade and the seasonal high groundwater level. Many roadways and parking areas have been damaged as a result of deterioration of the base conditions and/or the base/surface course bond. We recommend that the seasonal high groundwater and the bottom of the flexible pavement limerock base course be separated by at least 24 inches. We recommend a separation of at least 18 inches below the bottom of a rigid concrete pavement or below a flexible pavement with a crushed concrete base.

4.4.5 Pavement Subgrade Soils

The subgrade soils (upper 24 inches) beneath either flexible or rigid pavement systems should consist of free draining granular soils (SP or SP-SM).

4.4.6 Curbing

We recommend that curbing around the landscaped sections adjacent to the parking areas and driveways be constructed with full-depth curb sections. Using extruded curb sections which lie directly on top of the final asphalt level, or eliminating the curbing entirely, can allow migration of irrigation water from the landscape areas to the interface between the asphalt and the base. This migration often causes separation of the wearing surface from the base and subsequent rippling and pavement deterioration. Topsoil placed behind curbing in landscaped areas should be limited to 6 inches vertical thickness within five feet of flexible pavement.

4.4.7 Construction Traffic

Light duty roadways and incomplete pavement sections will not perform satisfactorily under construction traffic loadings. We recommend that construction traffic (construction equipment, concrete trucks, sod trucks, garbage trucks, dump trucks, etc.) be re-routed away from these roadways or that the pavement section be designed for these loadings.

4.5 SITE PREPARATION

We recommend normal, good practice site preparation procedures. These procedures include: stripping the site of existing vegetation and topsoil, undercutting any unsuitable soils, compacting the subgrade and placing necessary fill or backfill to grade with engineered fill. A more detailed synopsis of this work is as follows:

1. Prior to construction, the location of any existing underground utility lines within the construction area should be established. Provisions should then be made to relocate interfering utilities to appropriate locations. It should be noted that if underground pipes are not properly removed or plugged, they may serve as conduits for subsurface erosion which may subsequently lead to excessive settlement of overlying structure(s).

2. The groundwater level was estimated to occur at a depth of 22 feet below the existing ground surface at the time of our exploration. The seasonal high groundwater level is estimated to occur at a depth of 10 or more feet below the existing ground surface. The groundwater level should be maintained at a depth of at least 2 feet below the surface of any vibratory compaction procedures and a foot below any excavations. If required, temporary groundwater control can probably be achieved by pumping from sumps located in perimeter ditches. Each sump should be located outside the bearing areas to avoid loosening of the fine sandy bearing soils. We anticipate that surface water control will be needed throughout the project schedule. Groundwater control should not be needed except possibly for the installation of new below grade utilities.

3. Remove the existing vegetation and strip the proposed construction limits of all grass, roots, topsoil, and other deleterious materials within 5 feet beyond the perimeter of the proposed building areas and within 3 feet beyond the perimeter of the proposed paved areas. Expect typical stripping at this site to depths of 6 inches or less. Some isolated areas may require several feet or undercutting to remove the root systems of some trees. The resulting excavations should be properly backfilled to level construction grade with compacted structural fill. In confined areas structural backfill should be placed in 4 to 6-inch thick loose lifts and compacted with walk-behind vibratory compactors.

4. Compact the subgrade from the surface with a heavy weight vibratory drum roller (a 8- to 10-ton roller, static weight and 4- to 5-foot drum diameter) until you obtain a minimum density of at least 95 percent of the Modified Proctor maximum dry density (ASTM D-1557), to a depth of 1 foot below the compacted surface. A minimum of eight (8) complete coverages (in perpendicular directions) should be made in the building construction area with the roller to improve the uniformity and increase the density of the underlying sandy soils. The soils should exhibit moisture contents within ± 2 percent of the Modified Proctor optimum moisture content during compaction. Because of the relatively dry nature of the site soils, it will be necessary to add moisture during the surface compaction activity. Surface compaction should be performed prior to placing structural fill in the lower areas and after performing any earthwork cuts in the higher areas.

   Should the bearing level soils experience pumping and soil strength loss during the compaction operations, compaction work should be immediately terminated and (1) the disturbed soils removed and backfilled with dry structural fill soils which are then compacted, or (2) the excess pore pressures within the disturbed soils allowed to dissipate before recompacting.

   Care should be exercised to avoid damaging any nearby structures while the compaction operation is underway. Prior to commencing compaction, occupants of adjacent structures should be notified and the existing conditions of the structures be documented with photographs and survey (if deemed necessary). Compaction should cease if deemed detrimental to adjacent structures. Universal Engineering Sciences can provide vibration monitoring services to help document and evaluate the effects of the surface compaction operation on existing structures. In the absence of vibration monitoring it is recommended the vibratory roller remain a minimum of 60 feet from existing structures. Within this zone, use of a bulldozer or a vibratory roller operating in the static mode is recommended.

5. Test the subgrade for compaction at a frequency of not less than one test per 2,500 square feet in the building area, or a minimum of two test locations per building, whichever is greater, and every 10,000 square feet in pavement areas, or a minimum of two test locations, whichever is greater.

6. Place fill material, as required. The fill should consist of an inorganic, non-plastic granular soil with less than 10 percent soil fines (relatively clean fine sand). Typically, the soils should exhibit moisture contents within ± 2 percent of the Modified Proctor optimum moisture content during compaction. Place fill in uniform 10- to 12-inch loose lifts and compact each lift to a minimum density of 95 percent of the Modified Proctor maximum dry density.

The top 12 inches of fill beneath flexible pavement areas and the top 24 inches of fill beneath rigid pavements should be compacted to 98 percent of the Modified Proctor maximum dry density. For flexible pavements, stabilize this zone as needed with clay, shell or limerock to obtain a minimum LBR of 40 as recommended in Section 4.4.2.

7. Perform compliance tests within the fill/backfill at a frequency of not less than one test per 2,500 square feet per lift in the building areas, or at a minimum of two tests per building area, whichever is greater. In paved areas, perform compliance tests at a frequency of not less than one test per 10,000 square feet per lift, or at a minimum of two test locations, whichever is greater.

8. Test all footing cuts for compaction to a depth of 1 foot. Additionally, we recommend you conduct density testing in every column footing, and every 100 linear feet in wall footings. Recompaction of the foundation excavation bearing level soils, if loosened by the excavation process, can probably be achieved by making several coverages with a light weight walk-behind vibratory sled or roller.

4.6 RETENTION POND CONSIDERATION

4.6.1 Hydraulic Conductivity

As previously noted, the USDA Soil Survey indicates hydraulic conductivity values of approximately 6.0 to 20 inches per hour (approximately 12 to 40 feet per day) for the upper sandy soils. The coefficients of permeability from the Soil Survey are intended to provide an indication of the soils drainage characteristics. The double ring infiltration test indicated an infiltration rate of 40.0 inches per hour at a depth of 2 feet. The actual permeability/infiltration rates may be different due to pond geometry, soil stratification, retention volume and groundwater mounding effects. We estimate that the effective porosity of the sandy soils in the retention pond area is on the order of 0.23.

4.6.2 Borrow Suitability

The soils encountered by the SPT borings (to a depth of 12 feet) and auger borings (to a depth of 6 feet) are considered suitable for use as structural fill or backfill. It should be understood that soils excavated from below the water table may be relatively wet and may require stockpiling or spreading to dry prior to placement and compaction.

4.7 CONSTRUCTION RELATED SERVICES

We recommend the owner retain Universal Engineering Sciences to perform construction materials tests and observations on this project. Field tests and observations include verification of foundation and pavement subgrades by performing

quality assurance tests on the placement of compacted structural fill and pavement courses. We can also provide concrete testing, pavement section testing, structural steel testing, and general construction observation services.

The geotechnical engineering design does not end with the advertisement of the construction documents. The design is an on-going process throughout construction. Because of our familiarity with the site conditions and the intent of the engineering design, we are most qualified to address problems that might arise during construction in a timely and cost-effective manner.

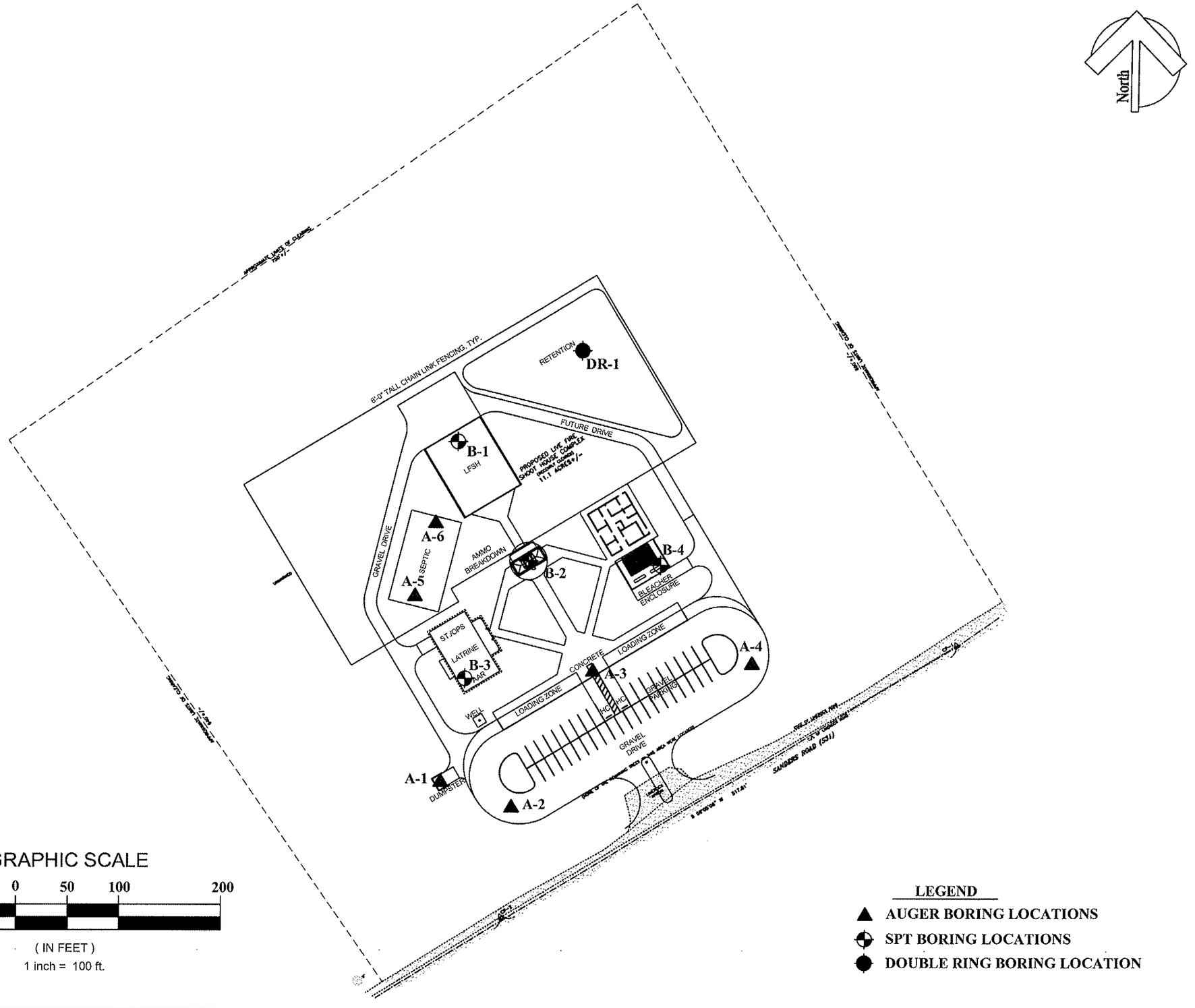
5.0 LIMITATIONS

During the early stages of most construction projects, geotechnical issues not addressed in this report may arise. Because of the natural limitations inherent in working with the subsurface, it is not possible for a geotechnical engineer to predict and address all possible problems. An Association of Engineering Firms Practicing in the Geosciences (ASFE) publication, "Important Information About Your Geotechnical Engineering Report" appears in Appendix B, and will help explain the nature of geotechnical issues.

Further, we present documents in Appendix B: Constraints and Restrictions, to bring to your attention the potential concerns and the basic limitations of a typical geotechnical report.

APPENDIX A

Boring Location Plan
Boring Logs
Double Ring Infiltrometer Test Results
Key to Boring Logs
Field and Laboratory Procedures



CLIENT: LENNAR

GEOTECHNICAL EXPLORATION
LIVE FIRE SHOOT HOUSE-CAMP BLANDING
CLAY COUNTY, FLORIDA

BORING LOCATION PLAN

DRAWN BY: TW	DATE: 12/16/10
CHECKED BY: LEH	DATE: 12/16/10
SCALE: 1"=100'	
PROJECT NO: 0930.1000238.0000	REPORT NO: 871812

UNIVERSAL
ENGINEERING SCIENCES

PAGE NO:
A-1

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0930.1000130.0000
REPORT NO.:	873519
PAGE:	

PROJECT: GEOTECHNICAL EXPLORATION
LIVE FIRE SHOOT HOUSE
CAMP BLANDING, FLORIDA

BORING DESIGNATION: **B1** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: EBERT NORMAN BRADY ARCHITECTS

LOCATION: SEE BORING LOCATION PLAN

REMARKS: N 2008684.67 / E 348140.89

G.S. ELEVATION (ft):
WATER TABLE (ft): 22 (EST.)
DATE OF READING: 12/8/10
EST. W.S.W.T. (ft): >6

DATE STARTED: 12/8/10
DATE FINISHED: 12/8/10
DRILLED BY: DH/TH
TYPE OF SAMPLING: ASTM D-1556

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG. CONT. (%)
0						Very Loose light brown fine SAND (SP)						
		1-1-2	3									
		2-2-2	4									
		2-1-2	3									
5												
		2-2-2	4			Loose to Very Loose brown fine SAND (SP)						
		2-2-3	5									
		2-2-2	4									
10						Loose light grey fine SAND (SP)						
		2-3-4	7									
						Loose light brown slightly Clayey fine SAND (SP-SC)						
15		3-4-5	9				10.3	9.7				
						Medium Dense grey brown fine SAND (SP)						
20		7-10-12	22					7.8				
						Medium Dense dark brown fine SAND (SP)						
25		8-13-15	28					19.8				

BORING_LOG 0930.1000130.0000 - LIVE FIRE SHOOT HOUSE.GPJ UNIENGSC.GDT 12/17/10

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0930.1000130.0000
REPORT NO.:	873519
PAGE:	

PROJECT: GEOTECHNICAL EXPLORATION
LIVE FIRE SHOOT HOUSE
CAMP BLANDING, FLORIDA

CLIENT: EBERT NORMAN BRADY ARCHITECTS

LOCATION: SEE BORING LOCATION PLAN

REMARKS: N 2008569.69 / E 48228.34

BORING DESIGNATION: **B2** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

G.S. ELEVATION (ft):
WATER TABLE (ft): 22 (EST.)
DATE OF READING: 12/8/10
EST. W.S.W.T. (ft): >6

DATE STARTED: 12/8/10
DATE FINISHED: 12/8/10
DRILLED BY: DH/TH
TYPE OF SAMPLING: ASTM D-1556

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						Very Loose grey brown fine SAND (SP)						
		1=9" 1=9"	1									
		1-1-2	3			Very Loose to Loose light brown fine SAND (SP)						
		2-2-2	4				2.1	1.5				
5												
		2-3-4	7			Loose brown fine SAND (SP)						
		3-3-4	7									
		4-5-5	10									
10												
		3-4-5	9									
						Loose brown slightly Clayey fine SAND (SP-SC)						
15		4-4-5	9									
						Medium Dense grey fine SAND (SP)						
20		8-10-14	24									
						Medium Dense dark brown fine SAND (SP)						
25		7-12-14	26									

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0930.1000130.0000
REPORT NO.:	873519
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PROJECT: GEOTECHNICAL EXPLORATION
LIVE FIRE SHOOT HOUSE
CAMP BLANDING, FLORIDA

CLIENT: EBERT NORMAN BRADY ARCHITECTS

LOCATION: SEE BORING LOCATION PLAN

REMARKS: N 2008452.80 / E 348148.01

BORING DESIGNATION: **B3** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

G.S. ELEVATION (ft):
WATER TABLE (ft): 22 (EST.)
DATE OF READING: 12/8/10
EST. W.S.W.T. (ft): >6

DATE STARTED: 12/8/10
DATE FINISHED: 12/8/10
DRILLED BY: DH/TH
TYPE OF SAMPLING: ASTM D-1556

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						Very Loose grey brown fine SAND (SP)						
		1=9" 1=9"	1									
		1-1-1	2			Very Loose light brown fine SAND (SP)						
		1-1-1	2									
5		1-1-2	3			Very Loose to Loose brown fine SAND (SP)						
		2-2-2	4									
		2-2-3	5									
10		2-3-3	6									
						Medium Dense grey brown slightly Clayey fine SAND (SP-SC)						
15		4-6-7	13									
						Medium Dense grey brown fine SAND (SP)						
20		6-12-13	25									
						Medium Dense dark brown fine SAND (SP)						
25		9-11-14	25									

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PROJECT NO.:	0930.1000130.0000
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PROJECT: GEOTECHNICAL EXPLORATION
LIVE FIRE SHOOT HOUSE
CAMP BLANDING, FLORIDA

BORING DESIGNATION: **B4** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: EBERT NORMAN BRADY ARCHITECTS

LOCATION: SEE BORING LOCATION PLAN

REMARKS: N 2008561.94 / E 348349.29

G.S. ELEVATION (ft):
WATER TABLE (ft): 22 (EST.)
DATE OF READING: 12/8/10
EST. W.S.W.T. (ft): >6

DATE STARTED: 12/8/10
DATE FINISHED: 12/8/10
DRILLED BY: DH/TH
TYPE OF SAMPLING: ASTM D-1556

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						Very Loose grey brown fine SAND (SP)						
		1-1-1	2									
		1-1-1	2			Very Loose to Loose light brown fine SAND (SP)						
		1-1-1	2									
5		2-1-2	3			Loose brown fine SAND (SP)	2.3	1.9				
		2-2-3	5									
		2-3-4	7									
10		3-3-5	8			Loose brown slightly Clayey fine SAND (SP-SC)						
15		3-3-6	9			Medium Dense grey fine SAND (SP)						
20		8-10-12	22			Medium Dense dark brown fine SAND (SP)						
25		5-13-14	27									

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REPORT NO.:	873519
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PROJECT: GEOTECHNICAL EXPLORATION
LIVE FIRE SHOOT HOUSE
CAMP BLANDING, FLORIDA

CLIENT: EBERT NORMAN BRADY ARCHITECTS

LOCATION: SEE BORING LOCATION PLAN

REMARKS: N 2008358.33 / E 348117.13

BORING DESIGNATION: **A1** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

G.S. ELEVATION (ft):
WATER TABLE (ft): NE
DATE OF READING: 12/9/10
EST. W.S.W.T. (ft): >6

DATE STARTED: 12/9/10
DATE FINISHED: 12/9/10
DRILLED BY: TH
TYPE OF SAMPLING: ASTM D-1452

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						Brown fine SAND (SP)						
						Light brown fine SAND (SP)						
5												

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REPORT NO.:	873519
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PROJECT: GEOTECHNICAL EXPLORATION
LIVE FIRE SHOOT HOUSE
CAMP BLANDING, FLORIDA

BORING DESIGNATION: **A2** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: EBERT NORMAN BRADY ARCHITECTS

LOCATION: SEE BORING LOCATION PLAN

REMARKS: N 2008326.97 / E 348194.29

G.S. ELEVATION (ft):
WATER TABLE (ft): NE
DATE OF READING: 12/9/10
EST. W.S.W.T. (ft): >6

DATE STARTED: 12/9/10
DATE FINISHED: 12/9/10
DRILLED BY: TH
TYPE OF SAMPLING: ASTM D-1452

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						Grey brown fine SAND (SP) w/ trace roots	2.7	1.7				1.6
						Light brown fine SAND (SP)						
5												

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PROJECT NO.:	0930.1000130.0000
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PROJECT: GEOTECHNICAL EXPLORATION
LIVE FIRE SHOOT HOUSE
CAMP BLANDING, FLORIDA

BORING DESIGNATION: **A3** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: EBERT NORMAN BRADY ARCHITECTS

LOCATION: SEE BORING LOCATION PLAN

REMARKS: N 2008460.89 / E348273.94

G.S. ELEVATION (ft):
WATER TABLE (ft): NE
DATE OF READING: 12/9/10
EST. W.S.W.T. (ft): >6

DATE STARTED: 12/9/10
DATE FINISHED: 12/9/10
DRILLED BY: TH
TYPE OF SAMPLING: ASTM D-1452

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						Grey brown fine SAND (SP)						
						Brown fine SAND (SP)						
5												

BORING_LOG 0930.1000130.0000 - LIVE FIRE SHOOT HOUSE.GPJ UNIENGSC.GDT 12/17/10

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BORING LOG

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PROJECT: GEOTECHNICAL EXPLORATION
LIVE FIRE SHOOT HOUSE
CAMP BLANDING, FLORIDA

CLIENT: EBERT NORMAN BRADY ARCHITECTS

LOCATION: SEE BORING LOCATION PLAN

REMARKS: N 2008467.99 / E 348429.79

BORING DESIGNATION: **A4** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

G.S. ELEVATION (ft):
WATER TABLE (ft): NE
DATE OF READING: 12/9/10
EST. W.S.W.T. (ft): >6

DATE STARTED: 12/9/10
DATE FINISHED: 12/9/10
DRILLED BY: TH
TYPE OF SAMPLING: ASTM D-1452

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						Grey brown fine SAND (SP)						
						Light brown fine SAND (SP)						
5												

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BORING LOG

PROJECT NO.:	0930.1000130.0000
REPORT NO.:	873519
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PROJECT: GEOTECHNICAL EXPLORATION
LIVE FIRE SHOOT HOUSE
CAMP BLANDING, FLORIDA

CLIENT: EBERT NORMAN BRADY ARCHITECTS

LOCATION: SEE BORING LOCATION PLAN

REMARKS: N 2008534.09 / E 348099.36

BORING DESIGNATION: **A5** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

G.S. ELEVATION (ft):
WATER TABLE (ft): NE
DATE OF READING: 12/9/10
EST. W.S.W.T. (ft): >6

DATE STARTED: 12/9/10
DATE FINISHED: 12/9/10
DRILLED BY: TH
TYPE OF SAMPLING: ASTM D-1452

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						Grey brown fine SAND (SP)						
						Brown fine SAND (SP)						
5												

BORING_LOG 0930.1000130.0000 - LIVE FIRE SHOOT HOUSE.GPJ UNIENGSC.GDT 12/17/10

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BORING LOG

PROJECT NO.:	0930.1000130.0000
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PROJECT: GEOTECHNICAL EXPLORATION
LIVE FIRE SHOOT HOUSE
CAMP BLANDING, FLORIDA

CLIENT: EBERT NORMAN BRADY ARCHITECTS

LOCATION: SEE BORING LOCATION PLAN

REMARKS: N 2008605.22 / E 348119.08

BORING DESIGNATION: **A6** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

G.S. ELEVATION (ft):
WATER TABLE (ft): NE
DATE OF READING: 12/9/10
EST. W.S.W.T. (ft): >6

DATE STARTED: 12/9/10
DATE FINISHED: 12/9/10
DRILLED BY: TH
TYPE OF SAMPLING: ASTM D-1452

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						Grey fine SAND (SP)						
						Light brown fine SAND (SP)						
5												

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BORING LOG

PROJECT NO.:	0930.1000130.0000
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PROJECT: GEOTECHNICAL EXPLORATION
LIVE FIRE SHOOT HOUSE
CAMP BLANDING, FLORIDA

CLIENT: EBERT NORMAN BRADY ARCHITECTS

LOCATION: SEE BORING LOCATION PLAN

REMARKS: N 2008773.82 / E 48262.91

BORING DESIGNATION: **DR-1** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

G.S. ELEVATION (ft):
WATER TABLE (ft): NE
DATE OF READING: 12/9/10
EST. W.S.W.T. (ft): >6

DATE STARTED: 12/9/10
DATE FINISHED: 12/9/10
DRILLED BY: TH
TYPE OF SAMPLING: ASTM D-1452

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						Grey fine SAND (SP) w/ trace roots						
						Light brown fine SAND (SP)						
5												

BORING_LOG 0930.1000130.0000 - LIVE FIRE SHOOT HOUSE.GPJ UNIENGSC.GDT 12/17/10

Double Ring Infiltrometer Test Result No. 1
ASTM D 3385-03

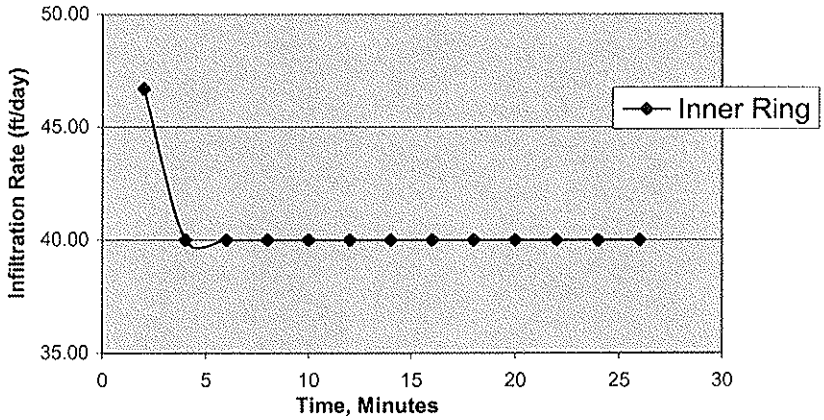
Project Name:	Live Fire Shoot House - Camp Blanding, FL		
Project Number:	0930.1000130.0000	Technician:	T. Henderson
Test Date:	12/9/2010	Head (in)	4
Test Location:	DR-1 - See Boring Location Plan		
Test Depth:	2 feet		

Inner Ring Diameter:	12 inches	Area	113.10 sq. in.
Outer Ring Diameter:	24 inches	Annular Area	339.29 sq. in.

See attached Auger Boring Record for soil profile

Inner Ring			
Elapsed Time (minutes)	Volume (ml)	Infiltration Rate (in/hr)	Comments
2	2883	46.70	DRI test started after a 15-minute initial saturation period
4	2472	40.00	
6	2472	40.00	
8	2472	40.00	
10	2472	40.00	
12	2472	40.00	
14	2472	40.00	
16	2472	40.00	
18	2472	40.00	
20	2472	40.00	
22	2472	40.00	
24	2472	40.00	
26	2472	40.00	

Infiltration Rate



Average Infiltration Rate (in/hr): ^40.0
Steady State Infiltration Rate (in/hr): ^40.0

Reviewed by:

Lewis E. Hay, P.E.
FL Registration No. 48098

UNIVERSAL
ENGINEERING SCIENCES

KEY TO BORING LOGS

SYMBOLS

SYMBOL	DESCRIPTION
N	No. of blows of a 140-lb weight falling 30 inches required to drive standard spoon 1 foot.
WOR	Weight of Drill Rods
WOH	Weight of Drill Rods and Hammer
% REC	Percent Core Recovery from Rock Core Drilling
RQD	Rock Quality Designation
EOB	End Of Boring
BT	Boring Terminated
-200	Fines Content or % Passing N0. 200 Sieve
MC	Moisture Content
LL	Liquid Limit
PI	Plasticity Index
K	Coefficient of Permeability
O.C.	Organic Content
▽	Estimated seasonal high groundwater level
▼	Measured groundwater level at time of drilling

UNIFIED CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS More than 50% retained on No. 200 sieve*	GRAVELS 50% or more of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Well-graded gravels and gravel-sand mixtures, little or no fines
		GRAVELS WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS More than 50% of coarse fraction passes No. 4 sieve	CLEAN SANDS	SW**	Well-graded sands and gravelly sands, little or no fines
			SP**	Well-graded sands and gravelly sands, little or no fines
		SANDS WITH FINES	SM**	Silty sands, sand-silt mixtures
			SC**	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS 50% or more passes No. 200 sieve*	SILTS AND CLAYS Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
			CH	Organic clays or high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
			PT	Peat, muck and other highly organic soils

* Based on the material passing the 3-in. (75 mm) sieve.

** Use dual symbol (such as, SP-SM and SP-SC) for soil with more than 5% but less than 12% passing through No. 200 sieve.

RELATIVE DENSITY
(sand-silt)

Very Loose - Less Than 4 Blows/Ft.
Loose - 4 to 10 Blows/Ft.
Medium - 11 to 30 Blows/Ft.
Dense - 31 to 50 Blows/Ft.
Very Dense - More Than 50 Blows/Ft.

CONSISTENCY
(clay)

Very Soft - Less than 2 Blows/Ft.
Soft - 2 to 4 Blows/Ft.
Medium - 5 to 8 Blows/Ft.
Stiff - 9 to 15 Blows/Ft.
Very Stiff - 16 to 30 Blows/Ft.
Hard - More Than 30 Blows/Ft.

RELATIVE HARDNESS
(Limestone)

Soft - 100 Blows for more than 2"
Hard - 100 Blows for less than 2"

MODIFIERS

These modifiers provide our estimate of the amount of minor constituents (SILT or CLAY sized particles) in the soil sample.
Trace - 5% or less
With SILT or with CLAY - 6% to 11%
SILTY or CLAYEY - 12% to 30%
Very SILTY or Very CLAYEY - 31% to 50%

These modifiers provide our estimate of the amount of organic components in the soil sample.
Trace - 1% to 2%
Few - 3% to 4%
Some - 5% to 8%
Many - Greater than 8%

These modifiers provide our estimate of the amount of other components (Shell, Gravel, Etc.) in the soil sample
Trace - 5% or less
Few - 6% to 12%
Some - 13% to 30%
Many - 31% to 50%

FIELD AND LABORATORY PROCEDURES

FIELD PROCEDURES

Penetration (SPT) Borings - The penetration borings were made in general accordance with ASTM D 1586-67, "Penetration Test and Split-Barrel Sampling of Soils". The borings were advanced to the water table by augering and, after encountering the groundwater table, further advanced by mud rotary drilling techniques using a circulating bentonite fluid to stabilize the borehole and flush the cuttings. At regular intervals, the drilling tools were removed from the borehole and a split-barrel sampler inserted to the borehole bottom and driven 18 inches into the material using a 140-pound SPT hammer falling, on the average, 30 inches per hammer blow. The number of hammer blows for the final 12 inches of penetration is termed the "penetration resistance, blow count, or N-value". This value is an index to several in-place geotechnical properties of the material tested, such as relative density and Young's Modulus.

After driving the sampler 18 inches (or less, if in hard rock or rock-like material) at each test interval, the sampler was retrieved from the borehole and a representative sample of the material within the split-barrel was placed in a glass jar and sealed. After completing the drilling operations, the samples for the borings were transported to our laboratory where they were examined by our engineer in order to verify the driller's field classifications. The samples will be kept in our laboratory for a period of two months after submittal of the formal written report, unless otherwise directed by the client.

Auger Borings - The auger borings were performed manually using a post-hole auger or mechanically with a continuous flight auger attached to the drill rig and in general accordance with ASTM D 1452-80 ("Soil Investigation and Sampling by Auger Borings"). Representative samples of the soils brought to the ground surface by the augering process were placed in glass jars, sealed, and transported to our laboratory where they were examined by a geotechnical engineer to verify the driller's field classification.

LABORATORY PROCEDURES

Natural Moisture Content - The water content of the sample tested was determined in general accordance with the latest revision of ASTM D 2216. The water content is defined as the ratio of "pore" or "free" water in a given mass of material to the mass of solid material particles.

Fines Content – The fines content of the sample was determined by drying the soil and then washing it over a No. 200 mesh sieve. The percentage of soil by weight passing the sieve is the fines content or portion of the sample in silt and clay size range. This test was conducted in general accordance with ASTM D-1140.

Organic Content – The amount of organic material in a sample is determined by this test. The sample is first dried and weighed. The sample is next placed in a muffle furnace at 1380 degrees for 6 hours to ignite the organic material. The sample is then re-weighed and the amount of organic material is calculated and expressed as a percentage.

Universal Engineering Sciences, Inc.
GENERAL CONDITIONS

SECTION 1: RESPONSIBILITIES

1.1 *Universal Engineering Sciences, Inc.*, heretofore referred to as the Consultant, has the responsibility for providing the services described under the Scope of Services section. The work is to be performed according to accepted standards of care and is to be completed in a timely manner. The term "Consultant" as used herein includes all of *Universal Engineering Sciences, Inc's* agents, employees, professional staff, and subcontractors.

1.2 The Client or a duly authorized representative is responsible for providing the Consultant with a clear understanding of the project nature and scope. The Client shall supply the Consultant with sufficient and adequate information, including, but not limited to, maps, site plans, reports, surveys and designs, to allow the Consultant to properly complete the specified services. The Client shall also communicate changes in the nature and scope of the project as soon as possible during performance of the work so that the changes can be incorporated into the work product.

SECTION 2: STANDARD OF CARE

2.1 Services performed by the Consultant under this Agreement are expected by the Client to be conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the Consultant's profession practicing contemporaneously under similar conditions in the locality of the project. No other warranty, express or implied, is made.

2.2 The Client recognizes that subsurface conditions may vary from those observed at locations where borings, surveys, or other explorations are made, and that site conditions may change with time. Data, interpretations, and recommendations by the Consultant will be based solely on information available to the Consultant at the time of service. The Consultant is responsible for those data, interpretations, and recommendations, but will not be responsible for other parties' interpretations or use of the information developed.

SECTION 3: SITE ACCESS AND SITE CONDITIONS

3.1 Client will grant or obtain free access to the site for all equipment and personnel necessary for the Consultant to perform the work set forth in this Agreement. The Client will notify any and all possessors of the project site that Client has granted Consultant free access to the site. The Consultant will take reasonable precautions to minimize damage to the site, but it is understood by Client that, in the normal course of work, some damage may occur, and the correction of such damage is not part of this Agreement unless so specified in the Proposal.

3.2 The Client is responsible for the accuracy of locations for all subterranean structures and utilities. The Consultant will take reasonable precautions to avoid known subterranean structures, and the Client waives any claim against Consultant, and agrees to defend, indemnify, and hold Consultant harmless from any claim or liability for injury or loss, including costs of defense, arising from damage done to subterranean structures and utilities not identified or accurately located. In addition, Client agrees to compensate Consultant for any time spent or expenses incurred by Consultant in defense of any such claim with compensation to be based upon Consultant's prevailing fee schedule and expense reimbursement policy.

SECTION 4: SAMPLE OWNERSHIP AND DISPOSAL

4.1 Soil or water samples obtained from the project during performance of the work shall remain the property of the Client.

4.2 The Consultant will dispose of or return to Client all remaining soils and rock samples 60 days after submission of report covering those samples. Further storage or transfer of samples can be made at Client's expense upon Client's prior written request.

4.3 Samples which are contaminated by petroleum products or other chemical waste will be returned to Client for treatment or disposal, consistent with all appropriate federal, state, or local regulations.

SECTION 5: BILLING AND PAYMENT

5.1 Consultant will submit invoices to Client monthly or upon completion of services. Invoices will show charges for different personnel and expense classifications.

5.2 Payment is due 30 days after presentation of invoice and is past due 31 days from invoice date. Client agrees to pay a finance charge of one and one-half percent (1 ½ %) per month, or the maximum rate allowed by law, on past due accounts.

5.3 If the Consultant incurs any expenses to collect overdue billings on invoices, the sums paid by the Consultant for reasonable attorneys' fees, court costs, Consultant's time, Consultant's expenses, and interest will be due and owing by the Client.

SECTION 6: OWNERSHIP OF DOCUMENTS

6.1 All reports, boring logs, field data, field notes, laboratory test data, calculations, estimates, and other documents prepared by the Consultant, as instruments of service, shall remain the property of the Consultant.

6.2 Client agrees that all reports and other work furnished to the Client or his agents, which are not paid for, will be returned upon demand and will not be used by the Client for any purpose.

6.3 The Consultant will retain all pertinent records relating to the services performed for a period of five years following submission of the report, during which period the records will be made available to the Client at all reasonable times.

SECTION 7: DISCOVERY OF UNANTICIPATED HAZARDOUS MATERIALS

7.1 Client warrants that a reasonable effort has been made to inform Consultant of known or suspected hazardous materials on or near the project site.

7.2 Under this agreement, the term hazardous materials include hazardous materials (40 CFR 172.01), hazardous wastes (40 CFR 261.2), hazardous substances (40 CFR 300.6), petroleum products, polychlorinated biphenyls, and asbestos.

7.3 Hazardous materials may exist at a site where there is no reason to believe they could or should be present. Consultant and Client agree that the

discovery of unanticipated hazardous materials constitutes a changed condition mandating a renegotiation of the scope of work. Consultant and Client also agree that the discovery of unanticipated hazardous materials may make it necessary for Consultant to take immediate measures to protect health and safety. Client agrees to compensate Consultant for any equipment decontamination or other costs incident to the discovery of unanticipated hazardous waste.

7.4 Consultant agrees to notify Client when unanticipated hazardous materials or suspected hazardous materials are encountered. Client agrees to make any disclosures required by law to the appropriate governing agencies. Client also agrees to hold Consultant harmless for any and all consequences of disclosures made by Consultant which are required by governing law. In the event the project site is not owned by Client, Client recognizes that it is the Client's responsibility to inform the property owner of the discovery of unanticipated hazardous materials or suspected hazardous materials.

7.5 Notwithstanding any other provision of the Agreement, Client waives any claim against Consultant, and to the maximum extent permitted by law, agrees to defend, indemnify, and save Consultant harmless from any claim, liability, and/or defense costs for injury or loss arising from Consultant's discovery of unanticipated hazardous materials or suspected hazardous materials including any costs created by delay of the project and any cost associated with possible reduction of the property's value. Client will be responsible for ultimate disposal of any samples secured by the Consultant which are found to be contaminated.

SECTION 8: RISK ALLOCATION *(Must select a or b below if neither is selected a shall prevail)*

☐ 8.1a Client agrees that Consultant's liability for any damage on account of any error, omission or other professional negligence will be limited to a sum not to exceed $50,000 or Consultant's fee, whichever is greater. Client agrees that the foregoing limits of liability extend to all of consultant's employees and professionals who perform any services for Client. If Client prefers to have higher limits on professional liability, Consultant agrees to increase the limits up to a maximum of $1,000,000.00 upon Clients' written request at the time of accepting our proposal provided that Client agrees to pay an additional consideration of four percent of the total fee, or $400.00, whichever is greater. The additional charge for the higher liability limits is because of the greater risk assumed and is not strictly a charge for additional professional liability insurance.

☐ 8.1b Client agrees that Consultant's liability for any damage on account of any error, omission or other professional negligence will be limited to a sum not to exceed _____or Consultant's fee, whichever is greater. Client agrees that the foregoing limits of liability extend to all of consultant's employees and professionals who perform any services for Client.

SECTION 9: INSURANCE

9.1 The Consultant represents and warrants that it and its agents, staff and Consultants employed by it, is and are protected by worker=s compensation insurance and that Consultant has such coverage under public liability and property damage insurance policies which the Consultant deems to be adequate. Certificates for all such policies of insurance shall be provided to Client upon request in writing. Within the limits and conditions of such insurance, Consultant agrees to indemnify and save Client harmless from and against loss, damage, or liability arising from negligent acts by Consultant, its agents, staff, and consultants employed by it. The Consultant shall not be responsible for any loss, damage or liability beyond the amounts, limits, and conditions of such insurance or the limits described in Section 8, whichever is less. The Client agrees to defend, indemnify and save Consultant harmless for loss, damage or liability arising from acts by Client, Client's agent, staff, and other consultants employed by Client.

SECTION 10: DISPUTE RESOLUTION

10.1 All claims, disputes, and other matters in controversy between Consultant and Client arising out of or in any way related to this Agreement will be submitted to Aalternative dispute resolution (ADR) such as mediation and/or arbitration, before and as a condition precedent to other remedies provided by law.

10.2 If a dispute at law arises related to the services provided under this Agreement and that dispute requires litigation instead of ADR as provided above, then:

(a) the claim will be brought and tried in judicial jurisdiction of the court of the county where Consultant's principal place of business is located and Client waives the right to remove the action to any other county or judicial jurisdiction, and

(b) The prevailing party will be entitled to recovery of all reasonable costs incurred, including staff time, court costs, attorneys' fees, and other claim related expenses.

SECTION 11: TERMINATION

11.1 This agreement may be terminated by either party upon seven (7) days written notice in the event of substantial failure by the other party to perform in accordance with the terms hereof. Such termination shall not be effective if that substantial failure has been remedied before expiration of the period specified in the written notice. In the event of termination, Consultant shall be paid for services performed to the termination notice date plus reasonable termination expenses.

11.2 In the event of termination, or suspension for more than three (3) months, prior to completion of all reports contemplated by the Agreement, Consultant may complete such analyses and records as are necessary to complete his files and may also complete a report on the services performed to the date of notice of termination or suspension. The expense of termination or suspension shall include all direct costs of Consultant in completing such analyses, records and reports.

SECTION 12: ASSIGNS

12.1 Neither the Client nor the Consultant may delegate, assign, sublet or transfer his duties or interest in this Agreement without the written consent of the other party.

SECTION 13. GOVERNING LAW AND SURVIVAL

13.1 The laws of the State of Florida will govern the validity of these Terms, their interpretation and performance.

13.2 If any of the provisions contained in this Agreement are held illegal, invalid, or unenforceable, the enforceability of the remaining provisions will not be impaired. Limitations of liability and indemnities will survive termination of this Agreement for any cause.

APPENDIX B

Important Information About Your Geotechnical Engineering Report
Constraints and Restrictions
General Conditions

Important Information About Your Geotechnical Engineering Report

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

The following information is provided to help you manage your risks.

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 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 your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one–not even you*–should apply the 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.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of 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,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- 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 study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the 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 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 construction recommendations included in your report. *Those 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 recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject To Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower 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. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing 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 Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors 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 contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors 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 contractors do not 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 such risks, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations", many of the 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.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental 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 geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Rely on Your Geotechnical Engineer for Additional Assistance

Membership in ASFE exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

ASFE

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

CONSTRAINTS AND RESTRICTIONS

WARRANTY

Universal Engineering Sciences has prepared this report for our client for his exclusive use, in accordance with generally accepted soil and foundation engineering practices, and makes no other warranty either expressed or implied as to the professional advice provided in the report.

UNANTICIPATED SOIL CONDITIONS

The analysis and recommendations submitted in this report are based upon the data obtained from soil borings performed at the locations indicated on the Boring Location Plan. This report does not reflect any variations which may occur between these borings.

The nature and extent of variations between borings may not become known until excavation begins. If variations appear, we may have to re-evaluate our recommendations after performing on-site observations and noting the characteristics of any variations.

CHANGED CONDITIONS

We recommend that the specifications for the project require that the contractor immediately notify Universal Engineering Sciences, as well as the owner, when subsurface conditions are encountered that are different from those present in this report.

No claim by the contractor for any conditions differing from those anticipated in the plans, specifications, and those found in this report, should be allowed unless the contractor notifies the owner and Universal Engineering Sciences of such changed conditions. Further, we recommend that all foundation work and site improvements be observed by a representative of Universal Engineering Sciences to monitor field conditions and changes, to verify design assumptions and to evaluate and recommend any appropriate modifications to this report.

MISINTERPRETATION OF SOIL ENGINEERING REPORT

Universal Engineering Sciences is responsible for the conclusions and opinions contained within this report based upon the data relating only to the specific project and location discussed herein. If the conclusions or recommendations based upon the data presented are made by others, those conclusions or recommendations are not the responsibility of Universal Engineering Sciences.

CHANGED STRUCTURE OR LOCATION

This report was prepared in order to aid in the evaluation of this project and to assist the architect or engineer in the design of this project. If any changes in the design or location of the structure as outlined in this report are planned, or if any structures are included or added that are not discussed in the report, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions modified or approved by Universal Engineering Sciences.

USE OF REPORT BY BIDDERS

Bidders who are examining the report prior to submission of a bid are cautioned that this report was prepared as an aid to the designers of the project and it may affect actual construction operations.

Bidders are urged to make their own soil borings, test pits, test caissons or other investigations to determine those conditions that may affect construction operations. Universal Engineering Sciences cannot be responsible for any interpretations made from this report or the attached boring logs with regard to their adequacy in reflecting subsurface conditions which will affect construction operations.

STRATA CHANGES

Strata changes are indicated by a definite line on the boring logs which accompany this report. However, the actual change in the ground may be more gradual. Where changes occur between soil samples, the location of the change must necessarily be estimated using all available information and may not be shown at the exact depth.

OBSERVATIONS DURING DRILLING

Attempts are made to detect and/or identify occurrences during drilling and sampling, such as: water level, boulders, zones of lost circulation, relative ease or resistance to drilling progress, unusual sample recovery, variation of driving resistance, obstructions, etc.; however, lack of mention does not preclude their presence.

WATER LEVELS

Water level readings have been made in the drill holes during drilling and they indicate normally occurring conditions. Water levels may not have been stabilized at the last reading. This data has been reviewed and interpretations made in this report. However, it must be noted that fluctuations in the level of the groundwater may occur

due to variations in rainfall, temperature, tides, and other factors not evident at the time measurements were made and reported. Since the probability of such variations is anticipated, design drawings and specifications should accommodate such possibilities and construction planning should be based upon such assumptions of variations.

LOCATION OF BURIED OBJECTS

All users of this report are cautioned that there was no requirement for Universal Engineering Sciences to attempt to locate any man-made buried objects during the course of this exploration and that no attempt was made by Universal Engineering Sciences to locate any such buried objects. Universal Engineering Sciences cannot be responsible for any buried man-made objects which are subsequently encountered during construction that are not discussed within the text of this report.

TIME

This report reflects the soil conditions at the time of investigation. If the report is not used in a reasonable amount of time, significant changes to the site may occur and additional reviews may be required.

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Coordination drawings.
2. Requests for Information (RFIs).
3. Project Web site.
4. Project meetings.

B. Related Sections:
1. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.2 DEFINITIONS

A. RFI: Request from Owner, Architect, or Contractor seeking information from each other during construction.

1.3 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Project closeout activities.

1.4 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings in accordance with requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
b. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire protection, fire alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire protection, fire alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor's responsibility.

1.5 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

C. RFI Forms: AIA Document G716 or Software-generated form with substantially the same content as indicated above, acceptable to Architect.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

a. Requests for approval of submittals.
b. Requests for approval of substitutions.
c. Requests for coordination information already indicated in the Contract Documents.
d. Requests for adjustments in the Contract Time or the Contract Sum.
e. Requests for interpretation of Architect's actions on submittals.
f. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.

3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log each time an RFI is submitted. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.6 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Tentative construction schedule.
    b. Phasing.

c. Critical work sequencing and long-lead items.
d. Designation of key personnel and their duties.
e. Procedures for processing field decisions and Change Orders.
f. Procedures for RFIs.
g. Procedures for testing and inspecting.
h. Procedures for processing Applications for Payment.
i. Distribution of the Contract Documents.
j. Submittal procedures.
k. Preparation of record documents.
l. Use of the premises and existing building.
m. Work restrictions.
n. Working hours.
o. Owner's occupancy requirements.
p. Responsibility for temporary facilities and controls.
q. Procedures for moisture and mold control.
r. Procedures for disruptions and shutdowns.
s. Construction waste management and recycling.
t. Parking availability.
u. Office, work, and storage areas.
v. Equipment deliveries and priorities.
w. First aid.
x. Security.
y. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: 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 Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility problems.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written recommendations.
n. Warranty requirements.

o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Conduct progress meetings at monthly intervals.

1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction 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 schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.

9) Progress cleaning.
10) Quality and work standards.
11) Status of correction of deficient items.
12) Field observations.
13) Status of RFIs.
14) Status of proposal requests.
15) Pending changes.
16) Status of Change Orders.
17) Pending claims and disputes.
18) Documentation of information for payment requests.

3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's construction schedule.
2. Daily construction reports.
3. Field condition reports.

1.2 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of the Project.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.

1.3 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. PDF electronic file.

B. Start-up Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

D. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.

E. Daily Construction Reports: Submit at monthly intervals.

F. Field Condition Reports: Submit at time of discovery of differing conditions.

1.4 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.

2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include not less than 15 days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
6. Punch List and Final Completion: Include not more than 30 days for punch list and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.
3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
4. Work Restrictions: Show the effect of the following items on the schedule:

    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use of premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.

5. Work Stages: Indicate important stages of construction for each major portion of the Work.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered RFIs.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.

F. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule.

G. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's construction schedule within 30 days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Start-up Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.

a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
3. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to correlate with Contract Time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the start-up network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

a. Preparation and processing of submittals.
b. Mobilization and demobilization.
c. Purchase of materials.
d. Delivery.

e. Fabrication.
f. Utility interruptions.
g. Installation.
h. Work by Owner that may affect or be affected by Contractor's activities.
i. Testing and commissioning.
j. Punch list and final completion.
k. Activities occurring following final completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.

F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Principal events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the schedule of values).

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

2.4 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events.
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction and/or Work Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules 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 performance of construction activities.

END OF SECTION 013200

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Periodic construction photographs.

B. Related Sections:

1. Division 01 Section "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.

1.2 INFORMATIONAL SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph and video recording. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Photographs: Submit image files within three days of taking photographs.

1. Digital Camera: Minimum sensor resolution of 10 megapixels.
2. Identification: Provide the following information with each image description in file metadata tag:

a. Name of Project.
b. Name and contact information for photographer.
c. Date photograph was taken.
d. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

C. Construction Photographs: Submit two prints of each photographic view within seven days of taking photographs.

1. Format: 8-by-10-inch (203-by-254-mm) smooth-surface matte prints on single-weight commercial-grade photographic paper, enclosed back to back in clear plastic sleeves that are punched for standard three-ring binder.
2. Identification: On back of each print, provide an applied label or rubber-stamped impression with the following information:

a. Name of Project.
b. Name and contact information for photographer.
c. Name of Architect.
d. Name of Contractor.

e. Date photograph was taken if not date stamped by camera.
f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
g. Unique sequential identifier keyed to accompanying key plan.

1.3 QUALITY ASSURANCE

A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

1.4 COORDINATION

A. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities, including temporary lighting required to produce clear, well-lit photographs.

1.5 USAGE RIGHTS

A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in JPG format, with minimum size of 10 megapixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. Photographer: Engage a qualified photographer to take construction photographs.

B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in file name for each image.

2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect.

D. Preconstruction Photographs: Before commencement of excavation and commencement of demolition and starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points to adequately document the existing conditions.

1. Flag excavation areas and construction limits before taking construction photographs.
2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
3. Take 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.

E. Periodic Construction Photographs: Take 20 photographs monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

F. Final Completion Construction Photographs: Take 20 color photographs after date of Substantial Completion for submission as Project Record Documents. Architect will inform photographer of desired vantage points.

G. Additional Photographs: Architect may request photographs in addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum.

1. Three days' notice will be given, where feasible.
2. In emergency situations, take additional photographs within 24 hours of request.
3. Circumstances that could require additional photographs include, but are not limited to, the following:

a. Special events planned at Project site.
b. Immediate follow-up when on-site events result in construction damage or losses.
c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
d. Substantial Completion of a major phase or component of the Work.
e. Extra record photographs at time of final acceptance.
f. Owner's request for special publicity photographs.

END OF SECTION 013233

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action.

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.3 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Architect and additional time for handling and reviewing submittals required by those corrections.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic copies of CAD Drawings of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.

1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.

    a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
    b. Contractor shall execute a data licensing agreement in the form of an Agreement form acceptable to the Owner and Architect.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

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 parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

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

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.

D. Identification and Information: Place a permanent label or title block on each paper copy submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information for processing and recording action taken:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Construction Manager.
    e. Name of Contractor.
    f. Name of subcontractor.
    g. Name of supplier.
    h. Name of manufacturer.
    i. Submittal number or other unique identifier, including revision identifier.

        1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

    j. Number and title of appropriate Specification Section.
    k. Drawing number and detail references, as appropriate.
    l. Location(s) where product is to be installed, as appropriate.
    m. Other necessary identification.

E. Identification and Information: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

    a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
4. Include the following information on an inserted cover sheet:

    a. Project name.
    b. Date.
    c. Name and address of Architect.
    d. Name of Construction Manager.
    e. Name of Contractor.
    f. Name of firm or entity that prepared submittal.
    g. Name of subcontractor.
    h. Name of supplier.
    i. Name of manufacturer.
    j. Number and title of appropriate Specification Section.
    k. Drawing number and detail references, as appropriate.
    l. Location(s) where product is to be installed, as appropriate.
    m. Related physical samples submitted directly.
    n. Other necessary identification.

F. Options: Identify options requiring selection by the Architect.

G. Deviations: Identify deviations from the Contract Documents on submittals.

H. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.

I. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.

1. Transmittal Form: Use General Contractor’s standard transmittal.
2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

J. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

K. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

L. Use for Construction: Use only final submittals that are marked with approval notation from Architect's submittal review form attached to the actual submittal.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements:

1. Submit electronic submittals via email as PDF electronic files.

    a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Action Submittals: Submit three paper copies of each submittal, unless otherwise indicated. Architect will return two copies, except when the submittals are forwarded to the engineers for review. In this case, the Architect will return one copy.

3. Informational Submittals: Submit three paper copies of each submittal, unless otherwise indicated. Architect will return two copies, except when the submittals are forwarded to the engineers for review. In this case, the Architect will return one copy.
4. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."
5. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

    a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
    b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

6. Test and Inspection Reports Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams showing factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:

    a. PDF electronic file.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 42 inches (750 by 1067 mm).
3. Submit Shop Drawings in the following format:

    a. PDF electronic file.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

    a. Generic description of Sample.
    b. Product name and name of manufacturer.
    c. Sample source.
    d. Number and title of applicable Specification Section.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

    a. Number of Samples: Submit two full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

    a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a Project record sample.

        1) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Submit product schedule in the following format:

    a. PDF electronic file.

F. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

G. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."

H. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design.

1. Submit subcontract list in the following format:

    a. PDF electronic file.

J. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

L. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.

M. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

N. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

O. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

P. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

Q. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

R. Product Test Reports: Submit written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

S. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

T. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."

U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

W. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

X. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

Y. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally-signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Division 01 Section "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will attach a submittal review form to each submittal with the required action listed.

C. Informational Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will attach a submittal review form to each submittal with the required action listed.

D. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."

b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. Refer to Divisions 02 through 49. Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:

    a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable

products or substitutions for Contractor's convenience will not be considered, unless otherwise indicated.

b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

4. Manufacturers:

a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered, unless otherwise indicated.

b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.
9. Correction of the Work.

B. Related Sections:

1. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.2 INFORMATIONAL SUBMITTALS

A. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.3 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

1.4 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Architect according to requirements in Division 01 Section "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
3. Inform installers of lines and levels to which they must comply.
4. Check the location, level and plumb, of every major element as the Work progresses.
5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each

survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

D. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous construction waste.
2. Recycling nonhazardous construction waste.
3. Disposing of nonhazardous construction waste.

B. Related Requirements:
1. Section 042000 "Unit Masonry" for disposal requirements for masonry waste.
2. Section 311000 "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.2 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

C. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

D. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

E. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.3 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for salvage/recycling of 75 percent by weight of total non-hazardous solid waste generated by the Work. Facilitate recycling and salvage of materials.

1.4 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within 30 days of date established for the Notice to Proceed.

1.5 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons (tonnes).
4. Quantity of waste salvaged, both estimated and actual in tons (tonnes).
5. Quantity of waste recycled, both estimated and actual in tons (tonnes).
6. Total quantity of waste recovered (salvaged plus recycled) in tons (tonnes).
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. LEED Submittal: LEED letter template for Credit MR 2.1 and Credit MR 2.2, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.

H. Qualification Data: For waste management coordinator.

1.6 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: LEED-Accredited Professional, certified by USGBC.

1.7 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
1. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.

3.2 RECYCLING CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.3 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

3.4 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

3.5 SAMPLE FORMS

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.

B. Related Sections:

1. Division 01 Section "Photographic Documentation" for submitting final completion construction photographic documentation.
2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
4. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.2 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.

9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.3 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first.

2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Submit list of incomplete items in the following format:

    a. PDF electronic file.

1.5 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide table of contents at beginning of document.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that meet Green Seal GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
g. Sweep concrete floors broom clean in unoccupied spaces.
h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
j. Remove labels that are not permanent.
k. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.

l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
m. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
q. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.

B. Related Sections:

1. Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.2 CLOSEOUT SUBMITTALS

A. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically-indexed file. Submit on digital media acceptable to Architect.

a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically-linked operation and maintenance directory.
b. Enable inserted reviewer comments on draft submittals.

B. Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or modify each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Agent.
9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based upon file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel upon opening file.

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

    a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.3 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.

9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.

F. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Sections:

1. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
2. Divisions 02 through 49 Sections for specific requirements for project record documents of the Work in those Sections.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set(s) of marked-up record prints.
2. Number of Copies: Submit copies of record Drawings as follows:

a. Initial Submittal: Submit one paper copy set of marked-up record prints and one set of plots from corrected record digital data files. Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
b. Final Submittal: Submit PDF electronic files of marked-up record prints. Print each Drawing, whether or not changes and additional information were recorded.

B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

    a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    b. Record data as soon as possible after obtaining it.
    c. Record and check the markup before enclosing concealed installations.

2. Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked-up record prints.
3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
2. Format: DWG, Version, operating in Microsoft Windows operating system.
3. Format: Annotated PDF electronic file with comment function enabled.
4. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
5. Refer instances of uncertainty to Architect for resolution.
6. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Architect.
    e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as annotated PDF electronic file.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as annotated PDF electronic file.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as PDF electronic file.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and modifications to project record documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for

construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training video recordings.

1.2 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.

1. At completion of training, submit complete training manual(s) for Owner's use.

1.3 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

1.4 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

B. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Operations manuals.
    c. Maintenance manuals.
    d. Project record documents.
    e. Identification systems.
    f. Warranties and bonds.
    g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

    a. Startup procedures.
    b. Equipment or system break-in procedures.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.
    e. Control sequences.
    f. Safety procedures.
    g. Instructions on stopping.
    h. Normal shutdown instructions.
    i. Operating procedures for emergencies.
    j. Operating procedures for system, subsystem, or equipment failure.
    k. Seasonal and weekend operating instructions.
    l. Required sequences for electric or electronic systems.
    m. Special operating instructions and procedures.

5. Adjustments: Include the following:

    a. Alignments.

b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. Owner will furnish an instructor to describe Owner's operational philosophy.
3. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner with at least seven days' advance notice.

3.2 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

B. Video Recording Format: Provide high-quality color video recordings with menu navigation in format acceptable to Architect.

C. Narration: Describe scenes on video recording by audio narration by microphone while or dubbing audio narration off-site after video recording is recorded. Include description of items being viewed.

D. Pre-Produced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 017900

SECTION 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS - LEED FOR NEW CONSTRUCTION AND MAJOR RENOVATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements and procedures for compliance with certain USGBC LEED prerequisites and credits needed for Project to obtain LEED Silver certification based on USGBC's "LEED 2009 for New Construction & Major Renovations."

1. Other LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
2. Additional LEED prerequisites and credits needed to obtain the indicated LEED certification depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.
3. A copy of the LEED Project checklist is attached at the end of this Section for information only.
4. Specific requirements for LEED are also included in other Sections.

1.2 DEFINITIONS

A. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

B. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

C. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

1. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
2. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Respond to questions and requests from Architect and the USGBC regarding LEED credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures until the USGBC has made its determination on the project's LEED certification application. Document responses as informational submittals.

1.4 ACTION SUBMITTALS

A. LEED Documentation Submittals:

1. Credit EA 5: Product data and wiring diagrams for sensors and data collection system used to provide continuous metering of building energy-consumption performance over time.
2. Credit MR 4: Product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating cost for each product having recycled content.
3. Credit MR 5: Product data for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
4. Credit IEQ 3.1:

    a. Construction indoor-air-quality management plan.
    b. Product data for temporary filtration media.
    c. Product data for filtration media used during occupancy.
    d. Construction Documentation: Six photographs at three different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the indoor-air-quality management measures, such as protection of ducts and on-site stored or installed absorptive materials.

5. Credit IEQ 3.2:

    a. Signed statement describing the building air flush-out procedures including the dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.
    b. Product data for filtration media used during flush-out and during occupancy.
    c. Report from testing and inspecting agency indicating results of indoor-air-quality testing and documentation showing compliance with indoor-air-quality testing procedures and requirements.

6. Credit IEQ 4.1: Product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used.
7. Credit IEQ 4.2: Product data for paints and coatings used inside the weatherproofing system indicating VOC content of each product used.
8. Credit IEQ 4.4: Product data for products containing composite wood or agrifiber products or wood glues indicating that they do not contain urea-formaldehyde resin.

1.5 INFORMATIONAL SUBMITTALS

A. Project Materials Cost Data: Provide statement indicating total cost for materials used for Project. Costs exclude labor, overhead, and profit. Include breakout of costs for the following categories of items:

1. Furniture.
2. Plumbing.
3. Mechanical.
4. Electrical.
5. Specialty items such as elevators and equipment.
6. Wood-based construction materials.

B. LEED Action Plans: Provide preliminary submittals within 14 days of date established for the Notice to Proceed indicating how the following requirements will be met:

1. Credit MR 4: List of proposed materials with recycled content. Indicate cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.
2. Credit MR 5: List of proposed regional materials. Identify each regional material, including its source, cost, and the fraction by weight that is considered regional.

C. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to LEED credits, the Contractor shall determine additional materials and procedures necessary to obtain LEED credits indicated.

2.2 RECYCLED CONTENT OF MATERIALS

A. Credit MR 4: Building materials shall have recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content for Project constitutes a minimum of 10 percent of cost of materials used for Project.

1. Cost of post-consumer recycled content plus one-half of pre-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content plus one-half of pre-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.
2. Do not include furniture, plumbing, mechanical and electrical components, and specialty items such as elevators and equipment in the calculation.

2.3 REGIONAL MATERIALS

A. Credit MR 5: Not less than 10 percent of building materials (by cost) shall be regional materials.

2.4 LOW-EMITTING MATERIALS

A. Credit IEQ 4.1: For field applications that are inside the weatherproofing system, adhesives and sealants shall comply with the following VOC content limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L.
2. Metal-to-Metal Adhesives: 30 g/L.
3. Adhesives for Porous Materials (Except Wood): 50 g/L.
4. Subfloor Adhesives: 50 g/L.
5. Plastic Foam Adhesives: 50 g/L.
6. Carpet Adhesives: 50 g/L.
7. Carpet Pad Adhesives: 50 g/L.
8. VCT and Asphalt Tile Adhesives: 50 g/L.
9. Cove Base Adhesives: 50 g/L.
10. Gypsum Board and Panel Adhesives: 50 g/L.
11. Rubber Floor Adhesives: 60 g/L.
12. Ceramic Tile Adhesives: 65 g/L.
13. Multipurpose Construction Adhesives: 70 g/L.
14. Fiberglass Adhesives: 80 g/L.
15. Contact Adhesive: 80 g/L.
16. Structural Glazing Adhesives: 100 g/L.
17. Wood Flooring Adhesive: 100 g/L.
18. Structural Wood Member Adhesive: 140 g/L.
19. Single-Ply Roof Membrane Adhesive: 250 g/L.
20. Special-Purpose Contact Adhesive (contact adhesive that is used to bond melamine covered board, metal, unsupported vinyl, rubber, or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.
21. Top and Trim Adhesive: 250 g/L.
22. Plastic Cement Welding Compounds: 250 g/L.
23. ABS Welding Compounds: 325 g/L.
24. CPVC Welding Compounds: 490 g/L.
25. PVC Welding Compounds: 510 g/L.
26. Adhesive Primer for Plastic: 550 g/L.
27. Sheet-Applied Rubber Lining Adhesive: 850 g/L.
28. Aerosol Adhesive, General Purpose Mist Spray: 65 percent by weight.
29. Aerosol Adhesive, General Purpose Web Spray: 55 percent by weight.
30. Special Purpose Aerosol Adhesive (All Types): 70 percent by weight.
31. Other Adhesives: 250 g/L.
32. Architectural Sealants: 250 g/L.
33. Nonmembrane Roof Sealants: 300 g/L.
34. Single-Ply Roof Membrane Sealants: 450 g/L.
35. Other Sealants: 420 g/L.
36. Sealant Primers for Nonporous Substrates: 250 g/L.

37. Sealant Primers for Porous Substrates: 775 g/L.
38. Modified Bituminous Sealant Primers: 500 g/L.
39. Other Sealant Primers: 750 g/L.

B. Credit IEQ 4.2: For field applications that are inside the weatherproofing system, paints and coatings shall comply with the following VOC content limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Flat Paints and Coatings: VOC not more than 50 g/L.
2. Nonflat Paints and Coatings: VOC not more than 150 g/L.
3. Dry-Fog Coatings: VOC not more than 400 g/L.
4. Primers, Sealers, and Undercoaters: VOC not more than 200 g/L.
5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
6. Zinc-Rich Industrial Maintenance Primers: VOC not more than 340 g/L.
7. Pretreatment Wash Primers: VOC not more than 420 g/L.
8. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
9. Clear Wood Finishes, Lacquers: VOC not more than 550 g/L.
10. Floor Coatings: VOC not more than 100 g/L.
11. Shellacs, Clear: VOC not more than 730 g/L.
12. Shellacs, Pigmented: VOC not more than 550 g/L.
13. Stains: VOC not more than 250 g/L.

C. Credit IEQ 4.4: Composite wood, agrifiber products, and adhesives shall not contain urea-formaldehyde resin.

PART 3 - EXECUTION

3.1 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

A. Credit IEQ 3.1: Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."

1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Section 015000 "Temporary Facilities and Controls," install filter media having a MERV 8 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.
2. Replace all air filters immediately prior to occupancy.

END OF SECTION 018113.13

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Data for Credit IEQ 4.3: For liquid floor treatments and curing and sealing compounds, documentation including printed statement of VOC content.
3. Design Mixtures for Credit ID 1.1: For each concrete mixture containing fly ash as a replacement for portland cement or other portland cement replacements, and for equivalent concrete mixtures that do not contain portland cement replacements.

C. Design Mixtures: For each concrete mixture.

D. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement.

1.3 INFORMATIONAL SUBMITTALS

A. Material certificates.

B. Material test reports.

C. Floor surface flatness and levelness measurements.

1.4 QUALITY ASSURANCE

A. 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."

B. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

C. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

E. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

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.

2.2 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 60 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

D. Galvanized-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from galvanized-steel wire into flat sheets.

E. 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.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I. Supplement with the following:

a. Fly Ash: ASTM C 618, Class F.
b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, graded.

1. Maximum Coarse-Aggregate Size: As indicated.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

2.4 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will 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.

2.5 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

2.6 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A, B, or C. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.7 LIQUID FLOOR TREATMENTS

A. VOC Content: Liquid floor treatments shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

C. Products: Provide Conspec by Dayton Superior; Intraseal or approved equivalent. Product must include a minimum 10 year warranty.

2.8 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

F. Natural Cellulose Fabric (NCF) Wet Curing Blanket: UltraCure NCF by McTech Group or approved equivalent.

G. Concrete surfaces to receive penetrating liquid floor treatment (Intraseal or approved equivalent) shall utilize NCF Wet Curing Blanket unless an alternate curing system is approved by the floor treatment manufacturer and architect. The penetrating liquid floor treatment is not compatible with a membrane-forming curing compound. If a membrane-forming curing compound is utilized on a concrete surface to receive the penetrating liquid floor treatment, the curing compound will be required to be removed. The removal of the curing compound may involve chemical treatment and mechanical scrubbing.

2.9 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Semi-rigid Joint Filler: Two-component, semi-rigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 85 or greater per ASTM D 2240.

1. Products: Provide MM-80/MM-80P semi-rigid epoxy joint filler by Metzger/McGuire Co. or approved equivalent. Color to be selected by Architect.

2.10 CONCRETE MIXTURES

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.

B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.

C. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing or 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.

D. Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: As indicated.
2. Slump Limit: 4 inches, plus or minus 1 inch (8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture).
3. Air Content: 2.5 to 4.5 percent, at point of delivery.
4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.11 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.12 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, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, 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.

3.2 EMBEDDED ITEMS

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.

3.3 VAPOR RETARDERS

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 and seal with manufacturer's recommended tape.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 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 and as approved by Architect.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints as follows:

1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will 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.

E. Waterstops: Install in construction joints and at other joints indicated according to manufacturer's written instructions.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be 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. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

C. Cold-Weather Placement: Comply with ACI 306.1.

D. Hot-Weather Placement: Comply with ACI 305.

3.7 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 or to be covered with a coating or covering material applied directly to concrete.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 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 in one direction.

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.

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. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 3/16 inch.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

3.9 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 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 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. 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.
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, 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.
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.

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.

3.10 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete that is less than seven days old.
3. Do not apply when the air or surface temperatures are less than 40°F.
4. Apply liquid onto surface to the point of rejection, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous. Do not let treated surfaces dry during application or coats.
5. Puddles of liquid floor hardener shall be squeegeed out to prevent white residue from appearing on the surface. If residue appears, remove per manufacturer’s instructions.
6. Maintenance cleaning of the floor should be accomplished with the use of a mechanical scrubber.

3.11 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions. Products and installation shall be in compliance or exceed the joint filling criteria established in ACI 302 and ACI 360.

1. Defer joint filling as long as possible to allow for maximum slab shrinkage and joint widening. As a minimum, joint filling shall not occur until concrete has aged at least six months and the facility is under permanent temperature control.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semi-rigid joint filler full depth in saw-cut joints at interior, exposed areas. Overfill joint and trim joint filler flush with top of joint after hardening. The use of a compressible foam backer rod is strictly prohibited. Significant deficiencies in workmanship, including less than proper filler depth, inadequate joint cleaning, concave filler profile, etc. shall require removal and replacement.

3.12 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.

3.13 FIELD QUALITY CONTROL

A. Testing and Inspecting: Contractor will engage an independent qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

END OF SECTION 033000

SECTION 042200 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units (CMU's).
2. Decorative concrete masonry units.
3. Steel reinforcing bars.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:

1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: For reinforcing steel. Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.

D. Samples: For each type and color of exposed masonry unit.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of product indicated. For masonry units include material test reports substantiating compliance with requirements.

B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

1.4 QUALITY ASSURANCE

A. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

1.5 PROJECT CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

A. Regional Materials: CMUs shall be manufactured within 500 miles (800 km) of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

B. Shapes: Provide shapes indicated and for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

C. CMUs: ASTM C 90.

1. Unit Compressive Strength: As indicated.
2. Density Classification: Normal weight.

D. Decorative CMUs: ASTM C 90.

1. Products: Subject to compliance with requirements, provide the following Basis-of-Design Concrete Masonry Unit or equivalent:

a. A-1 Block, Color #S115 for the split-face base and field block and the mock-up building smooth CMU.

b. A-1 Block, Color #S-116 for the top two courses of the smooth CMU accent color.

2. Unit Compressive Strength: Provide units with minimum average net-area compressive strength as indicated.
3. Density Classification: Normal weight.
4. Pattern and Texture:

a. Standard pattern, split-face finish. Match Architect's samples.

b. Standard pattern, smooth finish (color to match split face units). Match Architect's samples.

2.3 MASONRY WALL LINTELS

A. Masonry Wall Lintels: Preformed steel lintel shall be galvanized coil steel as manufactured by Powers Steel and Wire Products, Inc. or approved equivalent. Steel grade shall be ASTM A570 Grade C. Steel lintels shall bear 3-1/2" on fully grouted cells. Shore lintels as required to compensate for dead load deflection on non-cured masonry grout. Install steel lintels per the manufacturer's recommendations and specifications.

2.4 MORTAR AND GROUT MATERIALS

A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

C. Hydrated Lime: ASTM C 207, Type S.

D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

E. Mortar Cement: ASTM C 1329.

F. Aggregate for Mortar: ASTM C 144.

1. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
2. White-Mortar Aggregates: Natural white sand or crushed white stone.
3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

G. Aggregate for Grout: ASTM C 404.

H. Water: Potable.

2.5 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).

B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.

1. Interior Walls: Hot-dip galvanized, carbon steel.
2. Exterior Walls: Hot-dip galvanized, carbon steel.
3. Wire Size for Side Rods: 0.148-inch (3.77-mm) diameter.
4. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
6. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.

2.6 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.

B. Partition Top anchors: 0.105-inch- (2.66-mm-) thick metal plate with 3/8-inch- (9.5-mm-) diameter metal rod 6 inches (152 mm) long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

C. Anchor Bolts: Headed steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

2.7 EMBEDDED FLASHING MATERIALS

A. Single-Wythe CMU Flashing System: System of CMU cell flashing pans and interlocking CMU web covers made from high-density polyethylene incorporating chemical stabilizers that prevent UV degradation. Cell flashing pans have integral weep spouts that are designed to be built into mortar bed joints and weep collected moisture to the exterior of CMU walls and that extend into the cell to prevent clogging with mortar.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Mortar Net USA, Ltd.; Blok-Flash.

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.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; formulated from neoprene, urethane or PVC.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

2.9 MORTAR AND GROUT MIXES

A. General: 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.
2. Use portland cement-lime or mortar cement mortar unless otherwise indicated.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.

1. For masonry below grade or in contact with earth, use Type S.
2. For reinforced masonry, use Type N.
3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.

D. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa).
3. Provide grout with a slump of 8 to 11 inches (203 to 279 mm) as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).

3.2 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

C. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

E. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

F. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.3 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.4 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).

1. Space reinforcement not more than 16 inches (406 mm) o.c.
2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

3.5 FLASHING

A. General: Install embedded flashing in masonry at lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

B. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

3.6 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms 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.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

3.7 REPAIRING, POINTING, AND CLEANING

A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
2. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.8 MASONRY WASTE DISPOSAL

A. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042200

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Roof sheathing.
3. Sheathing joint and penetration treatment.

1.2 ACTION SUBMITTALS

A. LEED Submittals:

1. Certificates for Credit MR 7: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
2. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS

A. Certified Wood: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":

1. Plywood.

B. Plywood: Either DOC PS 1 or DOC PS 2 unless otherwise indicated.

2.2 ROOF SHEATHING

A. Plywood Roof Sheathing: Exposure 1 sheathing.

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

D. Coordinate roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

SECTION 061753 - SHOP-FABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood roof trusses.

1.2 ACTION SUBMITTALS

A. Product Data: For metal-plate connectors, metal truss accessories, and fasteners.

B. LEED Submittals:

1. Certificates for Credit MR 7: Chain-of-custody certificates indicating that wood trusses and permanent bracing comply with forest certification requirements. Include documentation that fabricator is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.

C. Shop Drawings: Show fabrication and installation details for trusses.

1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
2. Indicate sizes, stress grades, and species of lumber.
3. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
4. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
5. Show splice details and bearing details.

D. Delegated-Design Submittal: For metal-plate-connected wood trusses indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Evaluation Reports: For the following, from ICC-ES:

1. Metal-plate connectors.
2. Metal truss accessories.

1.4 QUALITY ASSURANCE

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.

1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that complies with quality-control procedures in TPI 1 and that involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction and is certified for chain of custody by an FSC-accredited certification body.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Handle and store trusses to comply with recommendations in TPI BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.

2.2 DIMENSION LUMBER

A. Certified Wood: For metal-plate-connected wood trusses and permanent bracing, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Provide dry lumber with 19 percent maximum moisture content at time of dressing.

2.3 METAL CONNECTOR PLATES

A. 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:

1. Alpine Engineered Products, Inc.; an ITW company.
2. Cherokee Metal Products, Inc.; Masengill Machinery Company.
3. CompuTrus, Inc.
4. Eagle Metal Products.
5. Jager Building Systems, Inc.; a Tembec/SGF Rexfor company.
6. MiTek Industries, Inc.; a subsidiary of Berkshire Hathaway Inc.
7. Robbins Engineering, Inc.
8. Truswal Systems Corporation; an ITW company.

B. General: Fabricate connector plates to comply with TPI 1.

C. Hot-Dip Galvanized-Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 (Z180) coating designation; and not less than 0.036 inch (0.9 mm) thick.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
2. Where trusses are exposed to weather, in ground contact, made from pressure-preservative treated wood, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

2.5 METAL FRAMING ANCHORS AND ACCESSORIES

A. 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:

1. Cleveland Steel Specialty Co.
2. KC Metals Products, Inc.
3. Phoenix Metal Products, Inc.
4. Simpson Strong-Tie Co., Inc.
5. USP Structural Connectors.

B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical

data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

2.6 FABRICATION

A. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.

1. Fabricate wood trusses within manufacturing tolerances in TPI 1.

B. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wood trusses only after supporting construction is in place and is braced and secured.

B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.

C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

D. Install and brace trusses according to TPI recommendations and as indicated.

E. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.

F. Securely connect each truss ply required for forming built-up girder trusses.

G. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.

H. Install wood trusses within installation tolerances in TPI 1.

I. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.

J. Replace wood trusses that are damaged or do not meet requirements.

END OF SECTION 061753

SECTION 064113 - WOOD-VENEER-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Architectural wood cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing architectural wood cabinets unless concealed within other construction before cabinet installation.
3. Shop finishing of architectural wood cabinets.

1.2 ACTION SUBMITTALS

A. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

B. Samples:

1. Lumber for transparent finish, for each species and cut, finished on one side and one edge.

1.3 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 WOOD CABINETS FOR TRANSPARENT FINISH

A. Grade: Custom.

B. Regional Materials: Wood cabinets for transparent finish shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

C. Regional Materials: Wood cabinets for transparent finish shall be manufactured within 500 miles (800 km) of Project site.

D. Type of Construction: Frameless.

E. Cabinet and Door and Drawer Front Interface Style: Flush overlay.

F. Reveal Dimension: 1/2 inch (13 mm).

G. Wood for Exposed Surfaces: As indicated.

1. Species: White birch.
2. Cut: Plain sliced/plain sawn.
3. Grain Direction: Vertically for drawer fronts, doors, and fixed panels.
4. Matching of Veneer Leaves: Random match.
5. Veneer Matching within Panel Face: Running match.

H. Semiexposed Surfaces: Provide surface materials indicated below:

1. Surfaces Other Than Drawer Bodies: Compatible species to that indicated for exposed surfaces, stained to match.
2. Drawer Subfronts, Backs, and Sides: Solid-hardwood lumber.
3. Drawer Bottoms: Hardwood plywood.

I. Dust Panels: 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers unless located directly under tops.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: 8 to 13 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
1. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.

2.3 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087111 "Door Hardware (Descriptive Specification)."

B. Butt Hinges: 2-3/4-inch (70-mm), five-knuckle steel hinges made from 0.095-inch- (2.4-mm-) thick metal, and as follows:

C. Back-Mounted Pulls: BHMA A156.9, B02011.

D. Wire Pulls: Back mounted, solid metal 5 inches (127 mm) long, 2-1/2 inches (63.5 mm) deep, and 5/16 inch (8 mm) in diameter.

E. Catches: Magnetic catches, BHMA A156.9, B03141.

F. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

G. Drawer Slides: BHMA A156.9.

1. Grade 1 and Grade 2: Side mounted and extending under bottom edge of drawer; full-extension type; epoxy-coated steel with polymer rollers.
2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
3. For drawers not more than 3 inches (75 mm) high and not more than 24 inches (600 mm) wide, provide Grade 2.
4. For drawers more than 3 inches (75 mm) high but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1.
5. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide Grade 1HD-100.

H. Door and Drawer Silencers: BHMA A156.16, L03011.

I. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
1. Satin Stainless Steel: BHMA 630.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Do not use adhesives that contain urea formaldehyde.

D. Adhesives: Use adhesives that meet 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."

2.5 FABRICATION

A. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

B. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.6 SHOP FINISHING

A. General: Finish architectural wood cabinets at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

B. Finish Materials: Use finish materials that meet 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."

C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural wood cabinets, as applicable to each unit of work.

1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of cabinets.

D. Transparent Finish:

1. Grade: Custom.
2. Finish: System - 4, water-based latex acrylic.
3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to cabinets made from closed-grain wood before staining and finishing.
4. Staining: Match Architect's sample.
5. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
6. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

3.2 INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).

C. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

D. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.

E. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

F. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

END OF SECTION 064113

SECTION 066400 - PLASTIC PANELING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes glass-fiber reinforced plastic (FRP) wall and ceiling paneling and trim accessories.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For plastic paneling and trim accessories.

1.3 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

PART 2 - PRODUCTS

2.1 PLASTIC SHEET PANELING

A. General: Gelcoat-finished, glass-fiber reinforced plastic panels complying with ASTM D 5319.

1. 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. Kemlite Company Inc.
    b. Marlite.
    c. Nudo Products, Inc.

2. Nominal Thickness: Not less than 0.075 inch (1.9 mm).
3. Surface Finish: Smooth for walls and textured for ceilings.
4. Color: As selected by Architect from manufacturer's full range.

2.2 ACCESSORIES

A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.

1. Color: Match panels.

B. Adhesive: As recommended by plastic paneling manufacturer.

C. Sealant: Single-component, mildew-resistant, neutral-curing silicone or Single-component, mildew-resistant, acid-curing silicone sealant recommended by plastic paneling manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that could impair bond of adhesive, including oil, grease, dirt, and dust.

B. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.

C. Lay out paneling before installing. Locate panel joints where indicated and to provide equal panels at ends of walls not less than half the width of full panels and so that trimmed panels at corners are not less than 12 inches (300 mm) wide.

3.2 INSTALLATION

A. Install plastic paneling according to manufacturer's written instructions.

B. Install panels in a full spread of adhesive.

C. Install trim accessories with adhesive.

D. Fill grooves in trim accessories with sealant before installing panels and bed inside corner trim in a bead of sealant.

E. Maintain uniform space between panels and wall fixtures. Fill space with sealant.

F. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION 066400

SECTION 071900 - WATER REPELLENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes penetrating water-repellent treatments for the following vertical surfaces:
   1. Concrete unit masonry.

PART 2 - PRODUCTS

2.1 PENETRATING WATER REPELLENTS

A. Silane, Penetrating Water Repellent: Clear, containing 20 percent or more solids of alkyltrialkoxysilanes; with alcohol, mineral spirits, water, or other proprietary solvent carrier; and with 400 g/L or less of VOCs.

   1. Products: Subject to compliance with requirements, provide one of the following:
      a. BASF Construction Chemicals, LLC; Hydrozo 100 Plus.
      b. Degussa Corp; Protectosil Chem-Trete PB 100.
      c. Pecora Corporation; KlereSeal 9100-S.
      d. PROSOCO, Inc.; SLX100.
      e. Tamms Industries, Inc., Euclid Chemical Company (The); Baracade Silane 100.
      f. Textured Coatings of America, Inc.;Rainstopper 1750 Clear.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.

   1. Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements. Check moisture content in representative locations by method recommended by manufacturer.
   2. Inspect for previously applied treatments that may inhibit penetration or performance of water repellents.
   3. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.
   4. Verify that required repairs are complete, cured, and dry before applying water repellent.

B. Test pH level according to water-repellent manufacturer's written instructions to ensure chemical bond to silica-containing or siliceous minerals.

3.2 PREPARATION

A. Cleaning: Before application of water repellent, clean substrate of substances that could impair penetration or performance of product according to water-repellent manufacturer's written instructions.

B. Coordination with Mortar Joints: Do not apply water repellent until pointing mortar for joints adjacent to surfaces receiving water-repellent treatment has been installed and cured.

C. Coordination with Sealant Joints: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.

1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those required.

3.3 APPLICATION

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.

B. Apply a heavy-saturation coating of water repellent, on surfaces indicated for treatment, using low-pressure spray to the point of saturation. Remove excess material; do not allow material to puddle beyond saturation. Comply with manufacturer's written instructions for application procedure unless otherwise indicated.

C. Apply a second saturation coating, repeating first application. Comply with manufacturer's written instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if written instructions are not applicable to Project conditions.

3.4 CLEANING

A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Correct damage to work of other trades caused by water-repellent application.

B. Comply with manufacturer's written cleaning instructions.

END OF SECTION 071900

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Foam-plastic board insulation.
2. Spray polyurethane foam insulation.
3. Foamed-in-place masonry wall insulation.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Research/evaluation reports.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

1. 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. DiversiFoam Products.
b. Dow Chemical Company (The).
c. Owens Corning.
d. Pactiv Building Products.

2. Type X, 15 psi (104 kPa).

2.2 SPRAY POLYURETHANE FOAM INSULATION

A. Open-Cell Polyurethane Foam Insulation: Spray-applied polyurethane foam using water as a blowing agent, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. BaySystems NorthAmerica, LLC.
b. Demilec (USA) LLC.
c. Icynene Inc.
d. SWD Urethane Company.

2. Minimum density of 0.4 lb/cu. ft. (6.4 kg/cu. m), thermal resistivity of 3.4 deg F x h x sq. ft./Btu x in. at 75 deg F (24 K x m/W at 24 deg C).

2.3 FOAMED-IN-PLACE MASONRY WALL INSULATION

A. Two component thermal insulation produced by combining a plastic (amino-plast) resin and catalyst foaming agent surfactant which, when properly ratioed and mixed together with compressed air produce a cold-setting foam insulation in the hollow cores of hollow concrete unit masonry walls.

1. Basis-of-Design Product: Subject to compliance with requirements, provide “Core-Fill 500” Foam Insulation as manufactured by Tailor Chemical Products, P.O. Drawer 4186, Hickory, N.C. 28663 (1-800-627-1687) or comparable product:

2. Surface Burning characteristics: ASTM E-84 – Maximum flame spread, smoke developed and fuel contributed of 0, 5 and 0 respectively.

3. Combustion Characteristics: ASTM E-136 – Non-combustible, Class A Building Material.

4. Thermal Values: ASTM C-177 - “R” Value of 4.91/inch at 32 degrees F mean.

5. Sound Abatement: ASTM E90-90 – Minimum Sound Transmission Class (STC) rating of 53 and a minimum Outdoor Indoor Transmission Class (OITC) rating of 44 for and 8 inch wall assembly.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

E. Spray-Applied Insulation: Apply spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.

F. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
   1. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.2 INSTALLATION OF FOAMED-IN-PLACE INSULATION

A. General: Install foamed-in-place insulation from interior, or as specified, prior to installation of interior finish work and after all masonry and structural concrete work is in place; comply with manufacturer’s instructions.

B. Installation: Fill all open cells and voids in hollow concrete masonry walls where shown on drawings. The foam insulation shall be pressure injected through a series of 5/8” to 7/8” diameter holes drilled into every vertical column of cell blocks (8 inches on center) beginning at an approximate height of four (4) feet above finished floor. Repeat this procedure at an approximate height of ten (10) feet above the first horizontal row of holes (or as needed) until the void is completely filled. Patch holes with mortar and score to resemble the existing adjacent surfaces.

END OF SECTION 072100

SECTION 074113.13 - FORMED METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes exposed-fastener, lap-seam, metal roof panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Test Reports for Credit SS 7.2: For roofing materials, documentation indicating that roofing materials comply with Solar Reflectance Index requirement.

C. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.

D. Samples: For each type of metal panel indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Warranties: Sample of special warranties.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Solar Reflectance Index: Not less than 29 according to ASTM E 1980.

C. Energy Performance: Provide roof panels that are listed on the EPA/DOE's ENERGY STAR "Roof Product List" for steep-slope roof products.

D. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

E. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 or ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft. (137 Pa).

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing 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 (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 EXPOSED-FASTENER, LAP-SEAM, METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps. Include accessories required for weathertight installation.

B. Tapered-Rib-Profile, Exposed-Fastener Metal Roof Panels: Formed with raised, trapezoidal major ribs and intermediate stiffening ribs symmetrically spaced between major ribs.

1. Basis-of-Design Product: Subject to compliance with requirements, provide PBR-Panel by Metal Sales Manufacturing Corporation or a comparable product by one of the following:

    a. AEP Span; a BlueScope Steel company.
    b. Architectural Metal Systems; a Nucor company.
    c. Berridge Manufacturing Company.
    d. Butler Manufacturing; a BlueScope Steel company.
    e. CENTRIA Architectural Systems.
    f. Fabral.
    g. Firestone Metal Products, LLC.
    h. Flexospan Steel Buildings, Inc.
    i. MBCI; a division of NCI Building Systems, L.P.
    j. McElroy Metal, Inc.
    k. Metal Sales Manufacturing Corporation.
    l. Morin; a Kingspan Group company.

2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

    a. Nominal Thickness: 0.022 inch (0.56 mm).
    b. Exterior Finish: Two-coat fluoropolymer.
    c. Color: As selected by Architect from manufacturer's full range.

3. Major-Rib Spacing: 12 inches (305 mm) o.c.
4. Panel Coverage: 36 inches (914 mm).
5. Panel Height: 1.25 inches (32 mm).

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils (0.76 mm) thick, specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 220 deg F (111 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: Subject to compliance with requirements, provide one of the following:

    a. Carlisle Residential, a division of Carlisle Construction Materials; WIP 300HT.

b. Grace Construction Products, a unit of W. R. Grace & Co.; Grace Ice and Water Shield HT.
c. Owens Corning; WeatherLock Specialty Tile and Metal Underlayment.

B. Felt Underlayment: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felts.

C. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.4 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Gutters and Downspouts: Formed from same material as roof panels according to SMACNA's "Architectural Sheet Metal Manual." Finish to match metal roof panels.

E. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

F. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.5 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

2.6 FINISHES

A. Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat.
2. Concealed Finish: White or light-colored acrylic or polyester backer finish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.2 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below and on Drawings, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.

1. Apply over the entire roof surface.

B. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.

C. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

3.3 METAL PANEL INSTALLATION

A. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
5. Flash and seal panels with weather closures at perimeter of all openings.
6. Watertight Installation:

a. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels and elsewhere as needed to make panels watertight.
b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
c. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

B. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

C. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that are permanently watertight.

3.4 CLEANING

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION 074113.13

SECTION 074213.53 - METAL SOFFIT PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes metal soffit panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.

D. Samples: For each type of metal panel indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Warranties: Samples of special warranties.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

1. Wind Loads: As indicated on Drawings.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing 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 (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 METAL SOFFIT PANELS

A. General: Provide metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

B. Flush-Profile Metal Soffit Panels: Solid panels formed with vertical panel edges and a flat pan between panel edges; with flush joint between panels.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Soffit Panel by Metal Sales Manufacturing Corporation or comparable product by one of the following:

a. AEP Span; a BlueScope Steel company.
b. Architectural Building Components.
c. ATAS International, Inc.
d. Berridge Manufacturing Company.
e. CENTRIA Architectural Systems.
f. Dimensional Metals, Inc.
g. Englert, Inc.
h. Fabral.
i. Firestone Metal Products, LLC.

j. Innovative Metals Company, Inc.
k. MBCI; a division of NCI Building Systems, L.P.
l. McElroy Metal, Inc.
m. Merchant & Evans Inc.
n. Metal-Fab Manufacturing, LLC.
o. Metal Sales Manufacturing Corporation.
p. Petersen Aluminum Corporation.
q. Ultra Seam, Inc.

2. Material: Same material, finish, and color as metal roof panels.
3. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

   a. Nominal Thickness: 0.022 inch (0.56 mm).
   b. Exterior Finish: Two-coat fluoropolymer.
   c. Color: As selected by Architect from manufacturer's full range.

4. Panel Coverage: 12 inches (305 mm).
5. Panel Height: 1.0 inch (25 mm).

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

   1. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.4 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile for full length of panel.

C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

2.5 FINISHES

A. Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Concealed Finish: White or light-colored acrylic or polyester backer finish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

1. Soffit Framing: Fasten furring channels to underside of wood truss bottom chord, as required to comply with requirements for assemblies indicated.

3.2 METAL PANEL INSTALLATION

A. Metal Soffit Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Apply panels and associated items true to line for neat and weathertight enclosure.

2. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
3. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.

B. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

C. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

3.3 CLEANING

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION 074213.53

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

A. This Section includes joint sealants for the applications indicated in the Joint-Sealant Schedule at the end of Part 3.

B. Related Sections include the following:
   1. Division 4 Section "Unit Masonry Assemblies" for masonry control and expansion joint fillers and gaskets.
   2. Division 9 Section "Gypsum Board Assemblies" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
   3. Division 9 Section "Ceramic Tile" for sealing tile joints.
   4. Division 9 Section "Acoustical Panel Ceilings" for sealing edge moldings at perimeters of acoustical ceilings.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.

1.4 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products listed in other the joint sealant schedule.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

2.4 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.5 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint

substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

2.6 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

a. Concrete.
b. Masonry.
c. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

a. Metal.
b. Glass.
c. Porcelain enamel.
d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

F. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

H. Installation of Preformed Tapes: Install according to manufacturer's written instructions.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application JS-1: Exterior horizontal nontraffic and traffic isolation and contraction joints in cast-in-place concrete slabs.

1. Joint Sealant: Product - Vulkem 245, Two-Part Pourable Polyurethane Sealant.
2. Joint-Sealant Color: Match adjacent surface color.

B. Joint-Sealant Application JS-2: Exterior vertical control and expansion joints in unit masonry.

1. Joint Sealant: Product – Dymeric 240, Epoxidized Polyurethane Sealant.
2. Joint-Sealant Color: Match masonry mortar color.

C. Joint-Sealant Application JS-3: Exterior butt joints between metal panels.

1. Joint Sealant: Product – Vulkem 116, One-Part High Performance Elastomer weatherproofing sealant.
2. Joint-Sealant Color: Match intersecting metal color.

D. Joint-Sealant Application JS-4: Exterior vertical joints between different materials listed above.

1. Joint Sealant: Product - Dymeric 240, Epoxidized Polyurethane Sealant.
2. Joint-Sealant Color: Match masonry color.

E. Joint-Sealant Application JS-5: Exterior perimeter joints between masonry and frames of doors windows and louvers.

1. Joint Sealant: Product - Vulkem 116, One-Part High Performance Elastomer weatherproofing sealant.
2. Joint-Sealant Color: Match masonry color.

F. Joint-Sealant Application JS-6: Exterior control and expansion joints in ceilings and other overhead surfaces.

1. Joint Sealant: Product - Dymeric 240, Epoxidized Polyurethane Sealant.
2. Joint-Sealant Color: Match ceiling color.

G. Joint-Sealant Application JS-7: Vertical control and expansion joints on exposed interior surfaces of exterior walls.

1. Joint Sealant: Product - Dymeric 240, Epoxidized Polyurethane Sealant.
2. Joint-Sealant Color: Match ceiling color.

H. Joint-Sealant Application JS-8: Interior perimeter joints of exterior openings.

1. Joint Sealant: Product – Pecora AC-20 FTR, Fire and Temperature Rated Acoustical and Insulation Sealant.
2. Joint-Sealant Color: Match metal color.

I. Joint-Sealant Application JS-9: Interior ceramic tile expansion, control, contraction, and isolation joints in horizontal traffic surfaces.

1. Joint Sealant: Product - Vulkem 245, Two-Part Pourable Polyurethane Sealant.
2. Joint-Sealant Color: Match grout color.

J. Joint-Sealant Application JS-10: Interior joints between plumbing fixtures and adjoining walls, floors, and counters.

1. Joint Sealant: Product – Dow Corning, 786 Silicone Sealant
2. Joint-Sealant Color: White.

K. Joint-Sealant Application JS-11: Vertical joints on exposed surfaces of interior unit masonry and concrete walls and partitions.

1. Joint Sealant: Product – Pecora AC-20 FTR, Fire and Temperature Rated Acoustical and Insulation Sealant.
2. Joint-Sealant Color: White.

L. Joint-Sealant Application JS-12: Perimeter joints between interior wall surfaces and frames of interior doors, and windows.

1. Joint Sealant: Product – Pecora AC-20 FTR, Fire and Temperature Rated Acoustical and Insulation Sealant.
2. Joint-Sealant Color: Match window frame and door frame color.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes hollow-metal work.

1.2 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: Include elevations, door edge details, frame profiles, metal thicknesses, preparations for hardware, and other details.

D. Schedule: Prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. 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:

1. Amweld International, LLC.
2. Ceco Door Products; an Assa Abloy Group company.

3. Curries Company; an Assa Abloy Group company.
4. Republic Doors and Frames.
5. Steelcraft; an Ingersoll-Rand company.

2.2 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection rating and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

2.3 INTERIOR DOORS AND FRAMES

A. Heavy-Duty Doors and Frames: SDI A250.8, Level 2.

1. Physical Performance: Level B according to SDI A250.4.
2. Doors:

    a. Type: As indicated in the Door and Frame Schedule.
    b. Thickness: 1-3/4 inches (44.5 mm).
    c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch (1.0 mm).
    d. Edge Construction: Model 1, Full Flush.
    e. Core: Manufacturer's standard.

3. Frames:

    a. Materials: Metallic-coated, steel sheet, minimum thickness of 0.053 inch (1.3 mm).
    b. Construction: Full profile welded.

4. Exposed Finish: Prime.
    a. Construction: Full profile welded.

5. Exposed Finish: Prime.

2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

A. Heavy-Duty Doors and Frames: SDI A250.8, Level 2.

1. Physical Performance: Level B according to SDI A250.4.
2. Doors:

    a. Type: As indicated in the Door and Frame Schedule.
    b. Thickness: 1-3/4 inches (44.5 mm).

c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch (1.0 mm), with minimum G90 coating.
d. Edge Construction: Model 1, Full Flush.
e. Core: Manufacturer's standard insulation material.
f. R-value: R-5 minimum.

3. Frames:

a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum G90 coating.
b. Construction: Full profile welded.

4. Exposed Finish: Prime.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (51 mm) wide by 10 inches (254 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch (1.0 mm), and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at finish floor surface.

2.6 MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

E. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

F. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

G. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.

H. Glazing: Section 088000 "Glazing."

I. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat.

2.7 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Doors:

1. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
2. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated.

C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor.
5. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 16 inches (406 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c., to match coursing, and as follows:

        1) Two anchors per jamb up to 60 inches (1524 mm) high.
        2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
        3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
        4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.

b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:

1) Three anchors per jamb up to 60 inches (1524 mm) high.
2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.

6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers.

a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

D. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

E. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
3. Provide loose stops and moldings on inside of hollow-metal work.
4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.8 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: SDI A250.10.

2.9 ACCESSORIES

A. Louvers: Provide sightproof louvers for interior doors, where indicated, which comply with SDI 111C, with blades or baffles formed of 0.020-inch- (0.5-mm-) thick, cold-rolled steel sheet set into 0.032-inch- (0.8-mm-) thick steel frame.

B. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

C. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-rated openings, install frames according to NFPA 80.
    b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    c. Install frames with removable stops located on secure side of opening.
    d. Install door silencers in frames before grouting.
    e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

    a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-rated openings, install frames according to NFPA 80.
    b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    c. Install frames with removable stops located on secure side of opening.
    d. Install door silencers in frames before grouting.
    e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

    a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

B. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Steel Doors:

a. Between Door and Frame Jambs and Head: 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
b. Between Edges of Pairs of Doors: 1/8 inch (3.2 mm) to 1/4 inch (6.3 mm) plus or minus 1/32 inch (0.8 mm).
c. At Bottom of Door: 3/4 inch (19.1 mm) plus or minus 1/32 inch (0.8 mm).
d. Between Door Face and Stop: 1/16 inch (1.6 mm) to 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.

C. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

3.2 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Access doors and frames for walls and ceilings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Schedule: Types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 tested according to the following test method:

1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
2. NFPA 288 for fire-rated access door assemblies installed horizontally.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:

1. Access Panel Solutions.
2. Acudor Products, Inc.
3. Alfab, Inc.
4. Babcock-Davis.
5. Cendrex Inc.
6. Elmdor/Stoneman Manufacturing Co.; Div. of Acorn Engineering Co.
7. Jensen Industries; Div. of Broan-Nutone, LLC.
8. J. L. Industries, Inc.; Div. of Activar Construction Products Group.
9. Karp Associates, Inc.
10. Larsen's Manufacturing Company.

11. Maxam Metal Products Limited.
12. Metropolitan Door Industries Corp.
13. MIFAB, Inc.
14. Milcor Inc.
15. Nystrom, Inc.
16. Williams Bros. Corporation of America (The).

B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

C. Flush Access Doors with Exposed Flanges to fit in ceiling grid:

1. Basis-of-Design Product: Babcock-Davis B-LW Series – Special Lightweight Access panel.
2. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
3. Locations: Suspended Acoustical Ceiling directly below HVAC units.
4. Door Size: Refer to drawings.
5. Uncoated Steel Sheet for Door: Nominal 26 gage.

    a. Finish: Factory finish.

6. Frame Material: Same material, thickness, and finish as door.
7. Hinges: Manufacturer's standard.
8. Hardware: Latch.

D. Fire-Rated, Flush Access Doors with Concealed Flanges:

1. Basis-of-Design Product: Babcock-Davis BIW – Tape In
2. Assembly Description: Fabricate door to fit flush to frame, with a core of mineral-fiber insulation enclosed in sheet metal. Provide self-latching door with automatic closer and interior latch release. Provide frame with gypsum board beads for concealed flange installation.
3. Locations: Ceiling.
4. Fire-Resistance Rating: Not less than 1 hour.
5. Temperature-Rise Rating: 450 deg F (250 deg C) at the end of 30 minutes.
6. Uncoated Steel Sheet for Door: Nominal 0.036 inch (0.91 mm), 20 gage.

    a. Finish: Factory powder coat finish.

7. Frame Material: Same material, thickness, and finish as door.
8. Hinges: Manufacturer's standard.
9. Hardware: Latch.

E. Hardware:

1. Latch: Self-latching bolt operated by knurled knob.

2.3 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

C. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

D. Frame Anchors: Same type as door face.

E. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.4 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

1. For cylinder locks, furnish two keys per lock and key all locks alike.
2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

2.5 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Steel and Metallic-Coated-Steel Finishes:
1. Factory Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry-film thickness of 1 mil (0.025 mm) for topcoat.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

SECTION 083323 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Service doors.
   2. Counter doors.

B. Related Section:

   1. Section 055000 "Metal Fabrications" for miscellaneous steel supports.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance, Exterior Doors: Exterior overhead coiling doors shall withstand the wind loads, the effects of gravity loads, and loads and stresses within limits and under conditions indicated according to SEI/ASCE 7.

   1. Wind Loads: As indicated on Drawings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. 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.

C. Samples: For each exposed product and for each color and texture specified.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.

PART 2 - PRODUCTS

2.1 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
   1. Insulation: Fill slats for insulated service doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within slat faces.
   2. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face.

B. Bottom Bar for Service Doors: Consisting of two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch (38 by 38 by 3 mm) thick; fabricated from metal to match curtain slats and finish.

C. Bottom Bar for Counter Doors: Manufacturer's standard continuous channel or tubular shape, fabricated from metal to match curtain slats and finish.

D. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

   1. Removable Posts and Jamb Guides for Counter Doors: Manufacturer's standard.

2.2 HOOD

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

   1. Include automatic drop baffle on fire-rated doors to guard against passage of smoke or flame.

2.3 LOCKING DEVICES

A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

B. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

   1. Lock Cylinders: Provide cylinders specified in Section 087100 "Door Hardware".
   2. Keys: Provide three for each cylinder.

C. Chain Lock Keeper: Suitable for padlock.

D. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.4 CURTAIN ACCESSORIES

A. Weatherseals: Equip each exterior door with weather-stripping gaskets fitted to entire perimeter of door for a weathertight installation, unless otherwise indicated.

B. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door. Provide pull-down straps or pole hooks for doors more than 84 inches (2130 mm) high.

2.5 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.6 MANUAL DOOR OPERATORS

A. Equip door with manufacturer's recommended manual door operator unless another type of door operator is indicated.

B. Push-up Door Operation: Design counterbalance mechanism so required lift or pull for door operation does not exceed 25 lbf (111 N).

2.7 DOOR ASSEMBLY

A. Service and Counter Door: Overhead coiling door formed with curtain of interlocking metal slats.

1. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. ACME Rolling Doors.
b. C.H.I. Overhead Doors.
c. Cookson Company.
d. Cornell Iron Works, Inc.
e. Mahon Door Corporation.
f. McKeon Rolling Steel Door Company, Inc.
g. Overhead Door Corporation.
h. Raynor.

i. Southwestern Steel Rolling Door Co.
j. Wayne-Dalton Corp.
k. Windsor Door.

B. Operation Cycles: Not less than 20,000.

C. Door Curtain Material: Galvanized steel.

D. Door Curtain Slats: Flat profile slats of 2-5/8-inch (67-mm) center-to-center height for service doors and flat profile slats of 1-1/2-inch (38-mm) center-to-center height.
1. Insulated-Slat Interior Facing: Metal.

E. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.

F. Hood: Match curtain material and finish.

1. Shape: Round.
2. Mounting: Face of wall.

G. Sill Configuration for Counter Door: No sill.

H. Locking Devices: Equip door with locking device assembly.

1. Locking Device Assembly: Cremone type, both jamb sides locking bars, operable from inside with thumb turn.

I. Manual Door Operator: Push-up operation.

1. Provide operator with through-wall shaft operation.
2. Provide operator with manufacturer's standard removable operating arm.

J. Door Finish:
1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.
2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion. Lubricate bearings and sliding parts as recommended by manufacturer. Adjust seals to provide weathertight fit around entire perimeter.

END OF SECTION 083323

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior storefront framing.
2. Interior storefront framing.

1.2 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
2. Dimensional tolerances of building frame and other adjacent construction.
3. Failure includes the following:

    a. Deflection exceeding specified limits.
    b. Thermal stresses transferring to building structure.
    c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
    d. Noise or vibration created by wind and by thermal and structural movements.
    e. Loosening or weakening of fasteners, attachments, and other components.
    f. Failure of operating units.

B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1. Wind Loads: As indicated on Drawings.
    a. Basic Wind Speed: 110 mph.
    b. Importance Factor: 1.0.
    c. Exposure Category: C.
2. Blast Loads: As required by UFC 4-010-01 *DoD Minimum Antiterrosim Standards for Buildings* for a primary gathering building located within a controlled perimeter and having conventional construction standoff distance.
    a. Applicable Level of Protection: Low.
    b. Applicable Explosive Weight: II.

C. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.

D. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
2. Test Durations: 10 seconds.

E. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. (0.03 L/s per sq. m) of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft. (75 Pa).

F. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:

1. Product Data for Credit IEQ 4.1: For sealants used inside of the weatherproofing system, documentation including printed statement of VOC content.

C. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.

D. Samples: For each type of exposed finish required.

E. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Field quality-control reports.

C. Warranties: Sample of special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

C. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.

D. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

E. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Series BT601 by United States Aluminum for exterior windows and Series 400 by United States Aluminum for interior windows or comparable product by one of the following:
   1. EFCO Corporation.
   2. Kawneer North America; an Alcoa company.
   3. United States Aluminum.
   4. Vistawall Architectural Products; The Vistawall Group; a Bluescope Steel company.
   5. YKK AP America Inc.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

   1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
   2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
   3. Extruded Structural Pipe and Tubes: ASTM B 429.
   4. Structural Profiles: ASTM B 308/B 308M.
   5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

   1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
   2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
   3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

   1. Construction: Thermally broken for exterior and non-thermally broken for interior.
   2. Glazing System: Retained mechanically with gaskets on four sides.
   3. Glazing Plane: Center.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, fabricated from stainless steel.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

1. Sealants used inside the weatherproofing system shall have a VOC content of 250g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Section 088000 "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

2.5 ACCESSORY MATERIALS

A. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil (0.762-mm) thickness per coat.

2.6 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.

5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing from interior.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.7 ALUMINUM FINISHES

A. High-Performance Organic Finish: 2-coat fluoropolymer finish complying with AAMA 2604 and containing not less than 70 percent PVDF resin by weight in color coat.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing as specified in Section 088000 "Glazing."

END OF SECTION 084113

SECTION 087100 - DOOR HARDWARE

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 the following:

1. Commercial door hardware for the following:

a. Swinging doors.
b. Other doors to the extent indicated.

2. Cylinders for doors specified in other Sections.

B. Related Sections include the following:

1. Division 8 Section "Steel Doors and Frames" for astragals provided as part of a fire-rated labeled assembly and for door silencers provided as part of the frame.

C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.
1. Final replacement cores and keys to be installed by Owner.

1.3 SUBMITTALS

A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings.

C. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.

a. Organize door hardware sets in same order as in the Door Hardware Schedule at the end of Part 3.

3. Content: Include the following information:

a. Type, style, function, size, label, hand, and finish of each door hardware item.
b. Manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
e. Explanation of abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for door hardware.
g. Door and frame sizes and materials.
h. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.

1) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

D. Keying Schedule: Prepared by or under the supervision of supplier, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

E. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity and who is or employs a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

1. Scheduling Responsibility: Preparation of door hardware and keying schedules.

C. Architectural Hardware Consultant Qualifications: A person who is currently certified by the Door and Hardware Institute as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.

D. Regulatory Requirements: Comply with provisions of the following:

1. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1, as follows:

   a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
   b. Door Closers: Comply with the following maximum opening-force requirements indicated:

      1) Interior Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
      2) Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
      3) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

   c. Thresholds: Not more than 1/2 inch (13 mm) high. Bevel raised thresholds with a slope of not more than 1:2.

2. NFPA 101: Comply with the following for means of egress doors:

   a. Latches, Locks, and Exit Devices: Not more than 15 lbf (67 N) to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
   b. Delayed-Egress Locks: Lock releases within 15 seconds after applying a force not more than 15 lbf (67 N) for not more than 3 seconds.
   c. Door Closers: Not more than 30 lbf (133 N) to set door in motion and not more than 15 lbf (67 N) to open door to minimum required width.
   d. Thresholds: Not more than 1/2 inch (13 mm) high.

E. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1. Test Pressure: Test at atmospheric pressure.

F. Keying Conference: Conduct conference at Project site with the Owner. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2. Preliminary key system schematic diagram.
3. Requirements for key control system.
4. Address for delivery of keys.

G. Pre-installation Conference: Conduct conference at Project site. Review methods and procedures related to electrified door hardware including, but not limited to, the following:

1. Inspect and discuss preparatory work performed by other trades.
2. Review sequence of operation for each type of door hardware.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

4. Review required testing, inspecting, and certifying procedures.
5. Inspect frames for square conditions prior to door and hardware installation. Advise General Contractor of frames needing correction prior to installation of doors.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver keys to Owner by registered mail or overnight package service.

1.6 COORDINATION

A. Coordinate layout and installation of recessed pivots and closers with floor construction. Cast anchoring inserts into concrete.

B. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Electrical System Roughing-in: Coordinate layout and installation of door hardware with connections to power supplies, fire alarm system and detection devices, access control system, security system and building control system.

1.7 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: One (1) year from date of Substantial Completion, unless otherwise indicated.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PRODUCTS

1.9 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in this Section, door hardware sets indicated in door and frame schedule, and the Door Hardware Schedule at the end of Part 3.

1. Door Hardware Sets: Requirements for quantity, item, design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Schedule at the end of Part 3. Products are identified by descriptive titles corresponding to requirements specified in Part 2.

1.10 HINGES AND PIVOTS, GENERAL

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hinges:
   a. Hager Companies.
   b. Lawrence Brothers, Inc.
   c. McKinney Products Company; Div. of ESSEX Industries, Inc.

B. Standards: Comply with the following:

1. Butts and Hinges: BHMA A156.1.
2. Template Hinge Dimensions: BHMA A156.7.
3. Self-Closing Hinges and Pivots: BHMA A156.17.
4. Pivots: BHMA A156.4.

C. Quantity: Provide the following, unless otherwise indicated:

1. Two Hinges: For doors with heights up to 60 inches (1524 mm).
2. Three Hinges: For doors with heights 61 to 90 inches (1549 to 2286 mm).
3. Three Hinges: For doors with heights 91 to 120 inches (2311 to 3048 mm).
4. For doors with heights more than 120 inches (3048 mm), provide 4 hinges, plus 1 hinge for every 30 inches (750 mm) of door height greater than 120 inches (3048 mm).

D. Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

PART 2 -	PART 3 -	PART 4 - Metal Thickness (inches)	PART 5 -
PART 6 - Maximum Door Size (inches)	PART 7 - Hinge Height (inches)	PART 8 - Standard Weight	PART 9 - Heavy Weight
PART 10 -	PART 11 -	PART 12 -	PART 13 -
32 by 84 by 1-3/8	3-1/2	0.123	-
36 by 84 by 1-3/8	4	0.130	-

PART 2 -	PART 3 -	PART 4 - Metal Thickness (inches)	PART 5 -
PART 6 - Maximum Door Size (inches)	PART 7 - Hinge Height (inches)	PART 8 - Standard Weight	PART 9 - Heavy Weight
PART 10 -	PART 11 -	PART 12 -	PART 13 -
36 by 84 by 1-3/4	4-1/2	0.134	0.180
42 by 90 by 1-3/4	4-1/2	0.134	0.180
48 by 120 by 1-3/4	5	0.146	0.190

A. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

B. Hinge Applications: Unless otherwise indicated, provide the following:

1. Entrance Doors: Heavy-weight hinges.
2. Doors with Closers: Antifriction-bearing hinges.
3. Interior Doors: Standard-weight hinges.

C. Fasteners: Comply with the following:

1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
2. Wood Screws: For wood doors and frames.
3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
4. Screws: Use only manufacturer supplied fasteners with matching finish heads.

13.2 LOCKS AND LATCHES, GENERAL

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Mechanical Locks and Latches:
   a. Best Lock Corporation

2. Bored Locks and Latches: BHMA A156.2.
3. Mortise Locks and Latches: BHMA A156.13.
4. Exit Locks: BHMA A156.5.

B. Bored Locks: BHMA Grade 1; Series 4000.

C. Certified Products: Provide door hardware listed in the following BHMA directories:

1. Mechanical Locks and Latches: BHMA's "Directory of Certified Locks & Latches."

D. Lock Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:

1. Bored Locks: Minimum 1/2-inch (12.7-mm) latchbolt throw.

2. Mortise Locks: Minimum 3/4-inch (19-mm) latchbolt throw.
3. Deadbolts: Minimum 1-inch (25-mm) bolt throw.

13.3 DOOR BOLTS, GENERAL

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Surface Bolts:
   a. Hager Companies.
   b. Ives: H. B. Ives.
   c. Rockwood Manufacturing Company.

2. Flush Bolts:
   a. Hiawatha, Inc.
   b. Ives: H. B. Ives.
   c. Rixson-Firemark, Inc.; Div. of Yale Security Inc.
   d. Rockwood Manufacturing Company.

B. Standards: Comply with the following:

1. Surface Bolts: BHMA A156.16.
2. Automatic and Self-Latching Flush Bolts: BHMA A156.3.
3. Manual Flush Bolts: BHMA A156.16.

13.4 EXIT DEVICES, GENERAL

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Corbin Russwin Architectural Hardware; Div. of Yale Security Inc.
2. Falcon / Ingersoll Rand Security Technologies
3. Sargent Manufacturing Company; Div. of ESSEX Industries, Inc.
4. Yale Security Inc.; Div. of Williams Holdings.

B. Standard: BHMA A156.3.

1. BHMA Grade: Grade 1.

C. Certified Products: Provide exit devices listed in BHMA's "Directory of Certified Exit Devices."

D. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

E. Fire Exit Devices: Complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.

F. Through Bolts: For exit devices and trim on metal doors and fire-rated wood doors unless fire door blocking is specified in section 08211 Flush Wood Doors.

13.5 CYLINDERS AND KEYING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cylinders: Same manufacturer as for locks and latches.
2. Cylinders:
   a. Best Locks Corporation

3. Key Control Systems:

   a. Key Control Systems, Inc.
   b. Major Metalfab Co.
   c. Sargent Manufacturing Company; Div. of ESSEX Industries, Inc.

B. Standards: Comply with the following:

1. Cylinders: BHMA A156.5.
2. Key Control System: BHMA A156.5.

C. Cylinder Grade: BHMA Grade 1.

D. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:

1. Number of Pins: Seven
2. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
3. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
4. Bored-Lock Type: Cylinders with tailpieces to suit locks.

E. Construction Keying: Comply with the following:

1. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.

F. Keying System: Unless otherwise indicated, provide a factory-registered keying system complying with the following requirements:
1. Key System: Cylinders are operated by a change key.

   a. Cylinders shall be keyed at the direction of the designated owner’s representative.

   b. Keys: Provide nickel-silver keys complying with the following:

2. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:

   a. Notation: "DO NOT DUPLICATE."

3. Quantity: In addition to one extra blank key for each lock, provide the following:

   a. Cylinder Change Keys: Three.

G. Key Control System: BHMA Grade 1 system, including key-holding hooks, labels, two sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers. Contain system in metal cabinet with baked-enamel finish.

1. Multiple-Drawer Cabinet: Cabinet with drawers equipped with key-holding panels and key envelope storage, and progressive-type ball-bearing suspension slides. Include single cylinder lock to lock all drawers.
2. Wall-Mounted Cabinet: Cabinet with hinged-panel door equipped with key-holding panels and pin-tumbler cylinder door lock.
3. Portable Cabinet: Tray for mounting in file cabinet, equipped with key-holding panels, envelopes, and cross-index system.
4. Capacity: Able to hold keys for 150 percent of the number of locks.
5. Cross-Index System: Set up by key control manufacturer, complying with the following:

a. Card Index: Furnish four sets of index cards for recording key information. Include three receipt forms for each key-holding hook.
b. Computer Software: Furnish cross-index software for recording and reporting key-holder listings, tracking keys and lock and key history, and printing receipts for transactions. Include instruction manual.

13.6 STRIKES

A. Standards: Comply with the following:

1. Strikes for Bored Locks and Latches: BHMA A156.2.
2. Strikes for Mortise Locks and Latches: BHMA A156.13.
3. Strikes for Interconnected Locks and Latches: BHMA A156.12.
4. Strikes for Auxiliary Deadlocks: BHMA A156.5.
5. Dustproof Strikes: BHMA A156.16.
6. Electric Strikes: BHMA A156.5.

B. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.

C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Baldwin Hardware Corporation.
2. Hager Companies.
3. Rockwood Manufacturing Company.

D. Standard: Comply with BHMA A156.6.

E. Materials: Fabricate from stainless steel, unless otherwise indicated.

F. Push-Pull Design: As illustrated on Drawings.

13.7 ACCESSORIES FOR PAIRS OF DOORS, GENERAL

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Coordinators:

a. Hager Companies.
b. Ives: H. B. Ives.
c. Rockwood Manufacturing Company.

2. Astragals:

a. Hager Companies.
b. National Guard Products, Inc.
c. Pemko Manufacturing Co., Inc.

B. Standards: Comply with the following:

1. Coordinators: BHMA A156.3.
2. Removable Mullions: BHMA A156.3.

C. Carry-Open Bars: Provide carry-open bars for inactive leaves of pairs of doors, unless automatic or self-latching bolts are used.

D. Fire-Exit Removable Mullions: Provide removable mullions for use with fire exit devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252. Mullions shall be used only with exit devices for which they have been tested.

13.8 CLOSERS, GENERAL

A. 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:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Surface-Mounted Closers:
a. Corbin Russwin Architectural Hardware; Div. of Yale Security Inc.
b. Dor-O-Matic
c. Norton Door Controls; Div. of Yale Security Inc.
d. Rixson-Firemark, Inc.; Div. of Yale Security Inc.
e. Sargent Manufacturing Company; Div. of ESSEX Industries, Inc.
f. Yale Security Inc.; Div. of Williams Holdings.

2. Closer Holder Release Devices:

    a. Corbin Russwin Architectural Hardware; Div. of Yale Security Inc.
    b. Dor-O-Matic
    c. Norton Door Controls; Div. of Yale Security Inc.
    d. Rixson-Firemark, Inc.; Div. of Yale Security Inc.
    e. Sargent Manufacturing Company; Div. of ESSEX Industries, Inc.
    f. Yale Security Inc.; Div. of Williams Holdings.

C. Standards: Comply with the following:

1. Closers: BHMA A156.4.
2. Closer Holder Release Devices: BHMA A156.15.

D. Surface Closers: BHMA Grade 1

E. Concealed Closers: BHMA Grade 1

F. Certified Products: Provide door closers listed in BHMA's "Directory of Certified Door Closers."

G. Hold-Open Closers/Detectors: Coordinate and interface integral smoke detector and closer device with fire alarm system.

H. Flush Floor Plates: Provide finish cover plates for floor closers, unless thresholds are indicated. Match door hardware finish, unless otherwise indicated.

I. Recessed Floor Plates: Provide recessed floor plates with insert of floor finish material for floor closers, unless thresholds are indicated. Provide extended closer spindle to accommodate thickness of floor finish.

J. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

13.9 CLOSERS

A. Traditional Surface Closers: Rack-and-pinion hydraulic type; with adjustable sweep and latch speeds controlled by key-operated valves; with forged-steel main arm; enclosed in a cast-aluminum alloy shell; complying with the following:

1. Mounting: as indicated in hardware sets. Install all closers on non-public side of door opening.
2. Backcheck: Adjustable, effective between 60 and 85 degrees of door opening.

13.10 PROTECTIVE TRIM UNITS, GENERAL

A. 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:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Metal Protective Trim Units:
   a. Baldwin Hardware Corporation.
   b. Hager Companies.
   c. Hiawatha, Inc.
   d. Ives: H. B. Ives.
   e. Rockwood Manufacturing Company.

C. Standard: Comply with BHMA A156.6.

D. Materials: Fabricate protection plates from the following:
1. Stainless Steel: 0.050 inch (1.3 mm) thick; beveled top and 2 sides.

E. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units consisting of either machine or self-tapping screws.

F. Furnish protection plates sized 1-1/2 inches (38 mm) less than door width on push side and 1/2 inch (13 mm) less than door width on pull side, by height specified in schedule.

13.11 PROTECTIVE TRIM UNITS

A. Armor Plates: 36 inches (914 mm) high by door width, with allowance for frame stops.

B. Kick Plates: 12 inches (305 mm) high by door width, with allowance for frame stops.

C. Mop Plates: 6 inches (152 mm) high by 1 inch (25 mm) less than door width.

D. Stretcher Plates: 8 inches (203 mm) high by door width, with allowance for frame stops.
1. Nonmortise Cap Door Edging: Consisting of minimum 0.050-inch- (1.3-mm-) thick metal sheet).

13.12 STOPS AND HOLDERS, GENERAL

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Baldwin Hardware Corporation.
2. Hager Companies.
3. Ives: H. B. Ives.
4. Norton Door Controls; Div. of Yale Security Inc.
5. Rixson-Firemark, Inc.; Div. of Yale Security Inc.
6. Rockwood Manufacturing Company.
7. Yale Security Inc.; Div. of Williams Holdings.

B. Standards: Comply with the following:

1. Stops and Bumpers: BHMA A156.16.
2. Mechanical Door Holders: BHMA A156.16.
3. Electromagnetic Door Holders: BHMA A156.15.

4. Combination Overhead Holders and Stops: BHMA A156.8.
5. Door Silencers: BHMA A156.16.

C. Floor Stops: For doors, unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic.

1. Where floor or wall stops are not appropriate, provide overhead holders.

D. Silencers for Metal Door Frames: BHMA Grade 1; neoprene or rubber, minimum diameter 1/2 inch (13 mm); fabricated for drilled-in application to frame.

13.13 STOPS AND HOLDERS

A. Rigid Wall Stops: Polished cast brass, bronze, or aluminum; 3-1/2 inches (89 mm) long, with rubber bumper; expansion-shield application.

B. Wall Bumpers: Polished cast brass or aluminum with rubber bumper; 2-1/2-inch (64-mm) diameter, minimum 3/4-inch (19-mm) projection from wall, with backplate for concealed fastener installation.

C. Roller-Type Bumpers: Polished cast brass or bronze; minimum 4-3/8-inch (111-mm) projection from wall; attached by surface screws.

D. Rigid Floor Stop: Polished cast brass, bronze, or aluminum, with rubber bumper; expansion-shield application.

E. Dome-Type Floor Stop: Polished cast brass, bronze, or aluminum, with rubber bumper; and as follows:

1. Height: Minimum 1 inch (25 mm) high, for doors without threshold, 1-3/8 inches (35 mm) high, for doors with threshold.
2. Riser: Extruded aluminum for carpet installations.

F. Lever-Type Door Holders: Polished cast brass, bronze, or aluminum; consisting of 4-inch- (102-mm-) long arm that swings up and remains in vertical position; with replaceable rubber tip; surface-screw application.

G. Plunger-Type Door Holders: Polished cast brass, bronze, or aluminum; minimum 1-1/8-inch (29-mm) plunger throw; with replaceable rubber tip; surface-screw application.

13.14 DOOR GASKETING, GENERAL

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Door Gasketing:

a. Hager Companies.
b. National Guard Products, Inc.
c. Pemko Manufacturing Co., Inc.

2. Door Bottoms:

a. Hager Companies.
b. National Guard Products, Inc.
c. Pemko Manufacturing Co., Inc.

B. General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
2. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
3. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

C. Air Leakage: Not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested according to ASTM E 283.

D. Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784.

1. Provide smoke-labeled gasketing on 20-minute-rated doors and on smoke-labeled doors.

E. Fire-Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL 10B or NFPA 252.

F. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.

G. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

H. Gasketing Materials: Comply with ASTM D 2000 and AAMA 701/702.

13.15 DOOR GASKETING

A. Adhesive-Backed Perimeter Gasketing: Gasket material applied to frame rabbet with self-adhesive.

1. Gasket Material: Silicone.

B. Rigid, Housed Perimeter Gasketing: Gasket material held in place by metal housing; fastened to frame stop with screws.

1. Gasket Material: Silicone bulb
2. Housing Material: Aluminum

C. Door Sweeps: Gasket material held in place by flat metal housing or flange; surface mounted to face of door with screws.

1. Gasket Material: Vinyl.

2. Housing Material: Aluminum.

13.16 THRESHOLDS, GENERAL

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hager Companies.
2. National Guard Products, Inc.
3. Pemko Manufacturing Co., Inc.

B. Standard: Comply with BHMA A156.21.

13.17 THRESHOLDS

A. Compressing-Top Thresholds: Metal member with compressible vinyl seal on top of threshold that seals against bottom of door; and base metal of aluminum.

B. Saddle Thresholds: Type and base metal as follows:

1. Type: Fluted top.
2. Base Metal: Aluminum

13.18 FABRICATION

A. Manufacturer's Nameplate: Do not provide manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise approved by Architect.

1. Manufacturer's identification will be permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18 for finishes. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.

C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
2. Steel Machine or Wood Screws: For the following fire-rated applications:

a. Mortise hinges to doors.
b. Strike plates to frames.
c. Closers to doors and frames.

3. Steel Through Bolts: For the following fire-rated applications, unless door blocking is provided:

a. Surface hinges to doors.
b. Closers to doors and frames.
c. Surface-mounted exit devices.

4. Spacers or Sex Bolts: For through bolting of hollow metal doors.

13.19 FINISHES

A. Standard: Comply with BHMA A156.18.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

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 are assembled or installed to minimize contrast.

D. BHMA Designations: Comply with base material and finish requirements indicated by the following:

1. BHMA 600: Primed for painting, over steel base metal.
2. BHMA 626: Satin chromium plated over nickel, over brass or bronze base metal.
3. BHMA 630: Satin stainless steel, over stainless-steel base metal.
4. BHMA 689: Aluminum painted, over any base metal.

13.20 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance of door hardware.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

13.21 PREPARATION

A. Steel Doors and Frames: Comply with DHI A115 series.

1. Surface-Applied Door Hardware: Drill and tap doors and frames according to SDI 107.

13.22 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Key Control System: Place keys on markers and hooks in key control system cabinet, as determined by final keying schedule.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

13.23 FIELD QUALITY CONTROL

A. Independent Architectural Hardware Consultant: Owner may engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

13.24 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

13.25 DOOR HARDWARE SCHEDULE

PART 14 -

Door Hardware Set No. One

Locations: AAR Bldg. Doors 1A, 7: to have the following:

PART 15 -

Qty.	Item	Manufacturer	Product	Finish
3	Hinges	McKinney	T4A3386 NRP T4B	32D
1	Lockset	Best (Office)		32D
1	Deadbolt	Best		689
1	Closer	Sargent	1431-P10	689
1	Threshold	McKinney	MCK-2001AV-3/0	Aluminum
1	Door Gasketing	McKinney	MCK-303AS-307070	
1	Stop	McKinney	FS01	626

Door Hardware Set No. Two

Locations: Ammunition breakdown Building Door 1, AAR Bldg. Doors 1B, 2A, 3A, 3B; to have the following:

PART 16 -

Qty.	Item	Manufacturer	Product	Finish
3	Hinges	McKinney	T4A3386 T4B	32D
1	Lockset	Best (Storeroom)	45H7D15H	32D
1	Deadbolt	Best		689
1	Closer	Sargent	1431-P10	689
1	Door Gasketing	McKinney	MCK-303AS-307070	
1	Threshold	See plans		
1	Stop	McKinney	FS01	626

Door Hardware Set No. Three

Locations: AAR Bldg. Doors 4, 5; to have the following:

PART 17 -

Qty.	Item	Manufacturer	Product	Finish
3	Hinges	McKinney	T4A3386	32D
1	Lockset	Best (Passage)	45HON15H	32D
1	Deadbolt	Best		689
1	Closer	Sargent	1431-P10	689
1	Door Gasketing	McKinney	MCK-303AS-307070	
1	Mop plate			
1	Threshold	See plans		
1	Stop	McKinney	FS01	626

Door Hardware Set No. Four

Locations: AAR Bldg. Door 6: to have the following:

Qty.	Item	Manufacturer	Product	Finish
3	Hinges	McKinney	T4A3386 NRP T4B	32D
1	Lockset	Best (Classroom))		32D
1	Deadbolt	Best		689
1	Closer	Sargent	1431-P10	689
1	Threshold	McKinney	MCK-2001AV-3/0	Aluminum
1	Door Gasketing	McKinney	MCK-303AS-307070	
1	Stop	McKinney	FS01	626

Door Hardware Set No. Five
Locations: LFSH Electrical Door 9 and Mock-up Building bleacher Enclosure Door 1: to have the following:

Qty.	Item	Manufacturer	Product	Finish
6	Hinges	McKinney	T4A3386 NRP T4B	32D
1	Lockset	Best (Storage)		32D
1	Deadbolt	Best		689
2	Flushbolts			
1	Threshold	McKinney	MCK-2001AV-3/0	Aluminum
1	Door Gasketing	McKinney	MCK-303AS-607070	
1	Stop	McKinney	FS01	626

Door Hardware Set No. Six
Locations: AAR Door 2B: to have the following:

Qty.	Item	Manufacturer	Product	Finish
1	Deadbolt	Best		689

END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Exterior and Interior Storefront framing.
   2. Interior borrowed lites.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design glass, including comprehensive engineering analysis according to ICC's 2003 International Building Code by a qualified professional engineer, using the following design criteria:

   1. Design Wind Pressures: As indicated on Drawings.

1.3 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

C. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Preconstruction adhesion and compatibility test report.

B. Certificate of Performance indicating Solar Heat Gain Coefficient (SHGC) and assembly U-value.

1.5 QUALITY ASSURANCE

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

   1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."

2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F (250 deg C), and the fire-resistance rating in minutes.

D. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

1.6 WARRANTY

A. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: Five years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
2. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

2.3 LAMINATED GLASS

A. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer or cast-in-place and cured-transparent-resin interlayer to comply with interlayer manufacturer's written recommendations.
2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

    a. Polyvinyl butyral interlayer.
    b. Polyvinyl butyral interlayers reinforced with polyethylene terephthalate film.
    c. Ionoplast interlayer.
    d. Cast-in-place and cured-transparent-resin interlayer.
    e. Cast-in-place and cured-transparent-resin interlayer reinforced with polyethylene terephthalate film.

2.4 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.

1. Sealing System: Dual seal.
2. Spacer: Manufacturer's standard spacer material and construction.

2.5 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:

1. Neoprene complying with ASTM C 864.
2. EPDM complying with ASTM C 864.
3. Silicone complying with ASTM C 1115.
4. Thermoplastic polyolefin rubber complying with ASTM C 1115.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene, EPDM, silicone or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.

1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

2.6 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.7 MISCELLANEOUS GLAZING MATERIALS

A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

E. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

F. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.8 MONOLITHIC-GLASS TYPES

A. Glass Type: Clear fully tempered float glass.

1. Thickness: 6.0 mm.
2. Provide safety glazing labeling.
3. Locations: Interior glazing at door lites and interior storefront framing.

2.9 INSULATING-LAMINATED-GLASS TYPES

A. Glass Type: Tinted, insulating laminated glass.

1. Overall Unit Thickness: 1-5/16 inch (34 mm).
2. Thickness of Outdoor Lite: 6.0 mm.
3. Outdoor Lite: Tinted heat-strengthened float glass.
4. Interspace Content: Air.
5. Indoor Lite: Clear laminated glass with two plies of heat-strengthened float glass.
    a. Thickness of Each Glass Ply: 6.0 mm.
    b. Interlayer Thickness: 0.030 inch (0.76 mm).
6. Visible Light Transmittance: 40 percent minimum.
7. Summer Daytime U-Factor: .28 maximum center of the glass U-value; 0.45 overall window assembly U-value.
8. Solar Heat Gain Coefficient: .25 maximum.
9. Provide safety glazing labeling.

PART 3 - EXECUTION

3.1 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, 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 lites where length plus width is larger than 50 inches (1270 mm).

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

3.2 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing 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 tape manufacturer.

E. Apply heel bead of elastomeric sealant.

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.

3.3 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket 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. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.4 CLEANING AND PROTECTION

A. Protect exterior glass from damage 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. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing 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 buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION 088000

SECTION 089000 - LOUVERS AND VENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fixed, extruded-aluminum louvers.

B. Related Sections:

1. See Section 081113 "Hollow Metal Doors and Frames" for louvers in hollow-metal doors.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural performance requirements and design criteria indicated.

B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors.

1. Wind Loads: Determine loads based on pressures as indicated on Drawings.

C. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

C. Samples: For each type of metal finish required.

D. Delegated-Design Submittal: For louvers indicated to comply with structural performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on tests performed according to AMCA 500-L.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5, T-52, or T6.

B. Fasteners: Use types and sizes to suit unit installation conditions.

1. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
2. For color-finished louvers, use fasteners with heads that match color of louvers.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION, GENERAL

A. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

B. Join frame members to each other and to fixed louver blades with welds, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal Storm-Resistant Louver:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Model RS-4300 by Construction specialties, Inc. or comparable product by one of the following:

a. Air Balance Inc.; a Mestek company.
b. Air Flow Company, Inc.
c. Airolite Company, LLC (The).
d. All-Lite Architectural Products.
e. Construction Specialties, Inc.
f. Greenheck Fan Corporation.
g. Reliable Products, Inc.
h. Ruskin Company; Tomkins PLC.

2. Louver Depth: 4 inches (102 mm).
3. Frame and Blade Nominal Thickness: Not less than 0.060 inch (1.52 mm) for blades and 0.080 inch (2.03 mm) for frames.

4. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

B. Louver Screen Frames: Same kind and form of metal as indicated for louver to which screens are attached.

C. Louver Screening:

1. Bird Screening: Aluminum, 18 x 16 aluminum mesh, .011 inch (.279 mm) diameter wire insect screens secured within .055inch (1.40 mm) thick extruded aluminum frames. Frames shall have mitered corners and corner locks

2.5 ALUMINUM FINISHES

A. High-Performance Organic Finish: 2-coat fluoropolymer finish complying with AAMA 2605, 70% resin. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

D. Repair damaged finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory and refinish entire unit or provide new units.

E. Protect galvanized and nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint.

END OF SECTION 089000

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior gypsum board assemblies.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: Provide materials and construction identical to those tested according to ASTM E 119.

2.2 FRAMING SYSTEMS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Steel Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners of equivalent minimum base-metal thickness.

1. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm), except provide .0312 inch (0.80 mm) minimum base metal thickness at walls supporting ceramic tile and at nested studs on each side of door jambs.
2. Depth: As indicated on Drawings.

C. Slip-Type Head Joints: Where indicated, provide one of the following in thickness not less than indicated for studs and in width to accommodate depth of studs:

1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- (51-mm-) deep flanges, installed with studs friction fit into top runner and with continuous bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.
2. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes due to deflection of structure above.

D. Firestop Tracks: Manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).

F. Cold-Rolled Channel Bridging: Steel, 0.053-inch (1.34-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: 1-1/2 inches (38 mm).
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.

G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).
2. Depth: As indicated on Drawings.

2.3 AUXILIARY MATERIALS

A. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.
1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.2 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

    a. Install two studs at each jamb unless otherwise indicated.
    b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
    c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

    a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

E. Direct Furring:

1. Screw to wood framing.

F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Tile backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
3. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regionally manufactured and regionally extracted and manufactured materials. Include statement indicating cost for each regionally manufactured material.

    a. Include statement indicating location of manufacturer and distance to Project for each regionally manufactured material.
    b. Include statement indicating location of manufacturer and point of extraction, harvest, or recovery for each raw material used in regionally extracted and manufactured materials. Indicate distance to Project and fraction by weight of each regionally manufactured material that is regionally extracted.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Regional Materials: Gypsum panel products shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

C. Regional Materials: Gypsum panel products shall be manufactured within 500 miles (800 km) of Project site.

2.3 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Gypsum.
2. CertainTeed Corp.
3. Georgia-Pacific Gypsum LLC.
4. Lafarge North America Inc.
5. National Gypsum Company.
6. PABCO Gypsum.
7. Temple-Inland.
8. USG Corporation.

B. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Core: 5/8 inch (15.9 mm), Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; GlasRoc Tile Backer.
b. Georgia-Pacific Gypsum LLC; DensShield Tile Backer.

2. Core: 5/8 inch (15.9 mm), Type X.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.

B. Aluminum Trim: ASTM B 221 (ASTM B 221M), Alloy 6063-T5.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Exterior Gypsum Soffit Board: Paper.
3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
4. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

2.7 AUXILIARY MATERIALS

A. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

B. Acoustical Joint Sealant: ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings as demonstrated by testing according to ASTM E 90.

1. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS

A. Comply with ASTM C 840.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with

edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

D. Install trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

E. Prefill open joints, rounded or beveled edges, and damaged surface areas.

F. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

G. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
   1. Level 2: Panels that are substrate for tile, FRP Board and panels that are concealed by suspended acoustical ceiling tile.
   2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

      a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

H. Protect adjacent surfaces from drywall compound and texture finishes and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

I. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION 092900

SECTION 093000 - TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ceramic tile.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 TILE PRODUCTS

A. ANSI Ceramic Tile Standard: Provide Standard grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

B. Tile Type: Glazed Wall Tile. Basis of design: American Olean “Bright” Ceramic Wall Tile.

1. Module Size: 4-1/4 inch by 4-1/4 inch.
2. Thickness: 5/16 inch.
3. Finish: Bright gloss.
4. Tile Color: To be selected by Architect from manufacturer’s full range of colors up to and including color group 4.
5. Grout Color: As selected by Architect from manufacturer's full range.
6. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:

    a. Base: American Olean “Bright” Sanitary Cove Base model S-3419T, 4-1/4” x 6”.
    b. External Corners and window sills for Thin-Set Mortar Installations: Bullnose shape, same size as adjoining flat tile.

2.2 SETTING MATERIALS

A. Dry Set Mortar with Additive: ANSI A118.4.

1. Manufacturers: Subject to compliance with requirements, provide Mapei Kerabond/Keralastic System or comparable product by one of the following:

a. Bonsal American; an Oldcastle company.
b. Bostik, Inc.
c. C-Cure.
d. Custom Building Products.
e. DAP Inc.
f. Jamo Inc.
g. Laticrete International, Inc.
h. MAPEI Corporation.
i. Southern Grouts & Mortars, Inc.
j. Summitville Tiles, Inc.
k. TEC; a subsidiary of H. B. Fuller Company.

2.3 GROUT MATERIALS

A. Water-Cleanable Epoxy Grout: ANSI A118.3.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Mapei “Opticolor Stain-Free Grout” or comparable product by one of the following:
a. Bonsal American; an Oldcastle company.
b. Bostik, Inc.
c. Custom Building Products.
d. Laticrete International, Inc.
e. MAPEI Corporation.
f. Southern Grouts & Mortars, Inc.
g. Summitville Tiles, Inc.
h. TEC; a subsidiary of H. B. Fuller Company.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.

C. Blending: For tile exhibiting color variations, use factory blended tile or blend tiles at Project site before installing.

D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

B. Extend tile work into recesses and behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. 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 plates, collars, or covers overlap tile.

D. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
   1. Glazed Wall Tile: 1/16 inch.

3.4 INTERIOR TILE INSTALLATION SCHEDULE

A. Interior Wall Installations, Metal Studs or Furring:

   1. Tile Installation W245: Organic adhesive on coated glass-mat, water-resistant gypsum backer board; TCA W245.

      a. Tile Type: Glazed tile.
      b. Setting Materials: Dry set mortar with additive.
      c. Grout: Water-cleanable epoxy grout.

END OF SECTION 093000

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for ceilings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL PANEL CEILINGS, GENERAL

A. Low-Emitting Materials: Acoustical panel ceilings 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."

B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Acoustical Panel Standard: Comply with ASTM E 1264.

D. Metal Suspension System Standard: Comply with ASTM C 635.

E. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

2.3 ACOUSTICAL PANELS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Armatuff 861 by Armstrong World Industries or comparable product by one of the following:

1. Armstrong World Industries, Inc.
2. CertainTeed Corp.
3. Chicago Metallic Corporation.
4. Tectum Inc.
5. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Classification: Type III, Form 2, Pattern C E.

C. Color: White.

D. LR: .87.

E. NRC: .50.

F. CAC: 33.

G. Edge/Joint Detail: Square.

H. Thickness: 3/4 inch (19 mm).

I. Modular Size: 24 by 24 inches (610 by 610 mm).

2.4 METAL SUSPENSION SYSTEM

A. Basis-of-Design Product: Subject to compliance with requirements, provide Prelude ML 15/16" by Armstrong World Industries or comparable product by one of the following:

1. Armstrong World Industries, Inc.
2. CertainTeed Corp.
3. Chicago Metallic Corporation.
4. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 (Z90) coating designation; with prefinished 15/16-inch wide metal caps on flanges.
1. Structural Classification: Intermediate-duty system.
2. Face Design: Flat, flush.
3. Cap Material: aluminum cold-rolled sheet.
4. Cap Finish: Painted white.

C. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design

requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install acoustical panel ceilings to comply with ASTM C 636/C 636M according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

END OF SECTION 095113

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resilient base.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches (300 mm) long, of each resilient product color, texture, and pattern required.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.4 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive resilient products.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

A. Resilient Base:

1. Manufacturers: Subject to compliance with requirements, provide the following Basis-of-Design product or equivalent:
   a. Burke Mercer Flooring Products; Division of Burke Industries, Inc. – RubberMyte Wall Base.

B. Resilient Base Standard: ASTM F 1861.

1. Material Requirement: Type TP (rubber, thermoplastic).
2. Manufacturing Method: Group I (solid, homogeneous).
3. Style: Butt to (fit-to-floor).

C. Minimum Thickness: 0.125 inch (3.2 mm).

D. Height: 4 inches (102 mm).

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed or preformed.

G. Inside Corners: Job formed or preformed.

H. Finish: Low luster.

I. Colors and Patterns: As selected by Architect from full range of industry colors.

2.2 INSTALLATION MATERIALS

A. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are same temperature as the space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.2 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

3.3 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Cover resilient products until Substantial Completion.

END OF SECTION 096513

SECTION 099113 - EXTERIOR PAINTING

GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following exterior substrates:
   1. Steel.
   2. Galvanized metal.

2.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For each finish and for each color and texture required.

C. Product List: Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

2.3 QUALITY ASSURANCE

A. MPI Standards:

   1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
   1. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

A. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

   1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.

      a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
      b. Other Items: Architect will designate items or areas required.

   2. Final approval of color selections will be based on benchmark samples.

      a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

PRODUCTS

5.1 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: As selected by Architect from manufacturer's full range.

7.1 METAL PRIMERS

A. Alkyd Anticorrosive Metal Primer: MPI #79.

1. VOC Content: E Range of E1.

7.2 EXTERIOR ALKYD PAINTS

A. Exterior Alkyd Enamel (Gloss): MPI #9 (Gloss Level 6).

1. VOC Content: E Range of E1.

EXECUTION

7.3 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Plaster: 12 percent.
5. Gypsum Board: 12 percent.

B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

8.2 PREPARATION AND APPLICATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

11.1 EXTERIOR PAINTING SCHEDULE

A. Steel Substrates:

1. Alkyd System: MPI EXT 5.1D.

a. Prime Coat: Alkyd anticorrosive metal primer.
a. Intermediate Coat: Exterior alkyd enamel matching topcoat.
b. Topcoat: Exterior alkyd enamel (Semigloss).

A. Galvanized-Metal Substrates:

1. Alkyd System: MPI EXT 5.3B.

a. Prime Coat: Cementitious galvanized-metal primer.
a. Intermediate Coat: Exterior alkyd enamel matching topcoat.
b. Topcoat: Exterior alkyd enamel (Gloss).

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Concrete.
2. Concrete masonry units (CMU).
3. Steel.
4. Galvanized metal.
5. Gypsum board.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For each finish and for each color and texture required.

C. Product List: Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.3 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.

a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
b. Other Items: Architect will designate items or areas required.

2. Apply benchmark samples after permanent lighting and other environmental services have been activated.

3. Final approval of color selections will be based on benchmark samples.

    a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

PART 2 - PRODUCTS

2.1 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:

1. Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
2. Nonflat Paints, Coatings, and Primers: VOC content of not more than 150 g/L.
3. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
4. Floor Coatings: VOC not more than 100 g/L.
5. Shellacs, Clear: VOC not more than 730 g/L.
6. Shellacs, Pigmented: VOC not more than 550 g/L.
7. Flat Topcoat Paints: VOC content of not more than 50 g/L.
8. Nonflat Topcoat Paints: VOC content of not more than 150 g/L.
9. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
10. Floor Coatings: VOC not more than 100 g/L.
11. Shellacs, Clear: VOC not more than 730 g/L.
12. Shellacs, Pigmented: VOC not more than 550 g/L.
13. Primers, Sealers, and Undercoaters: VOC content of not more than 200 g/L.
14. Dry-Fog Coatings: VOC content of not more than 400 g/L.
15. Zinc-Rich Industrial Maintenance Primers: VOC content of not more than 340 g/L.
16. Pre-Treatment Wash Primers: VOC content of not more than 420 g/L.

C. Chemical Components of Field-Applied Interior Paints and Coatings: Provide topcoat paints and anti-corrosive and anti-rust paints applied to ferrous metals that comply with the following chemical restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:

1. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
2. Restricted Components: Paints and coatings shall not contain any of the following:

a. Acrolein.
b. Acrylonitrile.
c. Antimony.
d. Benzene.
e. Butyl benzyl phthalate.
f. Cadmium.
g. Di (2-ethylhexyl) phthalate.
h. Di-n-butyl phthalate.
i. Di-n-octyl phthalate.
j. 1,2-dichlorobenzene.
k. Diethyl phthalate.
l. Dimethyl phthalate.
m. Ethylbenzene.
n. Formaldehyde.
o. Hexavalent chromium.
p. Isophorone.
q. Lead.
r. Mercury.
s. Methyl ethyl ketone.
t. Methyl isobutyl ketone.
u. Methylene chloride.
v. Naphthalene.
w. Toluene (methylbenzene).
x. 1,1,1-trichloroethane.
y. Vinyl chloride.

D. Colors: As selected by Architect from manufacturer's full range.

2.2 BLOCK FILLERS

A. Interior/Exterior Latex Block Filler: MPI #4.

1. VOC Content: E Range of E2.

2.3 PRIMERS/SEALERS

A. Interior Alkyd Primer/Sealer: MPI #45.

1. VOC Content: E Range of E1.

2.4 METAL PRIMERS

A. Alkyd Anticorrosive Metal Primer: MPI #79.

1. VOC Content: E Range of E1.

2.5 ALKYD PAINTS

A. Interior Alkyd (Semigloss): MPI #47 (Gloss Level 5).

1. VOC Content: E Range of E1.
2. Environmental Performance Rating: EPR 1.

B. Interior Alkyd (Gloss): MPI #48 (Gloss Level 6).

1. VOC Content: E Range of E1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Gypsum Board: 12 percent.
5. Plaster: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION AND APPLICATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

D. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:

1. Mechanical Work:

a. Uninsulated metal piping.
b. Uninsulated plastic piping.
c. Pipe hangers and supports.
d. Tanks that do not have factory-applied final finishes.
e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

2. Electrical Work:

a. Switchgear.
b. Panelboards.
c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

E. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

F. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.3 INTERIOR PAINTING SCHEDULE

A. CMU Substrates:

1. Alkyd System: MPI INT 4.2C.

a. Prime Coat: Interior/exterior latex block filler.
b. Intermediate Coat: Interior alkyd matching topcoat.
c. Topcoat: Interior alkyd (semigloss).

B. Steel Substrates:

1. Alkyd System: MPI INT 5.1E.

a. Prime Coat: Alkyd anticorrosive metal primer.
b. Intermediate Coat: Interior alkyd matching topcoat.
c. Topcoat: Interior alkyd (semigloss).

C. Galvanized-Metal Substrates:

1. Alkyd System: MPI INT 5.3C.

    a. Prime Coat: Cementitious galvanized-metal primer.
    b. Intermediate Coat: Interior alkyd matching topcoat.
    c. Topcoat: Interior alkyd (semigloss).

D. Gypsum Board Substrates:

1. Alkyd Over Latex Primer System: MPI INT 9.2C.

    a. Prime Coat: Interior latex primer/sealer.
    b. Intermediate Coat: Interior alkyd matching topcoat.
    c. Topcoat: Interior alkyd (semi-gloss).

END OF SECTION 099123

SECTION 101100 - VISUAL DISPLAY SURFACES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Markerboards.
   2. Tackboards.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

   1. Include individual panel weights for sliding visual display units.

B. LEED Submittals:

   1. Product Data for Credit IEQ 4.4: For composite wood products, documentation indicating that the product contains no urea formaldehyde.

C. Shop Drawings: For visual display surfaces. Include plans, elevations, sections, details, and attachments to other work.

   1. Show locations of panel joints.
   2. Include sections of typical trim members.

D. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of fabrics.

C. Warranties: Sample of special warranties.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For visual display surfaces to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

1.6 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer's standard form in which manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Surfaces lose original writing and erasing qualities.
b. Surfaces exhibit crazing, cracking, or flaking.

2. Warranty Period: 50 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Porcelain-Enamel Face Sheet: ASTM A 424, enameling-grade steel, uncoated thickness indicated; with exposed face and edges coated with primer, 1.7-to-2.5-mil- (0.043-to-0.064-mm-) thick ground coat, and color cover coat; and with concealed face coated with primer and 1.7-to-2.5-mil- (0.043-to-0.064-mm-) thick ground coat.

B. Melamine: Thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.

C. Vinyl Fabric: Mildew resistant, washable, complying with FS CCC-W-408D, Type II, burlap weave; weighing not less than 13 oz./sq. yd. (440 g/sq. m); with surface-burning characteristics indicated.

D. Polyester Fabric: Nondirectional weave, 100 percent polyester; weighing not less than 15 oz./sq. yd. (508 g/sq. m); with surface-burning characteristics indicated.

E. Hardboard: ANSI A135.4, tempered.

F. Particleboard: ANSI A208.1, Grade M-1., made with binder containing no urea formaldehyde.

G. Fiberboard: ASTM C 208.

H. Extruded Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063.

2.2 MARKERBOARD ASSEMBLIES

A. Porcelain-Enamel Markerboards: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction consisting of backing sheet, core material, and 0.021-inch- (0.53-mm-) thick, porcelain-enamel face sheet with low-gloss finish.

1. 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. AARCO Products, Inc.
b. ADP Lemco, Inc.
c. Aywon.
d. Bangor Cork Company, Inc.
e. Best-Rite Manufacturing.
f. Claridge Products and Equipment, Inc.
g. Egan Visual Inc.
h. Ghent Manufacturing, Inc.
i. Marsh Industries, Inc.; Visual Products Group.
j. Platinum Visual Systems; a division of ABC School Equipment, Inc.
k. PolyVision Corporation; a Steelcase company.
l. Tri-Best Visual Display Products.

2. Manufacturer's Standard Core: Minimum 1/4 inch (6 mm) thick, with manufacturer's standard moisture-barrier backing.
3. Laminating Adhesive: Manufacturer's standard, moisture-resistant thermoplastic type.

2.3 TACKBOARD ASSEMBLIES

A. 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:

1. A-1 Visual Systems.
2. AARCO Products, Inc.
3. ADP Lemco, Inc.
4. Aywon.
5. Bangor Cork Company, Inc.
6. Best-Rite Manufacturing.
7. Claridge Products and Equipment, Inc.
8. Egan Visual Inc.
9. EverProducts by Glenroy Inc.
10. Ghent Manufacturing, Inc.
11. Marsh Industries, Inc.; Visual Products Group.
12. Platinum Visual Systems; a division of ABC School Equipment, Inc.
13. PolyVision Corporation; a Steelcase company.
14. Tri-Best Visual Display Products.

B. Vinyl-Fabric-Faced Tackboard: Vinyl fabric factory laminated to 3/8-inch- (9.5-mm-) thick fiberboard backing.

2.4 VISUAL DISPLAY CONFERENCE UNITS

A. 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:

1. A-1 Visual Systems.
2. AARCO Products, Inc.
3. ADP Lemco, Inc.
4. Best-Rite Manufacturing.
5. Claridge Products and Equipment, Inc.
6. Egan Visual Inc.
7. Ghent Manufacturing, Inc.
8. Marsh Industries, Inc.; Visual Products Group.
9. Peter Pepper Products, Inc.
10. Platinum Visual Systems; a division of ABC School Equipment, Inc.
11. PolyVision Corporation; a Steelcase company.

2.5 MARKERBOARD AND TACKBOARD ACCESSORIES

A. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch- (1.57-mm-) thick, extruded aluminum; standard size and shape.
1. Factory-Applied Trim: Manufacturer's standard.

B. Chalktray: Manufacturer's standard, continuous.
1. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.

2.6 FABRICATION

A. Porcelain-Enamel Visual Display Assemblies: Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.

B. Visual Display Boards: Factory assemble visual display boards unless otherwise indicated.

1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display boards at manufacturer's factory before shipment.

C. Factory-Assembled Visual Display Units: Coordinate factory-assembled units with trim and accessories indicated. Join parts with a neat, precision fit.

1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as indicated on approved Shop Drawings.
2. Provide manufacturer's standard vertical-joint spline or H-trim system between abutting sections of markerboards.
3. Provide manufacturer's standard mullion trim at joints between markerboards and tackboards of combination units.

4. Where size of visual display boards or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.

D. Modular Visual Display Boards: Fabricated with integral panel clips attached to core material.

E. Aluminum Frames and Trim: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to a neat, hairline closure.

1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display units at manufacturer's factory before shipment.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

2.8 VISUAL DISPLAY SURFACE SCHEDULE

1. Markerboard: Porcelain-enamel markerboard assembly.

    a. Color: Beige.

2. Corners: Square.
3. Width: As indicated on Drawings.
4. Height: As indicated on Drawings.
5. Mounting: Wall.
6. Mounting Height: As indicated on Drawings.
7. Factory-Applied Aluminum Trim: Manufacturer's standard with clear anodic finish.
8. Accessories:

    a. Chalktray: Solid type.
    b. Map rail with display rail, end stops.

B. Tackboard: Factory assembled.
1. Tack Surface: Vinyl-fabric-faced tackboard assembly.

    a. Color: As selected by Architect from full range of industry colors.

2. Corners: Square.
3. Width: As indicated on Drawings.
4. Height: As indicated on Drawings.
5. Mounting: Wall.
6. Mounting Height: As indicated on Drawings.
7. Edges: Concealed by trim.

    a. Factory-Applied Aluminum Trim: Manufacturer's standard style, with clear anodic finish.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display surfaces and wall surfaces.

B. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

C. Visual Display Boards: Attach visual display boards to wall surfaces with fasteners through the aluminum perimeter frame into wall blocking at not more than 16 inches on center. Secure both top and bottom of boards to walls.

D. Visual Display Boards: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display boards with fasteners at not more than 16 inches (400 mm) o.c. Secure both top and bottom of boards to walls.

E. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room. Cover and protect visual display surfaces.

END OF SECTION 101100

SECTION 101423 - PANEL SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Room-identification signs.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For panel signs.

   1. Include fabrication and installation details and attachments to other work.
   2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
   3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
   4. Show locations of electrical service connections.
   5. Include diagrams for power, signal, and control wiring.

C. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for signs.

2.2 SIGNS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:
   1. Advance Corporation; Braille-Tac Division.
   2. Allen Industries, Inc.
   3. APCO Graphics, Inc.
   4. ASE, Inc.
   5. ASI Sign Systems, Inc.
   6. Best Sign Systems Inc.

B. Room-Identification Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Basis-of-Design Product: Mohawk Signage Systems –Series 100.

2. Sign-Panel Perimeter: Finish edges smooth.

   a. Edge Condition: Square cut.
   b. Corner Condition in Elevation: Square.

3. Frame: Aluminum.

   a. Profile: Square.
   b. Corner Condition in Elevation: Square.
   c. Finish and Color: As selected by Architect from manufacturer's full range.

4. Mounting: Surface mounted to wall with countersunk flathead through fasteners.

2.3 PANEL-SIGN MATERIALS

A. Satin Aluminum.

2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
   1. Exposed Metal-Fastener Components, General:

      a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.

   2. Sign Mounting Fasteners:
      a. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, installed in predrilled holes.

2.5 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
2. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
4. Internally brace signs for stability and for securing fasteners.
5. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

B. Surface-Engraved Graphics: Machine engrave characters and other graphic devices into panel surface indicated to produce precisely formed copy, incised to uniform depth.

1. Engraved Metal: Fill engraved graphics with manufacturer's standard baked enamel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.

C. Remove temporary protective coverings and strippable films as signs are installed.

END OF SECTION 101423

SECTION 102113 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Solid-polymer toilet compartments configured as toilet compartment doors and urinal screens.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

A. Product certificates.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

   1. Flame-Spread Index: 75 or less.
   2. Smoke-Developed Index: 450 or less.

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1 for toilet compartments designated as accessible.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Zamac: ASTM B 86, commercial zinc-alloy die castings.

2.2 SOLID-POLYMER UNITS

A. 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:

1. Accurate Partitions Corporation.
2. Ampco, Inc.
3. Bradley Corporation; Mills Partitions.
4. Comtec Industries/Capitol Partitions.
5. General Partitions Mfg. Corp.
6. Global Steel Products Corp.
7. Hadrian Manufacturing Inc.
8. Knickerbocker Partition Corporation.
9. Metpar Corp.
10. Partition Systems Incorporated of South Carolina.
11. Rockville Partitions Incorporated.
12. Santana Products, Inc.
13. Sanymetal; a Crane Plumbing company.
14. Weis-Robart Partitions, Inc.

B. Urinal-Screen Style: Post from floor to ceiling.

C. Door and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch (25 mm) thick, seamless, with eased edges, no-sightline system, and with homogenous color and pattern throughout thickness of material.

1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
2. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum or stainless-steel strip fastened to exposed bottom edges of solid-polymer components to prevent burning.
3. Polymer Panel Finish: One color and pattern in each room.

a. Color and Pattern: As selected by Architect from manufacturer's full range.

D. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; polymer or stainless steel.

1. Polymer Color and Pattern: Matching pilaster.

E. Urinal-Screen Post: Manufacturer's standard post design of material matching the thickness and construction of pilasters or 1-3/4-inch- (44-mm-) square, aluminum tube with satin finish; with shoe and sleeve (cap) matching that on the pilaster.

F. Brackets (Fittings):

1. Stirrup Type: Ear or U-brackets, chrome-plated zamac or clear-anodized aluminum or stainless steel or chrome-plated brass.
2. Full-Height (Continuous) Type: Manufacturer's standard design; polymer or extruded aluminum or stainless steel.

a. Polymer Color and Pattern: Matching panel.

2.3 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.

1. Material: Chrome-plated zamac or Clear-anodized aluminum or Stainless steel or Chrome-plated brass.
2. Hinges: Manufacturer's standard paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees or continuous, cam type that swings to a closed or partially open position or continuous, spring-loaded type or integral hinge for solid-polymer doors.
3. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors and entrance-screen doors.
6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

2.4 FABRICATION

A. Floor-and-Ceiling-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.

B. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment at tops and bottoms of posts. Provide shoes and sleeves (caps) at posts to conceal anchorage.

C. Door Size and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide, in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide, out-swinging doors with a minimum 32-inch- (813-mm-) wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

B. Clearances: Maximum 1/2 inch (13 mm) between pilasters and panels; 1 inch (25 mm) between panels and walls.

C. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than two brackets attached near top and bottom of panel. Locate wall brackets so holes for wall anchors occur in masonry or tile joints. Align brackets at pilasters with brackets at walls.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and doors in entrance screens to return doors to fully closed position.

END OF SECTION 102113

SECTION 102600 - WALL PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Corner guards.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

B. Adhesive: As recommended by impact-resistant plastic wall protection manufacturer.

2.2 CORNER GUARDS

A. Surface-Mounted, Stainless Steel Corner Guards: Assembly consisting of 16 gauge, type 304 stainless steel with a #4 satin finish installed with adhesive and #8 fasteners at 36” on center; fabricated with 90-degree turn to match wall condition.

B. Basis-of-Design Product: Subject to compliance with the requirements, provide WallGuard.com Defender Series – 1-1/2” Bullnose, 6’-0” tall or comparable product by one of the following:
   a. Arden Architectural Specialties, Inc.
   b. Construction Specialties, Inc.
   c. IPC Door and Wall Protection Systems; Division of InPro Corporation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work. Install impact-resistant wall protection units in locations and at mounting heights indicated on Drawings.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 102600

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Warm-air dryers.
3. Underlavatory guards.
4. Custodial accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify products using designations indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 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.

PART 2 - PRODUCTS

2.1 PUBLIC-USE WASHROOM ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.
5. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
6. Tubular Specialties Manufacturing, Inc.

B. Toilet Tissue (Roll) Dispenser Drawing designation:

1. Basis-of-Design Product: Bradley 5234.
2. Description: Double-roll dispenser.
3. Mounting: Surface mounted.
4. Operation: Noncontrol delivery with theft-resistant spindle.
5. Capacity: Designed for 4-1/2- or 5-inch- (114- or 127-mm-) diameter tissue rolls.
6. Material and Finish: Stainless steel, No. 4 finish (satin).

C. Liquid-Soap Dispenser:

1. Basis-of-Design Product: Bradley 6562.
2. Description: Designed for dispensing soap in liquid or lotion form.
3. Mounting: Vertically oriented, surface mounted.
4. Capacity: 40 oz.
5. Materials: Stainless steel body, back and wall plate.
6. Lockset: Tumbler type.
7. Refill Indicator: Window type.

D. Grab Bar:

1. Basis-of-Design Product: Bradley 812.
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch (1.3 mm) thick.

    a. Finish: Smooth, No. 4 finish (satin).

4. Outside Diameter: 1-1/4 inches (32 mm).
5. Configuration and Length: As indicated on Drawings.

E. Mirror Unit:

1. Basis-of-Design Product: Bradley 748.

2. Size: As indicated on Drawings.

2.2 WARM-AIR DRYERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. A & J Washroom Accessories, Inc.
2. American Dryer, Inc.
3. American Specialties, Inc.
4. Bobrick Washroom Equipment, Inc.
5. Bradley Corporation.
6. Excel Dryer Corporation.
7. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
8. Tubular Specialties Manufacturing, Inc.
9. World Dryer Corporation.

B. Warm-Air Dryer:

1. Basis-of-Design Product: Bradley 2902-280000.
2. Mounting: Surface mounted.
3. Operation: Electronic-sensor activated with timed power cut-off switch.

a. Drying Time: 10 to 15 seconds.

4. Cover Material and Finish: Cast iron, with white enamel finish.
5. Electrical Requirements: 120/240V, 1 phase, 3 W. Confirm and coordinate with final electrical drawings.

2.3 UNDERLAVATORY GUARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Plumberex Specialty Products, Inc.
2. Truebro by IPS Corporation.

B. Underlavatory Guard:

1. Basis-of-Design Product: TruBro LavGuard.
2. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

2.4 CUSTODIAL ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.
5. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.
6. Tubular Specialties Manufacturing, Inc.

B. Mop and Broom Holder:

1. Basis-of-Design Product: Bradley Model 9984.
2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
3. Length: 36 inches (914 mm).
4. Hooks: Three.
5. Mop/Broom Holders: Four, spring-loaded, rubber hat, cam type.
6. Material and Finish: Stainless steel, No. 4 finish (satin).

a. Shelf: Not less than nominal 0.05-inch- (1.3-mm-) thick stainless steel.
b. Rod: Approximately 1/4-inch- (6-mm-) diameter stainless steel.

2.5 FABRICATION

A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of two keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

END OF SECTION 102800

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the indication of the required type of portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

C. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Failure of hydrostatic test according to NFPA 10.
    b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS (Owner provided-Contractor installed)

A. Fire Extinguishers: Type, size, and capacity for each mounting bracket indicated.

1. 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. Amerex Corporation.
b. Ansul Incorporated; Tyco International Ltd.
c. Badger Fire Protection; a Kidde company.
d. Buckeye Fire Equipment Company.
e. Fire End & Croker Corporation.
f. J. L. Industries, Inc.; a division of Activar Construction Products Group.
g. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
h. Larsen's Manufacturing Company.
i. Moon-American.
j. Pem All Fire Extinguisher Corp.; a division of PEM Systems, Inc.
k. Potter Roemer LLC.
l. Pyro-Chem; Tyco Safety Products.

2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.

B. Multipurpose Dry-Chemical Type: UL-rated 10 pound nominal capacity, with monoammonium phosphate-based dry chemical in manufacturer's standard enameled container.

2.2 MOUNTING BRACKETS (Contractor provided and installed)

A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

1. 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. Amerex Corporation.
b. Ansul Incorporated; Tyco International Ltd.
c. Badger Fire Protection; a Kidde company.
d. Buckeye Fire Equipment Company.
e. Fire End & Croker Corporation.
f. J. L. Industries, Inc.; a division of Activar Construction Products Group.
g. Larsen's Manufacturing Company.
h. Potter Roemer LLC.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

1. Mounting Brackets: 48 inches (1219 mm) above finished floor to top of fire extinguisher.

C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

SECTION 107500 - FLAGPOLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes ground-mounted aluminum flagpoles.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand the effects of gravity loads, and the following loads and stresses within limits and under conditions indicated according to the following design criteria:
   1. Wind Loads: Refer to drawings.
   2. Base flagpole design on polyester flags of maximum standard size suitable for use with flagpole.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Delegated-Design Submittal: For flagpole assemblies indicated to comply with performance requirements and design criteria, including analysis data and calculations signed and sealed by the qualified professional engineer responsible for their preparation.

   1. Include loads, point reactions, and locations for attachment of flagpoles to building's structure.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. 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:

   1. American Flagpole; a Kearney-National Inc. company.
   2. Atlantic Fiberglass Products, Inc.
   3. Baartol Company.
   4. Concord Industries, Inc.
   5. Eder Flag Manufacturing Company, Inc.

6. Ewing Flagpoles.
7. Lingo Inc.; Acme Flagpole Company Division.
8. Millerbernd Manufacturing Company.
9. Morgan-Francis; Division of Original Tractor Cab Co., Inc.
10. PLP Composite Technologies, Inc.
11. Pole-Tech Company Inc.
12. U.S. Flag & Flagpole Supply, LP.
13. USS Manufacturing Inc.

2.2 FLAGPOLES

A. Exposed Height: 20 feet (6 m).

B. Aluminum Flagpoles: Provide cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B 241/B 241M, Alloy 6063, with a minimum wall thickness of 3/16 inch (4.8 mm).

C. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, not less than 0.064-inch- (1.6-mm-) nominal wall thickness. Provide with 3/16-inch (4.8-mm) steel bottom plate and support plate; 3/4-inch- (19-mm-) diameter, steel ground spike; and steel centering wedges welded together. Galvanize steel after assembly. Provide loose hardwood wedges at top of foundation tube for plumbing pole. Provide flashing collar of same material and finish as flagpole.

D. Cast-Metal Shoe Base: For anchor-bolt mounting; provide with anchor bolts.

E. Finial Ball: Manufacturer's standard flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter. Fabricate from 0.063-inch (1.6-mm) spun aluminum, finished to match flagpole.

F. Internal Halyard, Winch System: Manually operated winch with control stop device and removable handle, stainless-steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Provide flush access door secured with cylinder lock. Finish truck assembly to match flagpole.

G. Halyard Flag Snaps: Provide two swivel snap hooks per halyard.

2.3 MISCELLANEOUS MATERIALS

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.

B. Sand: ASTM C 33, fine aggregate.

C. Elastomeric Joint Sealant: Joint sealant complying with requirements in Section 079200 "Joint Sealants."

2.4 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 FLAGPOLE INSTALLATION

A. General: Install flagpoles where shown and according to Shop Drawings and manufacturer's written instructions.

B. Ground Set: Place foundation tube, center, and brace to prevent displacement during concreting. Install flagpole, plumb, in foundation tube. Place tube seated on bottom plate between steel centering wedges and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch (50-mm) layer of elastomeric joint sealant and cover with flashing collar.

C. Baseplate: Cast anchor bolts in concrete foundation. Install baseplate on washers placed over leveling nuts on anchor bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.

D. Mounting Brackets and Bases: Anchor brackets and bases securely through to structural support with fasteners as indicated on Shop Drawings.

END OF SECTION 107500

SECTION 114860 - SHOOTING RANGE EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Military Range Equipment.

B. Turn-key Design and Construction Services:

1. Ballistic Wall System.
2. Live Fire Shoot House.
3. Ballistic Rubber.

1.2 RELATED SECTIONS

A. Section 033000 Cast-in-Place Concrete.

B. Section 042200 Concrete Unit Masonry.

C. Section 133419 Metal Building Systems.

D. Division 26 Electrical.

E. Division 31 Earthwork.

1.3 REFERENCES

A. ASTM E 84 - Test method for the Surface Burning Characteristics of Building Materials.

B. American Welding Society (AWS) D1.1 - Structural Welding Code - Steel.

C. ASTM A514/A514M - Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding.

D. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

E. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

F. Illuminating Engineering Society of North America (IESNA) Lighting Handbook.

G. National Rifle Association (NRA) of America - The NRA Range Source Book.

H. Environmental Protection Agency (EPA) - Best Management Practices for Lead at Outdoor Shooting

Ranges.

I. Public Law: Title 29 Code of Federal Regulations (CFR) - 1910.1025, Lead.

J. Test Report: Ballistic Standards by Product, dated December 31, 2008 by Range Systems.

K. ASTM E90 - Laboratory Sound Transmission Class

L. CEHNC 1110-1-23, USACE Design Manual for Ranges - http://www.hnd.usace.army.mil/rdg/InterTemplate.aspx.

M. TC 25-8, Army Training Ranges, 05 April 2004 - https://atiam.train.army.mil/soldierPortal/atia/adlsc/view/public/7465-1/TC/258/TOC.HTM.

N. US Army Study (Picatinny Arsenal) ballistic rubber capabilities and performance testing. Acceptable penetration and stopping power with specific use of 7.62 mm (M80 Ball) and 5.56 mm (M855 Ball). Field-test shows minimal ricochet at limited incidence of angle with specific use of 7.62 mm (M80 Ball), 5.56 mm (M855 Ball and M193 Ball) from M14 rifle, M16A2, M16A1, and the M4A1 carbine.

1.4 PERFORMANCE REQUIRMENTS

A. Delegated Design: Design of shoot house, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated and in accordance with the authorities having jurisdiction.

1.5 SUBMITTALS

A. Submit under provisions of Section 013300.

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. List of no less than five (5) projects of a similar scope.

D. Shop Drawings: Submit shop drawings prepared by the manufacturer showing plans, sections, elevations, layouts, profiles, and product component locations, including anchorage, bracing, fasteners, accessories, and finishes.

E. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

F. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

G. Closeout Submittals: Provide manufacturer's maintenance and operation instructions that include recommendations for periodic checking and adjustment of systems and maintenance of all components. One year warranty on manufacturing defects.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall have a minimum of 5 years manufacturing similar equipment, and be a certified contract holder for the General Services Administration (GSA) with a current license.

B. Installer Qualifications: Minimum two (2) years' experience installing similar equipment and acceptable to the equipment manufacturer.

1.7 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 jurisdiction.

C. Store materials protected from exposure to rain, snow or other harmful weather conditions

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

a. Basis-of-Design Product: Subject to compliance with requirements, provide Range Systems by Renew Resources, Inc. 5121 Winnetka Avenue,New Hope, MN 55428; Telephone 888-999-1217 or 763-533-9200; website – www.range-systems.com or comparable product by one of the following:

1) Meggit Training Systems, Inc.; 296 Brogdon Road, Suwanee, GA 30024; website-www.meggitttrainingsystems.com – Product – SHOTT (Shoot House Optimized for Tactical Training)

2). Advanced Training Systems; 4524 Highway 61 North, Saint Paul, Minnesota 551100; Telephone 651-429-8091, facsimile 651-429-8702; website – www.atsusa.biz.

2.2 SYSTEM DESIGN AND INSTALLATION SERVICES

A. Provide the following services in connection with the delivery of ballistic range systems:

1. Sales and Customer Support: Provide knowledgeable customer service and sales staff familiar with the requirements of live fire shooting environments.
2. Design: Provide design staff experienced in designing live fire environments, and the products used in those environments.

    a. Design/Engineering/Architectural Services.
    b. Environmental Control (HVAC Systems).

3. Technical Support: Technical personnel shall have the experience and knowledge to provide equipment installation, on-site technical support, new equipment training, and operations and maintenance guidance.

    a. Installation.
    b. On-site Technical Support.
    c. Maintenance Programs.

2.3 RANGE DESIGN CRITERIA REQUIREMENTS:

A. Ballistic Wall System:

1. Ballistic Wall System: As shown on drawings, to be supplied, complete, by Shoot House manufacturer.
2. Ballistic tactical wall system as manufactured by Basis-of-Design Range Systems is modular.

    a. Basis-of-Design Ballistic tactical wall system is constructed of 1/2 inch (12.7 mm) thick AR 500 steel plate backer and finished with a front covering of 2 inch thick (51 mm) Dura-Panel™ ballistic rubber. Each ballistic rubber wall panel measures 2 feet by 2 feet by 2 inches (610 mm by 610 mm by 51 mm) and encapsulates up to 2,500 rounds per panel. Manufacturer's dimensional tolerance +/- 1/4 inch length and width.

    b. Ballistic material shall be non-ricochet and non-splatter, round defeating, bullet encapsulating ballistic rubber system.

    c. Ballistic material must have been formally tested by an approved agency or facility for penetrations and ricochet values.

    d. Ballistic materials shall have a minimum of a one-year warranty on manufacturing defects.

2.4 LIVE-FIRE SHOOT HOUSE: MILITARY

A. Basis-of-Design System: Standardized parts, Modular design, Armored protection, Shoot House (SMASH) System as manufactured by Range Systems. SMASH™ components are interchangeable to provide a 360 degree live fire shooting environment in a fully modular, deployable, reconfigurable shoot

house system as indicated or required by the drawings.

1. Performance: Live fire shoot house shall be ballistically capable to accommodate the use of 7.62mm NATO and 5.56mm NATO, .45 cal, 9 mm NATO, .12 GA shotgun slugs, 00 buck and sabot rounds.
2. Shoot house walls shall be designed to eliminate any possibility of shoot-through during live fire exercises and shall eliminate ricochet and splatter.
3. Basis-of-Design Interior shoot house ballistic walls will consist of AR 500 ballistic plate steel, 1/2 inch (12.7 mm) where noted or required for ballistic rating, steel support tubing, steel support angle, connection bolts and anchors, and 50 mm thick (2 inch) *Dura-Panel anti-ricochet ballistic rubber affixed to steel surface in accordance with shoot house suppliers written instructions.
4. Basis-of-Design Encapsulating ballistic rubber Dura-Bloc™ Hotwalls placement in high impact or target areas shall maintain the ballistic integrity of the live fire shoot house.
5. Depending on ballistic capability levels, shoot house shall maximize the use of Dura-Bloc™ Hotwall placement in high impact or target areas to maintain the integrity of the facility and ensure a safe training environment.

    a. Shoot house shall be equipped with Dura-Bloc™ Hotwalls in high impact or target areas if required by the shoot house manufacturer to comply with the ballistic capability protection levels.

6. Shoot house shall include entry points such as breach and standard pre-hung doors. All doors shall be framed to allow installation of 36 inches wide by 80 inches high (914 mm by 2032 mm) doors.
7. Breach doors shall be capable of supporting mechanical, explosive, and shotgun breaches. Breach doors shall lead in and out of the shoot house, shall swing inwardly, and withstand all operational and environmental requirements as specified.
8. Components: Refer to drawings for scope and configurations. Construction may include, but is not limited to the following elements:

    a. Multi-story designs.
    b. Ballistic breaching doors/windows.
    c. Exterior ballistic protection.
    d. Lighting.
    e. Target systems.
    f. Closed circuit camera system.

2.5 BALLISTIC RUBBER PROTECTION MATERIAL AND GENERAL REQUIREMENTS

A. Basis-of-Design Product: Dura-Panel as manufactured by Range Systems or equivalent product by another shoot house manufacturer. NSN: 9320-01-565-6156. Provides anti-ricochet protection at indoor and outdoor ranges when used as part of the Encapsulator system. Made of patented rubber composite. Each panel measures 24 inches by 24 inches by 2 inches (610 mm by 610 mm by 51 mm) and weighs 34 lb (15.4 kg). Panels shall be designed to prevent ricochet and splatter of standard pistol and rifle rounds up to .308 / 7.62 mm.

B. Basis-of-Design Product: Dura-Bloc as manufactured by Range Systems. NSN: 9320-01-565-6471. Made of patented rubber composite. Designed to encapsulate ammunition up to 7.62 caliber. Total

weight: 74 lb (33.5 kg) per block. 24 inches L by 12 inches W by 9 inches H (610 mm by 305 mm by 229 mm).

2.6 ADDITIONAL COMPONENTS

A. Catwalk System

1. Catwalk system shall be provided by shoot house provider and integrated into the ballistic wall systems.
2. Catwalk shall be galvanized steel and designed and constructed to carry a working load of 100 psf and shall have railings with guardrails installed on all sides.
3. Provide galvanized steel stair to access catwalk system. Stair to have guard and hand rails on each side of stair and meet all applicable code requirements.

PART 3- EXECUTION

3.1 EXAMINATION

A. Do not begin installation until exterior locations, structure and installing surfaces have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 114860

SECTION 130700 - BULLET RESISTANT FIBERGLASS – UL752 LEVEL 8

PART 1 - GENERAL

1.1 REFERENCE

A. The publications listed below form a part of this specification.

1. UNDERWRITERS LABORATORY UL 752 10th Edition.
2. Standard for Bullet Resisting Equipment dated March 10, 2000.
3. ASTM E119-98 Standard Test for One-Hour Fire-Rating of Building Construction and Materials.

1.2 SUBMITTALS

A. Prior to fabrication, submit the following for approval in accordance with Section 0130700 and the special contract requirements: samples, brochures, specifications, installation instructions, maintenance manual, UL listing verification, proof of possession of product liability insurance in an amount not less than two million U.S. dollars, UL752 current test results as provided by Underwriters Laboratories, and printed data in sufficient detail to indicate compliance with the requirements and details indicated on the contract documents. Furnish verification of compliance with ASTM E119-00e One-Hour Fire Rating of Building Construction and Materials from a recognized testing laboratory. Manufacturer's installation instructions of Bullet Resistant Fiberglass Panels shall be specific for the project and include the attachment method and fastener type for attachment of the panels to the supporting members and for the attachment of the bullet resistant fiberglass battens to the bullet resistant fiberglass panels.

B. Qualification Data: For Installer.

C. Warranty Certificate: For bullet resistant fiberglass panel assembly per requirements in this section.

1.3 DESIGN

A. Through the design, manufacturing technique and material application, the Bullet Resistant Fiberglass Panels shall be of the "non-ricochet type". This design is intended to permit the encapture and retention of an attacking projectile lessening the potential of a random injury or lateral penetration.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver the materials to the project with the manufacturer's UL listed labels intact and legible. Handle the material with care to prevent damage. Store the materials inside under cover, stack flat, and off the floor.

B. All drilling, cutting and penetrating of the bullet resistant fiberglass shall be done in accordance with the manufacturer's written instruction.

1.5 WARRANTY

A. All materials and workmanship shall be warranted against defects for a period of two (2) years from the date of project completion.

PART 2 - PRODUCTS

2.1 BULLET RESISTANT FIBERGLASS MATERIAL

A. The panels shall be made of multiple layers of woven roving ballistic grade fiberglass cloth impregnated with a thermoset polyester resin and compressed into flat rigid sheets. The production technique and materials used shall provide the controlled internal delamination to permit the encapture of a penetrating projectile.

B. Bullet Resistant Fiberglass panels: 15.0 pounds per square foot maximum weight. Basis-of-Design material shall be ArmorCore Level 8 by Waco Composites I. Ltd., Waco, Texas or approved equivalent.

2.2 SECURITY LEVEL

A. The Bullet Resistant Fiberglass will be rated and tested for UL752 Level 8.

PART 3 - EXECUTION

3.1 SUPPORTING MEMBERS

A. Prior to installing the bullet resistive material, the contractor shall verify that all supports have been installed as required by the contract documents and the architectural and structural drawings. Any supporting members necessary for installation, but not shown on the contract documents or the signed and sealed metal building shop drawings, shall be designed and furnished by the bullet resistant fiberglass material manufacturer or the contractor. All additional supporting members shall be included in the base bid and be subject to review by the architect and engineer.

3.2 JOINTS

A. All joints shall be reinforced by a back-up layer of bullet resistive material. The bullet resistance of the joint, as reinforced, shall be at least equal to that of the panel. Minimum width of reinforcing layer at joint shall be 4 inches (2 inches on each panel or a 2 inch minimum overlap).

3.3 APPLICATION

A. Bullet resistant fiberglass panel assembly shall be installed with hot dip galvanized or stainless steel bolted connections in accordance with the manufacturer’s printed instructions and as shown on the

construction documents. Method of installation shall maintain the bullet resistive rating at all joints, intersections, and required penetrations.

END OF SECTION 130700

SECTION 133419 - METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural-steel framing.
2. Metal roof panels.
3. Metal wall panels.
4. Accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of metal building system component.

B. LEED Submittals:

1. Product Test Reports for Credit SS 7.2: For roof panels, documentation indicating that panels comply with Solar Reflectance Index requirement.
2. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: For metal building system components. Include plans, elevations, sections, details, and attachments to other work.

D. Samples: For each type of exposed finish required.

E. Delegated-Design Submittal: For metal building systems indicated to comply with performance requirements and design criteria, including analysis data and calculations signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Metal Building System Certificates: For each type of metal building system, from manufacturer.

1. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:

a. Name and location of Project.
b. Order number.

c. Name of manufacturer.
d. Name of Contractor.
e. Building dimensions including width, length, height, and roof slope.
f. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
g. Governing building code and year of edition.
h. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
i. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
j. Building-Use Category: Indicate category of building use and its effect on load importance factors.
k. AISC Certification for Category MB: Include statement that metal building system and components were designed and produced in an AISC-Certified Facility by an AISC-Certified Manufacturer.

C. Material test reports.

D. Source quality-control reports.

E. Field quality-control reports.

F. Warranties: Sample of special warranties.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer and member of MBMA.

1. AISC Certification for Category MB: An AISC-Certified Manufacturer that designs and produces metal building systems and components in an AISC-Certified Facility.
2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

D. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings," for design requirements and allowable stresses.

E. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.

F. Preinstallation Conference: Conduct conference at Project site.

1.6 WARRANTY

A. Special Warranty on Metal Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 20 years from date of Substantial Completion.

B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. 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:

1. A&S Building Systems, Inc.; Division of NCI Building Systems, L.P.
2. Alliance Steel, Inc.
3. American Buildings Company; Division of Magnatrax Corp.
4. Behlen Mfg. Co.
5. Bigbee Steel Buildings, Inc.
6. Butler Manufacturing Company; a BlueScope Steel company.
7. CBC Steel Buildings; Division of Magnatrax Corp.
8. Ceco Building Systems; Division of NCI Building Systems, L.P.
9. Chief Buildings; Division of Chief Industries, Inc.
10. Garco Building Systems; Division of NCI Building Systems, L.P.
11. Gulf States Manufacturers, Inc.; Division of Magnatrax Corp.
12. Inland Buildings; Subsidiary of Behlen Mfg. Co.
13. Kirby Building Systems; Division of Magnatrax Corp.
14. Mesco Building Solutions; Division of NCI Building Systems, L.P.
15. Metallic Building Company; Division of NCI Building Systems, L.P.
16. Mid-West Steel Building Company; Division of NCI Building Systems, L.P.
17. Nucor Building Systems.

18. Oakland Metal Buildings, Inc.
19. Pinnacle Structures, Inc.
20. Robertson Building Systems; an NCI company.
21. Ruffin Building Systems, Inc.
22. Schulte Building Systems, LLP.
23. Spirco Manufacturing.
24. Star Building Systems; an NCI company.
25. Tyler Building Systems, L.P.
26. USA, Inc.
27. VP Buildings; a United Dominion company.
28. Vulcan Steel Structures, Inc.
29. Whirlwind Building Systems.

2.2 METAL BUILDING SYSTEM PERFORMANCE

A. Delegated Design: Design metal building system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Metal building systems shall be designed according to procedures in MBMA's "Metal Building Systems Manual."

1. Design Loads: As indicated on Drawings and as required by MBMA's "Metal Building Systems Manual" and ASCE/SEI 7.
2. Deflection Limits: Design metal building system assemblies to withstand design loads with deflections no greater than the following:

    a. Purlins and Rafters: Vertical deflection of 1/240 of the span.
    b. Girts: Horizontal deflection of 1/240 of the span.
    c. Metal Roof Panels: Vertical deflection of 1/240 of the span.
    d. Metal Wall Panels: Horizontal deflection of 1/240 of the span.
    e. Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.

3. Drift Limits: Engineer building structure to withstand design loads with drift limits no greater than the following:

    a. Lateral Drift: Maximum of 1/300 of the building height.

4. Metal panel assemblies shall withstand the effects of gravity loads and loads and stresses within limits and under conditions indicated according to ASTM E 1592.

C. Seismic Performance: Metal building systems shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

D. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base

engineering calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

E. Air Infiltration for Metal Roof Panels: Air leakage through assembly of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) of roof area when tested according to ASTM E 1680 at negative test-pressure difference of 1.57 lbf/sq. ft. (75 Pa).

F. Air Infiltration for Metal Wall Panels: Air leakage through assembly of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) of wall area when tested according to ASTM E 283 at static-air-pressure difference of 1.57 lbf/sq. ft. (75 Pa).

G. Water Penetration for Metal Roof Panels: No water penetration when tested according to ASTM E 1646 at test-pressure difference of 2.86 lbf/sq. ft. (137 Pa).

H. Water Penetration for Metal Wall Panels: No water penetration when tested according to ASTM E 331 at a wind-load design pressure of not less than 2.86 lbf/sq. ft. (137 Pa).

I. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for Class 90.

J. Solar Reflectance Index: Not less than 29 when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.

K. Energy Performance: Provide roof panels that are listed on the DOE's ENERGY STAR Roof Products Qualified Product List for steep-slope roof products.

2.3 STRUCTURAL-STEEL FRAMING

A. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafter, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.

1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly.
2. Frame Configuration: Single gable.
3. Exterior Column Type: Uniform depth.
4. Rafter Type: Uniform depth.

B. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, prepainted with coil coating.

C. Bolts: Provide plain-finish bolts for structural-framing components that are primed or finish painted. Provide zinc-plated or hot-dip galvanized bolts for structural-framing components that are galvanized.

D. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

E. Finish: Factory primed. Apply specified primer immediately after cleaning and pretreating.

2.4 METAL ROOF PANELS

A. Tapered-Rib-Profile, Lap-Seam Metal Roof Panels: Formed with raised, trapezoidal major ribs and intermediate stiffening ribs symmetrically spaced between major ribs; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.

1. Material: Aluminum-zinc alloy-coated steel sheet, 0.028-inch (0.71-mm) nominal thickness.

    a. Exterior Finish: Two-coat fluoropolymer.
    b. Color: As selected by Architect from manufacturer's full range.

2. Major-Rib Spacing: 12 inches (305 mm) o.c.
3. Panel Coverage: 36 inches (914 mm).
4. Panel Height: 1.25 inches (32 mm).

2.5 METAL WALL PANELS

A. Tapered-Rib-Profile, Exposed-Fastener Metal Wall Panels: Formed with raised, trapezoidal major ribs and intermediate stiffening ribs symmetrically spaced between major ribs; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.

1. Material: Aluminum-zinc alloy-coated steel sheet, 0.022-inch (0.56-mm) nominal thickness.

    a. Exterior Finish: Two-coat fluoropolymer.
    b. Color: As selected by Architect from manufacturer's full range.

2. Major-Rib Spacing: 12 inches (305 mm) o.c.
3. Panel Coverage: 36 inches (914 mm).
4. Panel Height: 1.25 inches (32 mm).

2.6 ACCESSORIES

A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.

1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.

C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.

D. Flashing and Trim: Formed from 0.022-inch (0.56-mm) nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match adjacent metal panels.

E. Gutters: Formed from 0.022-inch (0.56-mm) nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- (2438-mm-) long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."

1. Gutter Supports: Fabricated from same material and finish as gutters.
2. Strainers: Bronze, copper, or aluminum wire ball type at outlets.

F. Downspouts: Formed from 0.022-inch (0.56-mm) nominal-thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match metal wall panels. Fabricate in minimum 10-foot- (3-m-) long sections, complete with formed elbows and offsets.

1. Mounting Straps: Fabricated from same material and finish as gutters.

G. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.

2.7 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate product.

B. Testing: Test and inspect shop connections for metal buildings according to the following:

1. Bolted Connections: Shop-bolted connections shall be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
2. Welded Connections: In addition to visual inspection, shop-welded connections shall be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at inspector's option:

    a. Liquid Penetrant Inspection: ASTM E 165.
    b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
    c. Ultrasonic Inspection: ASTM E 164.
    d. Radiographic Inspection: ASTM E 94.

C. Product will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

2.8 FABRICATION

A. General: Design components and field connections required for erection to permit easy assembly.

1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.

B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.

C. Primary Framing: Shop fabricate framing components to size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.

D. Secondary Framing: Shop fabricate framing components to size and section by roll-forming or break-forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.

E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

PART 3 - EXECUTION

3.1 ERECTION OF STRUCTURAL FRAMING

A. Erect metal building system according to manufacturer's written erection instructions and erection drawings.

B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.

C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.

D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.

3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.

F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.

1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for bolt type and joint type specified.

a. Joint Type: Snug tightened or pretensioned.

G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.

1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
2. Locate and space wall girts to suit openings such as doors and windows.
3. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.

H. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.

1. Tighten rod and cable bracing to avoid sag.
2. Locate interior end-bay bracing only where indicated.

I. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.

J. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

3.2 METAL PANEL INSTALLATION, GENERAL

A. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.

a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.

2. Install metal panels perpendicular to structural supports unless otherwise indicated.
3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Locate metal panel splices over, but not attached to, structural supports with end laps in alignment.
6. Lap metal flashing over metal panels to allow moisture to run over and off the material.

B. Lap-Seam Metal Panels: Install screw fasteners using power tools with controlled torque adjusted to compress EPDM washers tightly without damage to washers, screw threads, or metal panels. Install screws in predrilled holes.

1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply metal panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants recommended by metal panel manufacturer.

1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel manufacturer.

3.3 METAL ROOF PANEL INSTALLATION

A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.

1. Install ridge caps as metal roof panel work proceeds.
2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.

B. Lap-Seam Metal Roof Panels: Fasten metal roof panels to supports with exposed fasteners at each lapped joint, at location and spacing recommended by manufacturer.

1. Provide metal-backed sealing washers under heads of exposed fasteners bearing on weather side of metal roof panels.
2. Provide sealant tape at lapped joints of metal roof panels and between panels and protruding equipment, vents, and accessories.

3. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps and on side laps of nesting-type metal panels, on side laps of ribbed or fluted metal panels, and elsewhere as needed to make metal panels weatherproof to driving rains.
4. At metal panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.

C. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

D. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

3.4 METAL WALL PANEL INSTALLATION

A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
2. Shim or otherwise plumb substrates receiving metal wall panels.
3. When two rows of metal panels are required, lap panels 4 inches (102 mm) minimum.
4. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
5. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Predrill panels.
6. Flash and seal metal wall panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
7. Install screw fasteners in predrilled holes.
8. Install flashing and trim as metal wall panel work proceeds.
9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated; or, if not indicated, as necessary for waterproofing.
10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer.

3.5 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil-canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

C. Gutters: Join sections with riveted-and-soldered or lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than 36 inches (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

D. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1524 mm) o.c. in between.

1. Provide elbows at base of downspouts to direct water away from building.
2. Tie downspouts to underground drainage system indicated.

E. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panel as recommended by manufacturer.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. High-Strength, Field-Bolted Connections: Connections shall be tested and inspected during installation according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
2. Welded Connections: In addition to visual inspection, field-welded connections shall be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at inspector's option:

    a. Liquid Penetrant Inspection: ASTM E 165.
    b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
    c. Ultrasonic Inspection: ASTM E 164.
    d. Radiographic Inspection: ASTM E 94.

C. Product will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 133419

SECTION 220001 - GENERAL PLUMBING REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General requirements for plumbing systems.

B. Trench excavation, pumping, backfilling and compaction for underground piping & plumbing.

1.2 DESCRIPTION

A. The scope of work shall include complete plumbing systems as shown on the Drawings and specified herein.

1.3 PRE-INSTALLATION CONFERENCE

A. Prior to start of any work, the successful Contractor shall meet with the Architect to determine that no questions remain concerning the intent of the Drawings or Specifications. The Contractor shall outline his method of procedure and bring up for discussion and decision any questions concerning the project. No work shall be performed prior to this meeting. The Architect shall set the date, time and place of conference.

1.4 CODES, ORDINANCES AND PERMITS:

A. Comply with all codes applying to the Work of this Contract. Obtain information on all code restrictions and requirements. In case of conflict between the Contract Documents and a governing code or ordinance, such conflict shall be immediately brought to the attention of the Architect for resolution. Extra payment will not be allowed for Work required by code restrictions except through written agreement with the Owner.

B. Apply for, obtain, and pay for all required permits and inspection certificates. Final payment is contingent upon delivery of such certificates to the Architect.

C. All materials and equipment shall be new and first class in every respect. As far as is practical, similar products shall be by one manufacturer. Where applicable, all materials and equipment shall bear the Underwriters' Laboratories seal or ASME code stamp. Certificates to this effect shall be furnished to the Architect upon request.

1.5 SITE INSPECTION

A. Visit the site and thoroughly inspect conditions affecting the Work before submitting Bid. Assume responsibility for meeting all existing conditions including access and work space limitations.

1.6 DRAWINGS AND SPECIFICATIONS:

A. Refer to the general Construction Drawings which are bound with the Drawings of this Work for construction details, elevations, etc. Architectural and Structural Drawings shall take precedence over Plumbing Drawings. It is the intent of the Plumbing Drawings to show the general arrangement of the system and not to indicate all offsets, fittings and accessories which may be required, nor to show exact locations of piping or equipment except where actual dimensions are given. All vertical piping shall be located in walls in finished spaces unless otherwise noted.

B. It is the intent of the Drawings and Specifications to call for finished Work, tested, and ready for operation, and in complete conformance with all applicable codes, rules and regulations. Minor details not usually shown or specified, but manifestly necessary for the proper installation and operation of the various systems, shall be included in the Work and in the proposal, the same as if specified or shown on the Drawings.

C. If any departures from the Drawings and Specifications are deemed necessary, details of such departures and the reasons therefore shall be submitted to the Architect for approval. No departures shall be made without prior approval of the Architect.

D. Specific reference in the Specifications to any article, device, product, material, fixture or type of construction, etc., by proprietary name, make or catalog number shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. Substitutes may be used subject to compliance with requirements set forth in the General Requirements, Division I, and as approved by the Architect.

1.7 MANUFACTURER'S SPECIFICATIONS

A. Where the name of a concern or manufacturer is mentioned on the Drawings or in Specifications in reference to his required service or product, and no qualifications or specification of such is included, then the material gauges, details of manufacturer, finish, etc., shall be in accordance with his standard practice, directions or specifications. The Contractor shall be responsible for any infringement of patents, royalties, or copyrights which may be incurred thereby.

B. Equipment scheduled on Drawings was used to arrive at space, maintenance, and utility service. If other equipment is submitted and approved, take responsibility for maintaining these space, maintenance, and utility service requirements and cost for any resulting changes including cost to change electrical service required by substituted equipment.

1.8 SUBMITTALS

A. Samples plumbing equipment or materials shall be submitted if requested by the Architect. If a sample is requested, have the sample delivered to the Architect or arrange for the Architect to examine it elsewhere. Failure to comply may be cause for rejection.

B. Submit shop drawings or catalog data for Architects approval before purchasing or installing the following items:

1. Plumbing Fixtures
2. Water Coolers
3. Piping (where revised from design drawings)

1.9 PERFORMANCE DATA

A. All performance data specified herein shall be considered actual performance of equipment as installed. Make suitable allowances if installation details are such that actual operating conditions unfavorably affect performance as compared to conditions under which the equipment was rated.

1.10 OPERATION AND MAINTENANCE DATA

A. Provide four (4) complete sets of a compilation of catalog data of each manufactured item of equipment used in the PLumbing Work. In addition to the catalog data, installation, operating and maintenance data and bill of materials for all operating equipment shall be submitted. Each of the four sets of data shall be bound in loose leaf binders and submitted to the Architect before final payment is made. A complete double index shall be provided as follows:

1. Listing the Products alphabetically by name.
2. Listing the names of manufacturer's alphabetically by name together with their addresses and the names and addresses of local sales representatives.

B. It is the intent of this catalog, operation and maintenance data to provide the Owner with complete instructions on the proper operation and use, lubrication and periodic maintenance, together with the source of replacement parts and service, for the items of equipment covered.

1.11 CONTRACTOR COORDINATION

A. The Electrical Contractor shall furnish, set and wire all disconnect devices and starters as required for all equipment except for those items furnished with integral disconnect devices and/or starters.

B. Furnish detailed information to the Electrical Contractor on power wiring requirements for all plumbing equipment actually purchased as soon as practical. This shall include all diagrams and instructions necessary for the Electrical Contractor to make connections properly. If equipment actually purchased requires larger electrical service than equipment scheduled, arrange and pay for required electrical service change.

C. Coordinate location of equipment and piping with Electrical and HVAC Contractors to maintain clearance for equipment maintenance, avoid interference with duct and HVAC piping runs, and to

prevent piping from being installed over electrical panels. If interference develops, the Architect will decide which equipment, conduit, duct, piping, etc., must be relocated regardless of installation order. Take responsibility for relocating Plumbing Work, if so ordered, including all associated costs.

D. Within 30 days following award of the Contract, report to the Architect, in writing, all real or potential errors, ambiguities and/or conflicts on the Plumbing Work or between the trades and obtain an agreement with the Architect on a solution. Those reported after 30 days, except as a result of unforeseen circumstances, shall be resolved at the discretion of the Architect. Report conflicts resulting from the progress of Work to the Architect immediately or accept the expense of corrective work caused by failure to report such a conflict.

1.12 CHANGES

A. Do not make any changes in design without the written approval of the Engineer. Changes in design means any change which may affect the capacity, reliability, operation or safety of the systems or any parts thereof, including changes which may be required to conform to local regulations or codes.

1.13 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

1.14 DELIVERY, STORAGE, AND PROTECTION

A. Protect all materials and equipment against damage and vandalism during construction. Replace any damaged material or equipment and place the systems in perfect working condition.

1.15 WARRANTY

A. Provide written warranties as specified in the General Requirements, Division 1, and repair any defects becoming apparent within the warranty period as directed by the Architect.

B. The warranty shall not cause an obligation to repair damage resulting from accident or improper operation or care on the part of the Owner.

PART 2 PRODUCTS

2.1 Not Used.

PART 3 EXECUTION

3.1 GENERAL

A. Examine the site and all Drawings before proceeding with the layout and installation of the Work.

B. Arrange the Work essentially as shown, exact layout to be made on the job to suit actual conditions encountered. Confer and cooperate with other trades on the job so all Work will be installed in proper relationship and coordinate precise location of parts with the Work of others.

C. Arrange for required chases, slots and openings with the General Contractor including locations of required pipe sleeves through walls and foundations. Assume liability for cutting or patching made necessary by failure to make proper arrangements in this respect.

D. Indicated equipment connections are necessarily based on equipment of a given manufacture. Assume responsibility for proper arrangement of pipes, etc., to connect approved equipment in a proper and approved manner. Follow equipment manufacturer's detailed instructions and recommendations in the installation and connection of all equipment. In case of conflict between manufacturer's instructions and the Contract Documents, notify the Architect before proceeding. No equipment installation or connections shall be made in a manner that voids the manufacturers warranty.

E. Install all Work in a neat and workmanlike manner, using only workmen thoroughly qualified in the trade or duties they are to perform. Rough Work will be rejected.

3.2 EXCAVATION, BACKFILLING AND PUMPING

A. Perform all excavation, backfilling and pumping necessary for the completion of the Work in accordance with the requirements of Excavation and Backfill, Division 2.

B. Excavate trenches suitable in width to provide a minimum of 6" clear space between the barrel of the pipe and the trench wall on both sides of the pipe. Accurately grade the trench bottom to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along its entire length. Take care not to excavate below the depth necessary and excavate bell holes to ensure proper bedding. Backfill over-depths with loose, granular, moist material and thoroughly compact to the depth required.

C. Place and compact backfill material in 6" layers until the pipe has a minimum cover of 12". Place and compact the remaining material in 12" layers. Grade the surface to a reasonable uniformity and leave the mounding in neat condition as approved by the Architect.

D. Backfill all trenches passing under foundations with concrete to the underside of the foundation and at a 2:1 slope away from each side of the foundation. Backfill all trenches that are parallel and deeper than foundations with concrete to a point that will place the top of the concrete on a 2:1 slope away from the foundation bottom. Do not backfill trenches until all required tests and inspections are completed.

E. Repair or replace all topsoil, shrubbery, sod, sidewalks, streets, walls, etc. disturbed by the excavation, backfilling or pumping to the satisfaction of the Architect. Repair sidewalks in complete blocks; partial patching will not be accepted.

3.3 PIPE INSTALLATION

A. Because of the small scale of the Drawings, it is not possible to indicate all offsets, fittings and valves. Carefully investigate all conditions affecting the Work to avoid interferences between pipes, ducts, valves, conduits, electrical fixtures and equipment and install as conditions may dictate as part of this Contract.

B. Sanitary Piping: Locate and size sanitary piping within the building (minor in nature) where not shown on the Drawing in accordance with Standard Plumbing Code.

3.4 INSTRUCTION OF OWNER'S REPRESENTATIVE

A. After final acceptance of all Work and occupancy of building, provide service to make system adjustments to suit conditions created by the occupancy; instruct Owner's operating personnel in operation adjustment and maintenance procedures of system components and acquaint them with locations and functions of valves, control devices, etc., in the system.

B. The actual time of this service shall be as directed but shall not be less than 4 hours nor exceed 1 day. Additional time, if required, to fully prepare Owners operating personnel to operate and maintain the system shall be as directed by the Owner at the Owner's expense. Quote rates for this additional time in the Bid Proposal.

3.5 CLEANING AND RUBBISH

A. During the Work, keep the premises clear of rubbish created as a result of the Work. Protect and prevent unnecessary induction of dirt into piping, fixtures and equipment. On completion of the Work, remove all rubbish and debris resulting from the Work and dispose of same.

3.6 RECORD DRAWINGS

A. The Architect will furnish one set of blue line prints of the Drawings as issued for this Contract. Use these prints to indicate accurately and neatly any deviation in the actual installation from the Drawings as issued. At the completion of the job, deliver the marked-up Drawings to the Architect for a permanent record of the exact location of all equipment, pipe runs, etc., as incorporated in the job.

3.7 COMPLETE SYSTEMS

A. Leave all systems completely operative in all details and in satisfactory working condition, as determined by the Architect. Furnish and install as part of this Contract all apparatus and material obviously a part of the systems and necessary for their operation.

END OF SECTION

SECTION 220501 - PIPE HANGERS AND SUPPORTS

PART I- GENERAL

1.1 SECTION INCLUDES

A. The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the pipe hanger and supports as described in this specification.

1.2 REFERENCES

A. ASTM B633- Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

B. ASTM A123- Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip.

C. ASTM A653 G90-Specification for Steel Sheet, Zinc-Coated by the Hot-Dip Process.

D. MSS SP58- Manufacturers Standardization Society: Pipe Hangers and Supports- Materials, Design, and Manufacture.

E. MSS SP69 - Manufacturers Standardization Society: Pipe Hangers and Supports- Selection and Application.

1.3 QUALITY ASSURANCE

A. Hangers and supports used in fire protection piping systems shall be listed and labeled by Underwriters Laboratories.

B. Steel pipe hangers and supports shall have the manufacturers name, part number, and applicable size stamped in the part itself for identification.

C. Hangers and supports shall be designed and manufactured in conformance with MSS SP 58.

PART II- PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturer: B-Line or equal.

2.2 PIPE HANGERS AND SUPPORTS

A. HANGERS

1. Uninsulated pipes 2 inch and smaller:

a. Adjustable steel swivel ring (band type) hanger.
b. Adjustable steel swivel J-hanger.
c. Malleable iron ring hanger, or hinged ring hanger.
d. Malleable iron split-ring hanger with eye socket.
e. Adjustable steel clevis hanger.

2. Uninsulated pipes 2-1/2 inch and larger:
   a. Adjustable steel clevis hanger.
   b. Pipe roll with sockets.
   c. Adjustable steel yoke pipe roll.

3. Insulated pipe- Hot or steam piping:
   a. 2 inch and smaller pipes: use adjustable steel clevis with galvanized sheet metal shield.
   b. 2-1/2 inch and larger pipes:
      1) Adjustable steel yoke pipe roll with pipe covering protection saddle.
      2) Pipe roll with sockets with pipe covering protection saddle.

4. Insulated pipe- Cold or chilled water piping:
   a. 5 inch and smaller pipes: use adjustable steel clevis with galvanized sheet metal shield.

B. PIPE CLAMPS

1. When flexibility in the hanger assembly is required due to horizontal movement, use pipe clamps with weldless eye nuts. For insulated lines use double bolted pipe clamps.

C. MULTIPLE OR TRAPEZE HANGERS

1. Trapeze hangers shall be constructed from 12 gauge roll formed ASTM A570 Gr. 33 structural steel channel, 1-5/8@ x 1-5/8@ minimum.

2. Mount pipes to trapeze with 2 piece pipe straps sized for outside diameter of pipe.

3. For pipes subjected to axial movement:
   a. Strut mounted roller support. Use pipe protection shield or saddles on insulated lines.
   b. Strut mounted pipe guide.

D. WALL SUPPORTS

1. Pipes 4 inch and smaller:
   a. Carbon steel hook.
   b. Carbon steel J-hanger.

2. Pipes larger than 4 inch:
   a. Welded strut bracket and pipe straps.
   b. Welded steel brackets, with roller chair or adjustable steel yoke pipe roll. Use pipe protection shield or saddles on insulated lines.

E. VERTICAL SUPPORTS

1. Steel riser clamp sized to fit outside diameter of pipe.

F. COPPER TUBING SUPPORTS

1. Hangers shall be sized to fit copper tubing outside diameters.
   a. Adjustable steel swivel ring (band type) hanger.
   b. Malleable iron ring hanger, or hinged ring hanger.
   c. Malleable iron split-ring hanger with eye socket.
   d. Adjustable steel clevis hanger.
2. For supporting vertical runs use epoxy painted or plastic coated riser clamps.
3. For supporting copper tube to strut use epoxy painted pipe straps sized for copper tubing, or plastic inserted vibration isolation clamps.

G. PLASTIC PIPE SUPPORTS

1. V-Bottom clevis hanger with galvanized 18 gauge continuous support channel, to form a continuous support system for plastic pipe or flexible tubing.

H. SUPPLEMENTARY STRUCTURAL SUPPORTS

1. Design and fabricate supports using pre-manufacturered structural quality steel bolted framing materials suitable for application. Channels shall be roll formed, 12 gauge ASTM A570 Grade 33 steel, 1-5/8" x 1-5/8" or greater as required by loading conditions. Use clamps and fittings designed for use with the strut system.

2.3 UPPER ATTACHMENTS

A. For light commercial jobs with wood frame construction, any material meeting an approved interpretion of the Florida Plumbing Code or Florida Mechanical Code, as applicable, is acceptable.

B. BEAM CLAMPS

1. Beam clamps shall be used where piping is to be suspended from building steel. Clamp type shall be selected on the basis of load to be supported, and load configuration.
2. C-Clamps shall have locknuts and cup point set screws. Top flange c-clamps shall be used when attaching a hanger rod to the top flange of structural shapes. Refer to manufacturer's recommendation for setscrew torque. Retaining straps shall be used to maintain the clamps position on the beam where required.
3. Center loaded beam clamps shall be used where specified. Malleable iron or forged steel beam clamps with cross bolt shall be as required to fit beams.

C. CONCRETE INSERTS

1. Cast in place spot concrete inserts shall be used where applicable, either steel or malleable iron body. Spot inserts shall allow for lateral adjustment and have means for attachment to forms. Select inserts to suit threaded hanger rod sizes.

2. Continuous concrete inserts shall be used where applicable. Channels shall be 12 gauge, ASTM A 570 Grade 33 structural quality carbon steel, complete with styrofoam inserts and end caps with nail holes for attachment to forms. The continuous concrete insert shall have a load rating of 2,000 lbs/ft. in concrete. Select channel nuts suitable for strut and rod sizes.

2.4 VIBRATION ISOLATION AND SUPPORTS

A. For refrigeration, air conditioning, hydraulic, pneumatic, and other vibrating system applications, use a clamp that has a vibration dampening insert and a nylon inserted locknut.

B. For larger tubing or piping subjected to vibration, use neoprene or spring hangers as required.

C. For base mounted equipment use vibration pads, molded neoprene mounts, or spring mounts as required.

D. Vibration isolation products as manufactured by B-Line, Vibratrol systems, or equal.

2.5 ACCESSORIES

A. For light commercial jobs with wood frame construction, any material meeting an approved interpretion of the Florida Plumbing or Mechanical Code, as applicable is acceptable.

B. Hanger Rods shall be threaded both ends, or continuous threaded rods of circular cross section. Use adjusting locknuts at upper attachments and hangers. No wire, chain, or perforated straps are allowed.

C. Shields shall be 180 degree galvanized sheet metal, 12 inch minimum length, 18 gauge minimum thickness, designed to match outside diameter of the insulated pipe.

D. Pipe protection saddles shall be formed from carbon steel, 1/8 inch minimum thickness, sized for insulation thickness. Saddles for pipe sizes greater than 12 inch shall have a center support rib.

2.6 FINISHES

A. INDOOR FINISHES

1. Hangers and clamps for support of bare copper piping shall be coated with copper colored epoxy paint. Additional PVC coating of the epoxy painted hanger shall be used where necessary.

2. Hangers for other than bare copper pipe shall be zinc plated in accordance with ASTM B633 OR shall have an electro-deposited green epoxy finish, B-Line Dura-Green or equal.

3. Strut channels shall be pre-galvanized in accordance with ASTM A653 G90 OR have an electro-deposited green epoxy finish, B-Line Dura-Green, or equal.

B. OUTDOOR & CORROSIVE AREA FINISHES

1. Hangers and strut located outdoors shall be hot dip galvanized after fabrication in accordance with ASTM A123. All hanger hardware shall be hot dip galvanized or stainless steel. Zinc plated hardware is not acceptable for outdoor or corrosive use.

2. Hangers and strut located in corrosive areas shall be type 304 stainless steel with stainless steel hardware.

PART III- EXECUTION

3.1 PIPE HANGERS AND SUPPORTS

A. For light commercial jobs with wood frame construction, any method meeting an approved interpretion of the Florida Plumbing Code or Florida Mechanical Code, as applicable, is acceptable.

B. Pipe shall be adequately supported by pipe hanger and supports specified in PART II- PRODUCTS. Hangers for insulated pipes shall be sized to accommodate insulation thickness.

C. Vertical and horizontal support spacing requirements vary according to the locally adopted plumbing code and piping manufacturer's recommendations. Consult local code and piping manufacturer for spacing requirements. In case of conflict, the more strigent requirement shall apply. Do not exceed spacing requirements indicated for the following rod diameters.

D. Horizontal steel piping shall be supported in accordance with MSS SP-69 Tables 3 and 4, excerpts of which follow below.

1. NOMINAL PIPE SIZE	ROD DIAMETER	MAXIMUM SPACING
a. ½" - 1-1/4"	3/8"	7'
b. 1-1/2"	3/8"	9'
c. 2"	3/8"	10'
d. 2-1/2"	½"	11'
e. 3"	½"	12'
f. 3-1/2"	½"	13'
g. 4"	5/8"	14'

E. Horizontal copper tubing shall be supported in accordance with MSS SP-69 Tables 3 and 4, excerpts of which follow below

1. NOMINAL PIPE SIZE	ROD DIAMETER	MAXIMUM SPACING
a. ½"-3/4"	3/8"	5'
b. 1"	3/8"	6'

c.	1-1/4"	3/8"	7'
d.	1-1/2"	3/8"	8'
e.	2"	3/8"	8'
f.	2-1/2"	½"	9'
g.	3"	½"	10'
h.	3-1/2"	½"	10'
i.	4"	½"	12'

F. Provide means of preventing dissimilar metal contact such as plastic coated hangers, copper colored epoxy paint, or non adhesive isolation tape. Galvanized felt isolators sized for copper tubing may also be used.

G. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

H. Install hangers to provide a minimum of 1/2 inch space between finished covering and adjacent work.

I. Place a hanger within 12 inches of each horizontal elbow.

J. Support vertical piping independently of connected horizontal piping. As a minimum, support vertical pipes at every floor. (Local code may require closer spacing) Wherever possible, locate riser clamps directly below pipe couplings or shear lugs.

K. Where several pipes can be installed in parallel and at the same elevation, provide trapeze hangers as specified in section 2.02 C. Trapeze hangers shall be spaced according to the smallest pipe size, or install intermediate supports according to schedule in section 3.01B.

L. Do not support piping from other pipes, ductwork or other equipment which is not building structure.

3.2 CONCRETE INSERTS

A. Provide inserts for placement in formwork before concrete is poured.

B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Where concrete slabs form finished ceilings, provide inserts to be flush with slab surface.

D. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 in.

END OF SECTION

SECTION 221005 - PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for piping systems.

1. Sanitary sewer.
2. Domestic water.

1.2 REFERENCE STANDARDS

A. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2008 (ANSI/ASME B31.9).

B. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2004 (Reapproved 2009).

C. ASTM D 2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2009.

D. ASTM D2846/D2846M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems; 2009b.

E. ASTM D 2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2002).

F. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2008.

G. ASTM F437 - Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; 2009.

H. ASTM F438 - Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40; 2009.

I. ASTM F439 - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; 2009.

J. ASTM F441/F441M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80; 2009.

K. ASTM F 442/F 442M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR); 2009.

L. ASTM F 493 - Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings; 2004.

M. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 1996.

1.3 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body.

1.4 REGULATORY REQUIREMENTS

A. Conform to applicable code for installation of backflow prevention devices.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

PART 2 PRODUCTS

2.1 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. PVC Pipe: PVC DWV Schedule 40, ASTM D 2665.

1. Fittings: PVC.

2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.2 SANITARY SEWER PIPING, ABOVE GRADE

A. PVC Pipe: ASTM D2665.

1. Fittings: PVC.

2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.3 WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. CPVC Pipe: 2" and smaller: ASTM D 2846; larger than 2": F441 Sch 80.

1. Fittings: ASTM F 437, ASTM F 438, ASTM F 439, CPVC.

2. Joints: ASTM D 2855, solvent weld with ASTM D 2564 solvent cement. ASTM F 656 primer.

2.4 WATER PIPING, ABOVE GRADE

A. CPVC Pipe: 2" and smaller: ASTM D 2846; larger than 2": F441 Sch 80.

1. Fittings: ASTM F 437, ASTM F 438, ASTM F 439, CPVC.
2. Joints: ASTM D 2855, solvent weld with ASTM D 2564 solvent cement. ASTM F 656 primer.

2.5 PIPING INSULATION

A. All insulation materials and coatings shall meet flame spread and smoke developed ratings per NFPA Bulletin 90-A when tested in accordance with ASTM Standard E 84. Smoke developed less than or equal to 50, and flame spread less than or equal to 25. All coatings and mastics shall be non-flammable in wet state.

B. Piping insulation shall be fiberglass, ASTM C 547 and ASTM C 795; rigid molded, noncombustible.installed in accordance with manufacturer's instructions. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E 96 of 0.02 perm-inches.Insulation thicknesses shall be as follows: Insulation thicknesses shall be as follows:

1. Cold Water: 1/2" thick (locations outside building insulation)

2.6 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches and Under:

1. Ferrous pipe: Class 150 malleable iron threaded unions.

B. Flanges for Pipe Size Over 1 Inch:

1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.

C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.7 BALL VALVES

A. Manufacturers:

1. Nibco, Inc; Model 585-70-66: www.nibco.com.
2. Appollo; Model 77-140.

B. Construction: MSS SP-110, 150 psi SWP and 600 psi WOG, full port cast bronze two piece body (no yellow brass containing more than 15% zinc), ASTM B-61, ASTM B-62, or ASTM B-584, stainless steel ball and stem, TFE seats and seals, blow-out proof stem, lever handle, adjustable memory stops, solder or threaded ends with union. Where piping is insulated, provide protective sleeve that allows operation of valve without breaking vapor barrier.

C. Valves handles in domestic water systems shall have the following colors: red for hot water service;

blue for cold water service.

2.8 SLEEVES AND ESCUTCHEONS

A. Sleeves shall be 18 gauge galvanized steel or pre-formed plastic. Sleeves shall be sized to allow approximately 1/8" gap around the pipe or its insulation.

B. Sleeves through floor slabs shall be galvanized steel pipe of proper size, Sleeves through floor slabs shall extend 2" above the finished floor.

C. Escutcheon plates for finished spaces will be nickel-plated.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls, unless otherwise indicated on drawings.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Final routing of all piping shall allow for expansion and contraction without stressing pipe, joints, or connected equipment. Vent piping roof penetrations shall be made using flashing collars which are designed to allow for expansion and contraction (Stoneman or equal). Where expansion of vent stack or stack vent exceeds flashing manufacturer's recommendations, provide suitable offset or approved expansion device to accomodate expansion. Provide expansion joints and/or loops or approved expansion fittings as required in all runs of domestic water and DWV lines to avoid shearing of branch lines at structural members or otherwise overstressing joints. Expansion shall be based on manufacturer's data for an 80 degree Faranheit temperature rise, and the individual length of pipe. Submit any specific concerns to Engineer for evaluation. Submit shop drawings of expansion loops and offsets when requested.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

H. Provide access panels where valves and fittings are not exposed. Panels shall be provided in locations approved by the Architect and shall meet fire ratings of walls or ceilings. Adjust location of valves/piping when requested.

I. Install all piping in lavatory cabinets and vanities as tight to the rear of the cabinet or vanity as possible to provide full utilization of the cabinet or vanity for storage.

J. Install all piping so as not to interfere with any electric lighting outlets, duct work, other piping, or equipment. Do not install piping in front of any door or window and avoid interference with any such openings. Do not install any piping over any motors, transformers, electrical panels, or other electrical equipment.

K. Establish elevations of buried piping outside the building to ensure not less than 1.5 ft of cover at all locations @ 1/4" per foot grade.

L. Install vent piping penetrating roofed areas to maintain integrity of roof assembly. Flash all vents passing through roof.

M. ALL FIRE RATED ASSEMBLY PIPING PENETRATIONS MUST BE MADE IN ACCORDANCE WITH THE FIRE RATED ASSEMBLY'S UL LISTING, AND APPROVED BY AUTHORITY HAVING JURISDICTION.

N. Provide and install permanent metal tags identifying all valves and equipment.

O. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

P. Refer to Section 15001 for excavation, backfilling and pumping requirements.

Q. Install valves with stems upright or horizontal, not inverted.

R. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.

S. Install water piping to ASME B31.9.

T. Buried water piping shall be at least 12" deep.

U. Install trap primers in accessible locations. Provide access panels as necessary.

V. Maintain water/sewer horizontal separation of 10'.

W. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

X. Sleeve pipes passing through partitions, walls and floors with a schedule 40 pipe two sizes larger.

Y. Prior to locating building drain and branch lines, confirm piping will not be placed so as to run lengthwise under load bearing portions of or in footings. Adjust placement of pipe as necessary to avoid this condition.

Z. Insulation

1. Insulate all cold water piping exposed ambient temperatures including cold water piping in unisulated attic space. There is no hot water in this facility.
2. Use application details in accordance with the insulating material supplies recommendations except where a higher standard is specified herein.
3. Run covering for piping unbroken through hanger clevises, sleeves, etc. Use details for covering odd surfaces such that continuous covering with unbroken vapor barrier is provided. Use these same covering and hanging details for pipes connecting to vibrating equipment or carrying pulsating pressure to avoid metal-to-metal contact between pipes and hangers.
4. Provide an insert, not less than 6" long, of the same thickness and contour as adjoining insulation, between support shield and piping, but under the finish jacket, on piping 2" or larger, to prevent insulation from sagging at support points. Use heavy density insulating materials suitable for the specified temperature range and strong enough to prevent crushing.
5. Cover surfaces of valves, fittings, strainers, and specialties with built-up Insulation around irregular shapes to form smooth cylindrical surfaces. Cover such specialties in "cold" systems with special care to maintain continuous vapor barrier. Cover flanges and ground joint unions in "cold" systems.

AA. Sleeve and Escutcheon Installation

1. Accurately locate and set required sleeves in walls, foundations, floors, etc.. Where more than one pipe is necessarily passed through a single sleeve as to a unit piping enclosure or other conditions resulting in larger than 1/8" gap within the sleeve, tightly pack space with proper material to form a barrier against sound, vermin, fire, etc.
2. Provide escutcheons on all finished surfaces where exposed piping, bare or insulated, pass through floors, walls or ceilings, except in boiler, utility or equipment rooms. Fasten escutcheons securely to pipe or pipe covering.

3.3 APPLICATION

A. Fixtures, Floor Drains and Cleanouts: Provide all fixtures and floor drains with traps to comply with local regulations and as hereinafter specified. Provide exposed traps with brass cleanout plugs. Provide cleanouts in soil and waste lines as shown on the Plans and as required by the governing codes. Extend cleanouts for piping concealed in floor or ceiling construction through the floor above and provide with adjustable floor level cleanout set flush with the finished floor. Use wall cleanouts for piping concealed in wall construction only where indicated on the Drawings

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Install gate valves or ball 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 controls in water recirculating systems where indicated.

3.4 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.

B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.5 TESTS

A. Testing requirements are minimum and are not intended to be limiting where additional testing methods are required by the authority having jurisdiction.

B. All drainage, vent and inside conductor piping shall be tested before fixtures are installed by capping or plugging the openings and filling the entire system with water, allowing it to stand thus filled for 3 hours. If required to test system in sections, provide necessary test tees, plugs and stand pipe to test the system with at least 10 feet of pressure. Remake all leaking joints and retest.

C. Test all water supply piping before fixtures, equipment and/or hydrants are connected. Cap or plug the openings, fill the system with water and apply a hydrostatic pressure of 125 PSIG. Hold test pressure for at least 2 hours. Remake all leaking joints and retest.

D. Test each fixture for soundness, stability of support and satisfactory operation of all its parts.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfect the domestic water piping system in accordance with local municipality requirements. In the absence of a locally adopted municipality procedure, after all plumbing work has been completed and the system tested, disinfect the system as follows:

1. Prior to starting work, verify system is complete, flushed and clean.

2. After tests are completed, fill all water supply systems with a solution containing 50 PPM of chlorine and allow to stand for a period of at least 24 hours. As an alternate, fill the system with a solution containing 200 PPM of chlorine and allow to stand for 3 hours.

3. Following the standing time, the systems shall be flushed with clean potable water until the chlorine is purged from the system.

4. The procedure shall be repeated where shown by a bacteriological examination that contamination remains present in the system.

B. Deliver a dated letter certifying sterilization to the Architect.

3.7 SERVICE CONNECTIONS

A. Provide new sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, and sand strainer.

END OF SECTION

SECTION 221006 - PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Floor drains.

B. Cleanouts.

C. Trap Primers.

D. Hydrants.

E. Water hammer arrestors.

1.2 REFERENCE STANDARDS

A. ASME A112.6.3 - Floor and Trench Drains; The American Society of Mechanical Engineers; 2001 (R2007).

B. ASSE 1019 - Vacuum Breaker Wall Hydrants, Freeze Resistant Automatic Draining Type; American Society of Sanitary Engineering; 2004, and Errata 2005 (ANSI/ASSE 1019).

C. PDI-WH 201 - Water Hammer Arresters; Plumbing and Drainage Institute; 2006.

PART 2 PRODUCTS

2.1 DRAINS

A. Manufacturers:

1. Josam Company: www.josam.com.
2. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
3. Zurn Industries, Inc: www.zurn.com.

B. Floor Drain (FD):

1. ASME A112.21.1M; lacquered cast iron two piece body (adjustable housing) with double drainage flange, weep holes, and round, adjustable nickel-bronze strainer, trap primer connection. Outlet size shall match connecting waste pipe size.
2. Where indicated, provide sediment bucket. For Clay County projects, provide 40 mesh screens.
3. Polished bronze funnel or anti-splash rim for mechanical room applications.
4. Provide trap primers below lavatories where indicated on drawings.

C. Floor Sink (FS):

1. Square lacquered cast iron body with integral seepage pan, epoxy coated interior, aluminum dome strainer, clamp collar, half grate or 3/4 Grate, deep seal trap.

2.2 CLEANOUTS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
2. Zurn Industries, Inc: www.zurn.com.

B. All cleanouts shall have plugs of nylon or brass with raised or countersunk heads and shall conform to WW-P-401.

C. Cleanouts at Exterior Surfaced Areas:

1. Round cast nickel bronze access frame and non-skid cover.

D. Cleanouts at Interior Finished Wall Areas:

1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

2.3 HYDRANTS

A. Wall Hydrants:

1. ASSE 1019; freeze resistant, self-draining type with chrome plated wall plate hose thread spout, handwheel, and integral vacuum breaker.

2.4 WATER HAMMER ARRESTORS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
2. Watts Regulator Company: www.wattsregulator.com.
3. Zurn Industries, Inc: www.zurn.com.

B. Water Hammer Arrestors:

1. Stainless steel or copper construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psi working pressure.

2.5 TRAP PRIMERS

A. Trap primers shall conform to ANSI 1018, and shall be provided for all floor drains unless otherwise indicated on drawings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete or cast iron access box (paved areas) or pvc access box (unpaved areas) flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Install approved portable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

F. Pipe relief from backflow preventer to nearest drain.

G. Install water hammer arrestors complete with accessible isolation valves on hot and cold water supply piping to lavatories, flush valves, sinks,washing machine outlets, dental equipment connections, makeup water connections and refrigerator outlets in accordance with PDI WH 201 guidelines as outlined in drawings.

END OF SECTION

SECTION 224000 - PLUMBING FIXTURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water closets.

B. Urinals.

C. Lavatories.

D. Service sinks.

E. Drinking fountains.

1.2 RELATED REQUIREMENTS

A. Section 07 90 05 - Joint Sealers: Seal fixtures to walls and floors.

1.3 REFERENCE STANDARDS

A. ANSI Z124.2 - American National Standard for Plastic Shower Units; 1995.

B. ASME A112.18.1 - Plumbing Supply Fittings; The American Society of Mechanical Engineers; 2005.

C. ASME A112.19.1M - Enameled Cast Iron Plumbing Fixtures; The American Society of Mechanical Engineers; 1994 (R2004).

D. ASME A112.19.2 - Vitreous China Plumbing Fixtures and Hydraulic Requirements for Water Closets and Urinals; The American Society of Mechanical Engineers; 2008.

E. ASME A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use); The American Society of Mechanical Engineers; 2008.

F. ASME A112.19.4M - Porcelain Enameled Formed Steel Plumbing Fixtures; The American Society of Mechanical Engineers; 1994 (R2004).

PART 2 PRODUCTS

2.1 GENERAL

A. The following specifications supplement the fixtures as scheduled on the drawings. See schedule for approved manufacturer's/models.

B. Prior to ordering fixtures, confirm dimensional fit-up requirements for DWV piping layouts, framing/millwork, faucet trim holes, etc., and coordinate any required adjustments to ensure proper fit, form and function of each fixture.

2.2 WATER CLOSETS (Flush Valve Type)

A. Unless otherwise indicated, all water closets shall comply with the following requirements: floor mounted or or wall mounted as scheduled vitreous china (ASME A112.19.2M), syphon jet with elongated rim. Provide open front, white plastic seat, hinged, without cover, compatible with toilet. Provide all required fittings for complete installation including, but not limited to, 1-1/2" top spud & bolt caps. Flush rate as scheduled.

B. All water closets identified on drawings as "ADA" or "Handicapped" shall have mounting height of 17" to 19" inches as measured from the finished floor to the top of seat.

C. FLUSH VALVES

1. Exposed Flush Valve:
   a. ASME A112.18.1M; exposed chrome plated, diaphragm type with oscillating handle, escutcheon, seat bumper, integral screwdriver stop and vacuum breaker; flush rate as scheduled. Trap Primer connection.

2.3 WALL HUNG URINALS

A. Urinal:

1. ASME A112.19.2M; vitreous china, wall hung washout urinal with shields, integral trap, removable stainless steel strainer, top spud, steel supporting hanger. Urinal shall be designed for the flush rate indicated for flush valve.

B. FLUSH VALVES

C. Exposed Flush Valve:

1. ASME A112.18.1M; exposed chrome plated, diaphragm type with oscillating handle, escutcheon, integral screwdriver stop, vacuum breaker; maximum 0.125 gpf flush volume.

2.4 LAVATORIES

A. Unless otherwise indicated, all lavatories shall comply with the following requirements: Vitreous china (ASME A112.19.2M) with front overflow, drillings for required trim, 1/2" flexible supplies, escutcheon plates and stop valves. Countertop lavatories shall be sealed, self rimming. Exposed traps and arms shall be brass with cleanout. Provide removable P-traps. Faucets (ASME A112.18.1M) shall limit flow to 0.5 GPM at 80 PSI.

B. All lavatories identified on drawings as "ADA" or "Handicapped" shall be mounted with rim or counter surface no higher than 34" above finished floor, with at least 29" height from finished floor to bottom of apron, and knee & toe clearance as identified in Florida Accessibility Code, Fig. 31. Provide offset waste as required. Controls shall be operable with one hand and shall not require tight grasping, pinching or twisting of the wrist, and shall activate with less than 5 lbs of force. Provide ADA compliant protective shielding for piping and all sharp or abrasive surfaces under lavatory.

2.5 DRINKING FOUNTAINS

A. Fountain: Molded, color/finish by architect reinforced glass fiber with underside vandal proof cowling, hooded elevated anti-squirt bubbler with stream guard, automatic stream regulator, cross handle, mounting bracket, screwdriver stop.

2.6 SERVICE SINKS

A. Accessories:

1. Hose clamp hanger.
2. Mop hanger.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

C. Confirm with cabinet makers and framers in advance to properly size cutouts and make other provisions necessary for the installation of counter top lavatories and sinks prior to purchasing.

3.2 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide rigid or flexible supplies to fixtures with screwdriver stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall supports and bolts.

E. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07 90 05, color to match fixture.

F. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

3.4 INTERFACE WITH WORK OF OTHER SECTIONS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.5 ADJUSTING

A. Adjust shower shower mixing valves to limit outlet temperature to 110 degrees F.

B. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.6 CLEANING

A. Clean plumbing fixtures and equipment.

3.7 SCHEDULES

A. See Drawings for fixture schedule.

END OF SECTION

SECTION 230400 - GENERAL MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General requirements for heating, ventilating and air conditioning systems.

B. Miscellaneous material and execution requirements (pipe hangers, sleeves, escutcheons, equipment supports, etc.)

C. General requirements for plumbing systems.

D. Trench excavation, pumping, backfilling and compaction for underground piping & plumbing.

1.2 DESCRIPTION

A. The scope of work shall include complete heating, ventilating and air conditioning systems as shown on the Drawings and specified herein.

1.3 PRE-INSTALLATION CONFERENCE

A. Prior to start of any work, the successful Subcontractors shall thoroughly review the plans and specifications to determine that no questions remain concerning the intent of the contract documents, and shall bring concerns to the attention of the Architect and Engineer. Subcontractors shall meet with the Architect when requested. Each Subcontractors shall outline his method of procedure and bring up for discussion and decision any questions concerning the project. No work shall be performed prior to this meeting. The Architect shall set the date, time and place of conference.

1.4 CODES, ORDINANCES AND PERMITS:

A. Comply with all codes applying to the Work of this Contract including the Florida Energy Code. Obtain information on all code restrictions and requirements. In case of conflict between the Contract Documents and a governing code or ordinance, such conflict shall be immediately brought to the attention of the Architect for resolution. Extra payment will not be allowed for Work required by code restrictions except through written agreement with the Owner.

B. Apply for, obtain, and pay for all required permits and inspection certificates. Final payment is contingent upon delivery of such certificates to the Architect.

C. All materials and equipment shall be new and first class in every respect. As far as is practical, similar products shall be by one manufacturer. Where applicable, all materials and equipment shall bear the Underwriters' Laboratories seal or ASME code stamp. Certificates to this effect shall be furnished to the Architect upon request.

1.5 STANDARDS

A. Unless modified by these Specifications, the design, manufacture, testing and method of installing all materials, apparatus and equipment shall conform to the following:

1. ASHRAE Standard 90, Energy Conservation in New Building Design.
2. ANSI B9. 1, Safety Code for Mechanical Refrigeration.
3. NFPA, Standards of National Fire Protection Association.
4. ASHRAE Handbook of Fundamentals.
5. SMACNA Standards for Duct Work.
6. Associated Air Balance Council Standards for Field Measurement and Instrumentation.
7. Underwriters' Laboratories.
8. National Electrical Code.
9. Air Moving and Conditioning Association.
10. Air Conditioning and Refrigeration Institute.

1.6 SITE INSPECTION

A. Visit the site and thoroughly inspect conditions affecting the Work before submitting Bid. Assume responsibility for meeting all existing conditions including access and work space limitations.

1.7 DRAWINGS AND SPECIFICATIONS:

A. Refer to the general Construction Drawings which are bound with the Drawings of this Work for construction details, elevations, etc. Bring any discrepancies between Mechanical/Plumbing drawings and Architectural/Structural/Civil to the attention of the Architect prior to initiating work. It is the intent of the Mechanical and Plumbing Drawings to show the general arrangement of the system and not to indicate all offsets, fittings and accessories which may be required, nor to show exact locations of piping, ductwork or equipment except where actual dimensions are given. All vertical piping shall be located in walls in finished spaces unless otherwise noted.

B. It is the intent of the Drawings and Specifications to call for finished Work, tested, and ready for operation, and in complete conformance with all applicable codes, rules and regulations. Minor details not usually shown or specified, but manifestly necessary for the proper installation and operation of the various systems, shall be included in the Work and in the proposal, the same as if specified or shown on the Drawings.

C. If any departures from the Drawings and Specifications are deemed necessary, details of such departures and the reasons therefore shall be submitted to the Engineer for approval. No departures shall be made without prior approval of the Engineer.

D. Specific reference in the Specifications to any article, device, product, material, fixture or type of construction, etc., by proprietary name, make or catalog number shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. Substitutes may be used subject to compliance with requirements set forth in the General Requirements, Division I, and the requirements of this section.

1.8 APPROVED ALTERNATE MANUFACTURERS AND PRODUCT SUBSTITUTIONS

A. Equipment substitutions other than the basis of design scheduled on drawings shall comply in every respect with the applicable schedules and specifications contained in the contract documents, and shall meet the requirements of any relevant architectural administrative specification requirements on product substitutions. Equipment scheduled on Drawings was used to arrive at performance, space, maintenance, and utility service requirements. If other equipment is submitted and approved, take responsibility for providing the space, maintenance, and utility service requirements of this substituted equipment, and ensure the capacities, accessories and features as indicated for the scheduled manufacturer are provided. This responsibility shall include the costs associated with any resulting changes during and following installation, including costs to change electrical service required by substituted equipment, to obtain required clearances, or to provide missing accessories and features. Approval of equipment substitutions during the submittal review process or listing of alternate approved manufacturers in these specifications represents an acceptance of the general level of product quality and reliability, and does not imply that the alternate manufacturer's have been reviewed for compliance with the performance, features, materials and accessories already specified for the equipment scheduled on the drawings. It is the ultimate responsibility of the contractor to ensure any equipment substituted for what was scheduled on the drawings meets the contract document requirements.

B. Where the name of a concern or manufacturer is mentioned on the Drawings or in Specifications in reference to his required service or product, and no qualifications or specification of such is included, then the material gauges, details of manufacturer, finish, etc., shall be in accordance with his standard practice, directions or specifications. The Contractor shall be responsible for any infringement of patents, royalties, or copyrights which may be incurred thereby.

1.9 SUBMITTALS

A. Submit shop drawings or catalog data for Architects approval before purchasing or installing the following items.

1. Air Conditioning Equipment

2. Grilles, Diffusers and Registers
3. Exhaust Fans
4. Louvers
5. Duct Shop Drawings (where different from design drawings)
6. Test and Balance Report
7. Shop drawings for mounting details of air handling units and rooftop heatpumps.

1.10 PERFORMANCE DATA

A. All performance data specified herein shall be considered actual performance of equipment as installed. Make suitable allowances if installation details are such that actual operating conditions unfavorably affect performance as compared to conditions under which the equipment was rated.

1.11 OPERATION AND MAINTENANCE DATA

A. Provide four (4) complete sets of a compilation of catalog data of each manufactured item of equipment used in the Mechanical and Plumbing Work. In addition to the catalog data, installation, operating and maintenance data and bill of materials for all operating equipment shall be submitted. Each of the four sets of data shall be bound in loose leaf binders and submitted to the Architect before final payment is made. A complete double index shall be provided as follows:

1. Listing the Products alphabetically by name.
2. Listing the names of manufacturer's alphabetically by name together with their addresses and the names and addresses of local sales representatives.

B. Include the following information where applicable: Name and Mark number, Location, Complete Namplate Data, Certified Record Drawings and Shop Drawings, Parts List, Performance Curves, Wiring Diagrams, Lubrication Charts, Manufacturer's operating and maintenance instructions with all non-applicable information deleted.

C. Maintenance instruction manuals shall include complete oiling, cleaning, and servicing data compiled in clearly and easily understandable form. Data shall show all serial numbers of each piece of equipment, complete list of replacement parts, motor ratings, and actual loads.

D. It is the intent of this catalog, operation and maintenance data to provide the Owner with complete instructions on the proper operation and use, lubrication and periodic maintenance, together with the source of replacement parts and service, for the items of equipment covered.

1.12 CONTRACTOR COORDINATION

A. The Electrical Contractor shall furnish, set and wire all disconnect devices and starters as required for all equipment except for those items furnished with integral disconnect devices and/or starters.

B. Furnish detailed information to the Electrical Contractor on power wiring requirements for all mechanical and plumbing equipment actually purchased as soon as practical. This shall include all diagrams and instructions necessary for the Electrical Contractor to make connections properly. If equipment actually purchased requires larger electrical service than equipment scheduled, arrange and pay for required electrical service change.

C. Provide all air conditioning control devices, including thermostats, and complete all control wiring, including final connections.

D. Coordinate location of equipment, piping, and duct work with other trades to maintain clearance for equipment maintenance, prevent interference with duct and piping runs, and to prevent ducts and piping from being installed over electrical panels. If interference develops, the Architect will decide which equipment, conduit, duct, piping, etc., must be relocated regardless of installation order. Take responsibility for relocating the work of your trade, if so ordered, including all associated costs.

E. Within 30 days following award of the Contract, report to the Architect, in writing, all real or potential errors, ambiguities and/or conflicts on the Mechanical Work or between the trades and obtain an agreement with the Architect on a solution. Those reported after 30 days, except as a result of unforeseen circumstances, shall be resolved at the discretion of the Architect. Report conflicts resulting from the progress of Work to the Architect immediately or accept the expense of corrective work caused by failure to report such a conflict.

1.13 CHANGES

A. Do not make any changes in design without the written approval of the Engineer. Changes in design means any change which may affect the capacity, reliability, operation or safety of the systems or any parts thereof, including changes which may be required to conform to local regulations or codes.

1.14 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

1.15 DELIVERY, STORAGE, AND PROTECTION

A. Protect all materials and equipment against damage and vandalism during construction. Replace any damaged material or equipment and place the systems in perfect working condition.

1.16 WARRANTY

A. Provide written warranties as specified in the General Requirements, Division 1 for additional warranty requirements.

B. Provide five year manufacturer warranty for refrigeration compressors against defects in materials and workmanship. Repair any defects becoming apparent within the warranty period as directed by the Architect. The warranty shall not cause an obligation to repair damage resulting from accident or improper operation or care on the part of the Owner.

PART 2 PRODUCTS

2.1 MOTORS.

A. All permanently wired polyphase motors 1 HP or more shall be classified under the National Electric Manufacturer's Association's Standard as "energy efficient".

PART 3 EXECUTION

3.1 GENERAL

A. Examine the site and all Drawings before proceeding with the layout and installation of the Work. Locate all vertical piping within walls in finished spaces unless specifically noted otherwise. Such piping cannot always be shown within walls on Drawings due to their small scale.

B. Arrange the Work essentially as shown, exact layout to be made on the job to suit actual conditions encountered. Confer and cooperate with other trades on the job so all Work will be installed in proper relationship and coordinate precise location of parts with the Work of others.

C. Arrange for required chases, slots and openings with the General Contractor including locations of required pipe sleeves through walls and foundations. Assume liability for cutting or patching made necessary by failure to make proper arrangements in this respect.

D. Indicated equipment connections are necessarily based on equipment of a given manufacture. Assume responsibility for proper arrangement of pipes, ducts, etc., to connect approved equipment in a proper and approved manner. Follow equipment manufacturer's detailed instructions and recommendations in the installation and connection of all equipment. In case of conflict between manufacturer's instructions and the Contract Documents, notify the Architect before proceeding. No equipment installation or connections shall be made in a manner that voids the manufacturers warranty.

E. Install all Work in a neat and workmanlike manner, using only workmen thoroughly qualified in the trade or duties they are to perform. Rough Work will be rejected.

3.2 EQUIPMENT INSTALLATION

A. Supports

1. Where required, install galvanized steel supports under the air handling units to allow installation of supply and return air ducts and access to filters and access panels.

2. For installations where air handling units are to be suspended from the roof, Prepare and Furnish drawings indicating exact location, weight and proposed method of suspension to the Architect for confirmation of structural adequacy.

3. For installations where heat pump outdoor units or condensing units are to be mounted on the roof, Prepare and Furnish drawings indicating exact location, weight and proposed method of installation to the Architect for confirmation of structural adequacy. Units shall be mounted level and adequately secured.

4. Prepare and furnish Drawing and Templates indicating all concrete Work required for equipment furnished under this Work. All concrete required will be provided by the General Contractor. Provide, at the time concrete foundations, bases, or curbs or formed, all necessary anchor bolt as required for the various equipment in this Work. Grout all spaces between the equipment base and concrete supports.

B. Install all equipment to permit removal of coils, fan shafts and wheels, filters, belt guards, sheaves and drives, and all other parts requiring periodic replacement or maintenance.

C. Arrange equipment to permit ready access to valves, cocks, traps, starters, motors and control components, and to clear the openings of swinging and overhead doors and of access panels.

3.3 IDENTIFICATION OF EQUIPMENT

A. Securely attach manufacturers nameplate to all equipment giving data as to design and operating characteristics. Securely attach permanent metal tags identifying each major HVAC component (i.e. air handlers, condensing units, rooftop units, pumps, exhaust fans, etc.) with the original equipment tag assigned to the component by the equipment schedule on the drawings.

B. Securely attach nameplates to all switches, starters, gauges, control devices and similar items, giving the name and number of the item of equipment to which it is connected.

3.4 SLEEVE INSTALLATION

A. Accurately locate and set required sleeves pipe duct. Where more than one pipe is necessarily passed through a singe sleeve as to a unit piping enclosure or other conditions resulting in larger than 1 /8" gap within the sleeve, tightly pack space with proper material to form a barrier against sound, vermin, fire, etc.

3.5 MACHINERY GAURDS

A. Provide all belts, couplings, wheels, fan blades and other moving parts of machinery with removable metal gaurds. Provide tachometer openings for all belt driven or variable speed machinery.

3.6 EXCAVATION, BACKFILLING AND PUMPING

A. Perform all excavation, backfilling and pumping necessary for the completion of the Work in accordance with the requirements of Excavation and Backfill, Division 2.

B. Excavate trenches suitable in width to provide a minimum of 6" clear space between the barrel of the pipe and the trench wall on both sides of the pipe. Accurately grade the trench bottom to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along its entire length. Take care not to excavate below the depth necessary and excavate bell holes to ensure proper bedding. Backfill over-depths with loose, granular, moist material and thoroughly compact to the depth required.

C. Place and compact backfill material in 6" layers until the pipe has a minimum cover of 12". Place and compact the remaining material in 12" layers. Grade the surface to a reasonable uniformity and leave the mounding in neat condition as approved by the Architect.

D. Backfill all trenches passing under foundations with concrete to the underside of the foundation and at a 2:1 slope away from each side of the foundation. Backfill all trenches that are parallel and deeper than foundations with concrete to a point that will place the top of the concrete on a 2:1 slope away from the foundation bottom. Do not backfill trenches until all required tests and inspections are completed.

E. Repair or replace all topsoil, shrubbery, sod, sidewalks, streets, walls, etc. disturbed by the excavation, backfilling or pumping to the satisfaction of the Architect. Repair sidewalks in complete blocks; partial patching will not be accepted.

3.7 FIRESTOPPING

A. Thoroughly review Architectural plans and provide approved Firestopping at penetration of every fire rated wall, floor or ceiling system.

B. Refer to Architectural specifications for Firestopping product and installation requirements. In the absence of relevant Architectural specifications, Firestopping shall comply with the requirements of the Authority Having Jurisdiction and the following as a minimum:

1. Fire Testing: Provide firestopping assemblies of designs which provide the specified fire ratings when tested in accordance with methods indicated.
   a. Listing in the current classification or certification books of UL, FM, or ITS (Warnock Hersey) will be considered as constituting an acceptable test report.

2. Firestopping: Any material meeting requirements.
   a. Fire Ratings: Use any system listed by UL or tested in accordance with ASTM E 814 that has F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and that meets all other specified requirements.

3. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material. Remove incompatible materials which may affect bond. Install backing materials to arrest liquid material leakage.

4. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings. Do not cover installed firestopping until inspected by authority having jurisdiction. Install labelling required by code. Clean adjacent surfaces of firestopping materials. Protect adjacent surfaces from damage by material installation.

3.8 INSTRUCTION OF OWNER'S REPRESENTATIVE

A. After final acceptance of all Work and occupancy of building, provide service to make system adjustments to suit conditions created by the occupancy; instruct Owner's operating personnel in operation adjustment and maintenance procedures of system components and acquaint them with locations and functions of valves, control devices, etc., in the system.

B. The actual time of this service shall be as directed but shall not be less than 4 hours nor exceed 1 day. Additional time, if required, to fully prepare Owners operating personnel to operate and maintain the system shall be as directed by the Owner at the Owner's expense. Quote rates for this additional time in the Bid Proposal.

3.9 CLEANING AND RUBBISH

A. During the Work, keep the premises clear of rubbish created as a result of the Work. Protect and prevent unnecessary induction of dirt and thoroughly clean all equipment used for temporary heat and/or ventilation, as well as piping, fixtures, and plumbing equipment.

B. Use and maintain adequate filters in all fan coil equipment used for temporary heat and/or ventilation. Replace with new filters after construction and before units are placed in service. Close all air duct openings to effectively prevent the entrance of dust and construction debris during construction.

C. On completion of the Work, remove all rubbish and debris resulting from the Work and dispose of same. Thoroughly clean and leave in a satisfactory condition for use all equipment, pipe, fixtures, duct work, etc.

3.10 RECORD DRAWINGS

A. The Architect will furnish one set of blue line prints of the Mechanical Drawings as issued for this Contract. Use these prints to indicate accurately and neatly any deviation in the actual installation from the Drawings as issued. At the completion of the job, deliver the marked-up Drawings to the Architect for a permanent record of the exact location of all equipment, pipe runs, etc., as incorporated in the job.

3.11 COMPLETE SYSTEMS

A. Leave all systems completely operative in all details and in satisfactory working condition, as determined by the Architect. Furnish and install as part of this Contract all apparatus and material obviously a part of the systems and necessary for their operation.

END OF SECTION

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

1.2 REFERENCE STANDARDS

A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council; 2002.

B. ASHRAE Std 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 1988, with 1997 Errata.

C. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems; National Environmental Balancing Bureau; 2005, Seventh Edition.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Submit Test and Balance report.

C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.

1. Include at least the following in the plan:
    a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
    b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
    c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
    d. Final test report forms to be used.
    e. Procedures for formal deficiency reports, including scope, frequency and distribution.

1.4 QUALITY ASSURANCE (moved to PART 3)

A. Perform total system balance in accordance with AABC MN-1, ASHRAE Std 111, or NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

B. TAB Agency Qualifications: Company specializing in the testing, adjusting, and balancing of systems specified in this Section with minimum three years documented experience certified by AABC.

C. Perform Work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing and Adjusting Supervisor experienced in performance of this Work and licensed at the the State in which the Project is located.

1.5 WARRANTY (moved to PART 3)

A. Furnish AABC National Performance Guaranty for this project.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. TAB Agency Qualifications:

1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.

3.2 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:

1. Systems are started and operating in a safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.

9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.

B. Confirm the proper functions of all components as noted in the sequence of operations including, but not limited to, interlocks, overrides, and damper positions & equipment operations based on occupied and unoccupied modes of operation.

C. Beginning of work means acceptance of existing conditions.

3.3 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.

B. Provide additional balancing devices as required.

3.4 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.5 RECORDING AND ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

E. At final inspection, recheck random selections of data recorded in report. After building occupation, recheck points or areas (up to 20%) as selected and witnessed by the Engineer, at no additional cost.

3.6 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Upon completion of test and balance work, insert all data into a complete type written report and submit six copies of this report to the owner (via the architect).

END OF SECTION

SECTION 230800 - COMMISSIONING OF HVAC

PART 1 GENERAL

1.1 SUMMARY

A. See Section 01 91 13 - General Commissioning Requirements for overall objectives; comply with the requirements of Section 01 91 13.

B. This section covers the Contractor's responsibilities for commissioning; each subcontractor or installer responsible for the installation of a particular system or equipment item to be commissioned is responsible for the commissioning activities relating to that system or equipment item.

C. The Commissioning Authority (CA) directs and coordinates all commissioning activities and provides Prefunctional Checklists and Functional Test Procedures for Contractor's use.

D. The entire HVAC system is to be commissioned, including commissioning activities for the following specific items:

1. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

E. The Prefunctional Checklist and Functional Test requirements specified in this section are in addition to, not a substitute for, inspection or testing specified in other sections.

1.2 REFERENCE STANDARDS

A. ASHRAE Guideline 1 - The HVAC Commissioning Process; 1996

1.3 SUBMITTALS

A. Updated Submittals: Keep the Commissioning Authority informed of all changes to control system documentation made during programming and setup; revise and resubmit when substantial changes are made.

B. DRAFT Prefunctional Checklists and Functional Test Procedures for Control System: Detailed written plan indicating the procedures to be followed to test, checkout and adjust the control system prior to full system Functional Testing; include at least the following for each type of equipment controlled:

1. System name.

2. List of devices.

3. Step-by-step procedures for testing each controller after installation, including:
   a. Process of verifying proper hardware and wiring installation.

b. Process of downloading programs to local controllers and verifying that they are addressed correctly.
c. Process of performing operational checks of each controlled component.
d. Plan and process for calibrating valve and damper actuators and all sensors.
e. Description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.

4. Copy of proposed log and field checkout sheets to be used to document the process; include space for initial and final read values during calibration of each point and space to specifically indicate when a sensor or controller has “passed” and is operating within the contract parameters.

5. Description of the instrumentation required for testing.

6. Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the Commissioning Authority and TAB contractor for this determination.

C. Startup Reports, Prefunctional Checklists, and Trend Logs: Submit for approval of Commissioning Authority.

D. HVAC Control System O&M Manual Requirements. In addition to documentation specified elsewhere, compile and organize at minimum the following data on the control system:

1. Specific step-by-step instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. Provide an index and clear table of contents. Include the detailed technical manual for programming and customizing control loops and algorithms.

2. Full as-built set of control drawings.

3. Full as-built sequence of operations for each piece of equipment.

4. Full points list; in addition to the information on the original points list submittal, include a listing of all rooms with the following information for each room:
a. Floor.
b. Room number.
c. Room name.
d. Air handler unit ID.
e. Reference drawing number.
f. Air terminal unit tag ID.
g. Heating and/or cooling valve tag ID.
h. Minimum air flow rate.
i. Maximum air flow rate.

5. Full print out of all schedules and set points after testing and acceptance of the system.
6. Full as-built print out of software program.
7. Electronic copy on disk of the entire program for this facility.
8. Marking of all system sensors and thermostats on the as-built floor plan and HVAC drawings with their control system designations.
9. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
10. Control equipment component submittals, parts lists, etc.
11. Warranty requirements.
12. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).
13. Organize and subdivide the manual with permanently labeled tabs for each of the following data in the given order:
    a. Sequences of operation.
    b. Control drawings.
    c. Points lists.
    d. Controller and/or module data.
    e. Thermostats and timers.
    f. Sensors and DP switches.
    g. Valves and valve actuators.
    h. Dampers and damper actuators.
    i. Program setups (software program printouts).

E. Project Record Documents: See Section 01 78 00 for additional requirements.

1. Submit updated version of control system documentation, for inclusion with operation and maintenance data.
2. Show actual locations of all static and differential pressure sensors (air, water and building pressure) and air-flow stations on project record drawings.

F. Draft Training Plan: In addition to requirements specified in Section 01 79 00, include:

1. Follow the recommendations of ASHRAE Guideline 1.
2. Control system manufacturer's recommended training.
3. Demonstration and instruction on function and overrides of any local packaged controls not controlled by the HVAC control system.

G. Training Manuals: See Section 01 79 00 for additional requirements.

1. Provide three extra copies of the controls training manuals in a separate manual from the O&M manuals.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

A. Provide all standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become the property of Owner.

B. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

PART 3 EXECUTION

3.1 PREPARATION

A. Cooperate with the Commissioning Authority in development of the Prefunctional Checklists and Functional Test Procedures.

B. Furnish additional information requested by the Commissioning Authority.

C. Prepare a preliminary schedule for HVAC pipe and duct system testing, flushing and cleaning, equipment start-up and testing, adjusting, and balancing start and completion for use by the Commissioning Authority; update the schedule as appropriate.

D. Notify the Commissioning Authority when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and testing, adjusting, and balancing will occur; when commissioning activities not yet performed or not yet scheduled will delay construction notify ahead of time and be proactive in seeing that the Commissioning Authority has the scheduling information needed to efficiently execute the commissioning process.

E. Put all HVAC equipment and systems into operation and continue operation during each working day of testing, adjusting, and balancing and commissioning, as required.

F. Provide test holes in ducts and plenums where directed to allow air measurements and air balancing; close with an approved plug.

G. Provide temperature and pressure taps in accordance with the contract documents.

3.2 INSPECTING AND TESTING - GENERAL

A. Submit startup plans, startup reports, and Prefunctional Checklists for each item of equipment or other assembly to be commissioned.

B. Perform the Functional Tests directed by the Commissioning Authority for each item of equipment or other assembly to be commissioned.

C. Provide two-way radios for use during the testing.

D. Valve/Damper Stroke Setup and Check:

1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
2. Set pump/fan to normal operating mode.
3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
4. Command valve/damper open; verify position is full open and adjust output signal as required.
5. Command valve/damper to a few intermediate positions.
6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

E. Isolation Valve or System Valve Leak Check: For valves not by coils.

1. With full pressure in the system, command valve closed.
2. Use an ultra-sonic flow meter to detect flow or leakage.

F. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.

3.3 TAB COORDINATION

A. TAB: Testing, adjusting, and balancing of HVAC.

B. Coordinate commissioning schedule with TAB schedule.

C. Review the TAB plan to determine the capabilities of the control system toward completing TAB.

D. Provide all necessary unique instruments and instruct the TAB technicians in their use; such as handheld control system interface for setting terminal unit boxes, etc.

E. Have all required Prefunctional Checklists, calibrations, startup and component Functional Tests of the system completed and approved by the Commissioning Authority prior to starting TAB.

F. Provide a qualified control system technician to operate the controls to assist the TAB technicians or provide sufficient training for the TAB technicians to operate the system without assistance.

3.4 CONTROL SYSTEM FUNCTIONAL TESTING

A. Prefunctional Checklists for control system components will require a signed and dated certification that all system programming is complete as required to accomplish the requirements of the Contract Documents and the detailed Sequences of Operation documentation submittal.

B. Do not start Functional Testing until all controlled components have themselves been successfully Functionally Tested in accordance with the contract documents.

C. Using a skilled technician who is familiar with this building, execute the Functional Testing of the control system as required by the Commissioning Authority.

D. Functional Testing of the control system constitutes demonstration and trend logging of control points monitored by the control system.

1. The scope of trend logging is partially specified; trend log up to 50 percent more points than specified at no extra cost to Owner.

2. Perform all trend logging specified in Prefunctional Checklists and Functional Test procedures.

E. Functionally Test integral or stand-alone controls in conjunction with the Functional Tests of the equipment they are attached to, including any interlocks with other equipment or systems; further testing during control system Functional Test is not required unless specifically indicated below.

F. Demonstrate the following to the Commissioning Authority during testing of controlled equipment; coordinate with commissioning of equipment.

1. Setpoint changing features and functions.

2. Sensor calibrations.

G. Demonstrate to the Commissioning Authority:

1. That all specified functions and features are set up, debugged and fully operable.

2. That scheduling features are fully functional and setup, including holidays.

3. That all graphic screens and value readouts are completed.

4. Correct date and time setting in central computer.

5. That field panels read the same time as the central computer; sample 10 percent of field panels; if any of those fail, sample another 10 percent; if any of those fail test all remaining units at no extra cost to Owner.

6. Functionality of field panels using local operator keypads and local ports (plug-ins) using portable computer/keypad; demonstrate 100 percent of panels and 10 percent of ports; if any ports fail, sample another 10 percent; if any of those fail, test all remaining units at no extra cost to Owner.

7. Power failure and battery backup and power-up restart functions.
8. Global commands features.
9. Security and access codes.
10. Occupant over-rides (manual, telephone, key, keypad, etc.).
11. O&M schedules and alarms.
12. Occupancy sensors and controls.
13. All control strategies and sequences not tested during controlled equipment testing.

H. If the control system, integral control components, or related equipment do not respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice, under any of the conditions, sequences, or modes tested, correct all systems, equipment, components, and software required at no additional cost to Owner.

3.5 OPERATION AND MAINTENANCE MANUALS

A. See Section 01 78 00 for additional requirements.

B. Add design intent documentation furnished by Architect to manuals prior to submission to Owner.

C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.

D. Commissioning Authority will add commissioning records to manuals after submission to Owner.

3.6 DEMONSTRATION AND TRAINING

A. See Section 01 79 00 for additional requirements.

B. Demonstrate operation and maintenance of HVAC system to Owner' personnel; if during any demonstration, the system fails to perform in accordance with the information included in the O&M manual, stop demonstration, repair or adjust, and repeat demonstration. Demonstrations may be combined with training sessions if appropriate.

C. These demonstrations are in addition to, and not a substitute for, Prefunctional Checklists and demonstrations to the Commissioning Authority during Functional Testing.

D. Provide classroom and hands-on training of Owner's designated personnel on operation and maintenance of the HVAC system, control system, and all equipment items indicated to be commissioned. Provide the following minimum durations of training:

E. TAB Review: Instruct Owner's personnel for minimum ____ hours, after completion of TAB, on the following:

1. Review final TAB report, explaining the layout and meanings of each data type.
2. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.
3. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
4. Discuss any temporary settings and steps to finalize them for any areas that are not finished.
5. Other salient information that may be useful for facility operations, relative to TAB.

F. HVAC Control System Training: Perform training in at least three phases:

1. Phase 1 - Basic Control System: Provide minimum of ____ hours of actual training on the control system itself. Upon completion of training, each attendee, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.
   a. This training may be held on-site or at the manufacturer's facility.
   b. If held off-site, the training may occur prior to final completion of the system installation.
   c. For off-site training, Contractor shall pay expenses of up to two attendees.
2. Phase 2 - Integrating with HVAC Systems: Provide minimum of ____ hours of on-site, hands-on training after completion of Functional Testing. Include instruction on:
   a. The specific hardware configuration of installed systems in this facility and specific instruction for operating the installed system, including interfaces with other systems, if any.
   b. Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing setpoints and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.
   c. Trend logging and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends; provide practice in setting up trend logging and monitoring during training session.
   d. Every display screen, allowing time for questions.
   e. Point database entry and modifications.
3. Phase 3 - Post-Occupancy: Six months after occupancy conduct minimum of ____ hours of training. Tailor training session to questions and topics solicited beforehand from Owner. Also be prepared to address topics brought up and answer questions concerning operation of the system.

G. Provide the services of manufacturer representatives to assist instructors where necessary.

H. Provide the services of the HVAC controls instructor at other training sessions, when requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

END OF SECTION

SECTION 233100 - HVAC DUCTWORK AND INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal ductwork.

B. Nonmetal ductwork.

C. Duct Insulation

1.2 RELATED REQUIREMENTS

A. Section 23 33 00 - Air Duct Accessories.

B. Section 23 37 00 - Air Outlets and Inlets.

C. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.

1.3 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2008.

B. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2009a.

C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2009.

D. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

E. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

F. NAIMA - North American Insulation Manufacturer's Association.

1.4 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.5 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A standards.

PART 2 PRODUCTS

2.1 DUCT ASSEMBLIES

2.2 MATERIALS

A. The following requirements are for the different materials allowed to be used for this project. See schedule at the end of Part 3 for acceptable locations of acceptable duct materials.

B. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

C. Insulated Flexible Ducts:

1. UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire; fiberglass insulation; polyethylene vapor barrier film.
   a. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
   b. Maximum Velocity: 4000 fpm.
   c. Temperature Range: -20 degrees F to 210 degrees F.

D. Hanger Rod: ASTM A 36/A 36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.3 MANUFACTURED DUCTWORK AND FITTINGS

A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages,reinforcing, and sealing for operating pressures indicated.

2.4 DUCT INSULATION

A. General: Duct insulation shall be the required thickness and material to provide a minimum thermal resistance "R" of 6. Rating shall be at 75 degrees F, tested in accordance with ASTM C-518 or ASTM C-177.

B. Coverings and linings shall have a flamespread rating of not over 25 without evidence of continued progressive combustion and a smoke developed rating of not over 50, and shall not flame, flow, smolder or smoke when tested in accordance with ASTM C 411 at the designated maximum service temperature.

C. For determination of R-value of flexible duct wrap, the installed wrap shall have an assumed thickness of 75% of the nominal thickness, allowing for 25% compression.

D. Insulation: ASTM C 553; flexible, noncombustible blanket.

1. 'K' value : ASTM C 518, 0.25 at 75 degrees F.

2. Maximum service temperature: 250 degrees F.

3. Maximum moisture absorption: 0.20 percent by volume.

E. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.

2. Moisture vapor transmission: ASTM E 96; 0.02 perm.

3. Secure with pressure sensitive tape.

F. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. Install in accordance with manufacturer's instructions.

C. General

1. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

2. Provide 45 degree entry on all tees used for branch duct to main duct connections. Splitters and extractors shall not be used unless specifically called for on drawings.

3. Use spin-in fittings (no scoop) with manual volume dampers for all diffuser and grille connection takeoffs, unless otherwise indicated on drawings.

4. Install flexible duct connections to diffusers and grilles with a minimum run (not to exceed 6'). Bends shall have a minimum radius of 1-1/2 times the diameter of the duct as measured from the centerline. Collars shall be inserted into the flexible duct a minimum of 1" before fastening. Support flexible duct from building structure to minimize bends and sags. Duct shall be fully extended. Do not lay on light fixtures or ceiling.

5. Make all ductwork connections to air handler units, including fan terminal units, with flexible connectors.

6. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

7. Provide air foil turning vanes for all rectangular elbows where indicated on drawings. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline where radiused fittings are called for in drawings.

8. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

D. Metal Duct

1. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated on equipment schedules.

3.2 INSULATION

A. Install in accordance with manufacturer's instructions.

B. Insulated ducts conveying air below ambient temperature (all supply, return, and outside air ducts):

1. Provide insulation with vapor barrier jackets.

2. Finish with tape and vapor barrier jacket.

3. Continue insulation through walls, sleeves, hangers, and other duct penetrations, except fire rated walls as noted on drawing .

4. Install insulation adjacent to duct mounted electric heaters in accordance with heater manufacturer's recommendations. Ensure duct coverings are interrupted at the immediate area of operation of heater as required to meet the clearances specified as a condition of the equipment listing.

5. Seal all joints in insulation system with fabric and mastic.

3.3 SCHEDULES

A. Ductwork Material:

1. Supply and Return: Galvanized Steel. All joints (ductwork and insulation) shall be 100% sealed with pressure sensative tape and mastic.

2. General Exhaust: Steel (insulated).

3. Outside Air Intake: Steel (insulated).

B. Ductwork Pressure Class:

1. Supply and Return: 2 inch
2. General Exhaust: 1/2 inch.
3. Outside Air Intake: 1/2 inch.

END OF SECTION

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air turning devices.

B. Backdraft dampers.

C. Duct test holes.

D. Fire dampers.

E. Flexible duct connections.

F. Volume control dampers.

1.2 RELATED REQUIREMENTS

A. Section 15810 - Ductwork and Insulation.

1.3 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2009.

B. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

C. UL 33 - Heat Responsive Links for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.1 TURNING VANE ELBOWS

A. Turning Vanes shall be double thickness with 24 gauge rails and hollow vanes fabricated/manufactured in accordance with Smacna Duct Construction Standards.

2.2 BRANCH CONNECTIONS

A. Branch connection fittings shall be the 45 degree entry type fabricated and installed in accordance with Smacna Duct Construction Standards.

2.3 BACKDRAFT DAMPERS

A. Gravity Backdraft Dampers, Size 18 x 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

2.4 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

2.5 FIRE DAMPERS

A. Manufacturers:

1. Ruskin Company: www.ruskin.com.

2. Substitutions: As allowed by Section 15001.

B. Ceiling Dampers: Galvanized steel, 22 gage frame and 16 gage flap, two layers 0.125 inch ceramic fiber on top side and one layer on bottom side for round flaps, with locking clip.

C. Horizontal Dampers: Galvanized steel, 22 gage frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.

D. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream except for 1.0 inch pressure class ducts up to 12 inches in height.

E. Multiple Blade Dampers: 16 gage galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 x 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.

F. Fusible Links: UL 33, separate at 160 degrees F with adjustable link straps for combination fire/balancing dampers.

2.6 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strip.

1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.

2. Metal: 3 inches wide, 24 gage thick galvanized steel.

2.7 VOLUME CONTROL DAMPERS

A. Manufacturers:

1. Ruskin Company: www.ruskin.com.
2. Substitutions: As allowed by Section 15001.

B. As a minimum, all dampers shall have the following features:

1. Molded synthetic sleeve type bearings, corrosion resistant.
2. Square or hexagonal axles positively locked into the damper blade.
3. Externally visible position indicators with wing nut locking device.

C. Single Blade Manual Volume Dampers

1. Round: Ruskin MDRS25 or equal.
2. Rectangular: Ruskin MD25 or equal.

D. Splitter Dampers:

E. Opposed blade balancing dampers shall be 16 gauge minimum galvanized steel with zinc-plated hardware and bronze or nylon bearings. Blades shall not be over 8" wide. Maximum leakage shall be less than 1% at a static pressure of 4" w.g.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards. Refer to Section 15810 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts where indicated.

C. Provide duct test holes where required for testing and balancing purposes.

D. Provide fire dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Prior to bidding, review architectural plans for last minute changes on locations of fire rated walls. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

E. Demonstrate re-setting of fire dampers to Owner's representative.

F. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

G. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

H. Use splitter dampers only where indicated.

I. Provide opposed blade dampers as necessary to supplement multiple speed air handling units to obtain scheduled total airflow.

J. Provide single blade balancing dampers at duct take-off to diffusers, grilles, and registers, unless included in diffuser or register schedule. If impractical due to space limitations, an opposed blade damper shall be provided as an accessory to the diffuser, grille or register.

END OF SECTION

SECTION 233423 - HVAC POWER VENTILATORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. In-line and ceiling exhaust fans

1.2 RELATED REQUIREMENTS

A. Section 23 33 00 - Air Duct Accessories: Backdraft dampers.

B. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating; Air Movement and Control Association International, Inc.; 2007 (ANSI/AMCA 210, same as ANSI/ASHRAE 51).

B. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; Air Movement and Control Association International, Inc.; 2006.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Greenheck: www.greenheck.com.

B. Loren Cook Company: www.lorencook.com.

C. Substitutions: As allowed by Section 15001.

2.2 INLINE AND CEILING EXHAUST FANS

A. Unit shall be certified by AMCA for air and sound performance. Units shall be UL listed and CSA certified.

B. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.

C. Provide unit mounted variable speed controller allowing a minimum airflow adjustment from 100% to down to 50%.

D. Built-in thermal overload protection.

E. Disconnect Switch: Cord and plug in housing for thermal overload protected motor.

F. Grille: Molded white plastic.

G. Fans shall be selected to deliver scheduled airflow through a range of +/- 25% of external static pressure indicated.

H. Sound performance shall be as scheduled. If not scheduled, sound performance shall be 3 sones or less, unless otherwise authorized.

I. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Hung Fans:

1. Install fans with resilient mountings and flexible electrical leads. Refer to Section 22 05 48.

2. Install flexible connections specified in Section 23 33 00 between fan and ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

C. Provide sheaves required for final air balance.

D. Install backdraft dampers on inlet to roof and wall exhausters.

E. Provide backdraft dampers on outlet from in-line and ceiling exhauster fans and as indicated.

3.2 SCHEDULES

A. See drawings for equipment schedules.

END OF SECTION

SECTION 233700 - AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Diffusers.

B. Registers/grilles.

1.2 RELATED REQUIREMENTS

A. Section 09 90 00 - Painting and Coating: Painting of ducts visible behind outlets and inlets.

1.3 REFERENCE STANDARDS

A. ADC 1062: GRD - Test Code for Grilles, Registers & Diffusers; Air Diffusion Council; 1984.

B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; Air Movement and Control Association International, Inc.; 2007.

C. ASHRAE Std 70 - Method of Testing for Rating the Performance of Air Outlets and Inlets; American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.; 2006.

1.4 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

B. Test and rate louver performance in accordance with AMCA 500-L.

PART 2 PRODUCTS

2.1 ALL DIFFUSERS, GRILLES AND REGISTERS

A. See legend on mechanical plans.

B. Unless otherwise indicated, all diffusers, supply grilles and registers shall meet the following:

1. Pressure drop shall fall between the range of 0.035 to 0.85 inches w.g., based on airflows and neck size shown on plans.

2. Based on airflows and neck size shown on plans, noise criteria rating for corridor applications shall be less than or equal to NC 35. All other applications shall be less than or equal to NC 25.

C. Unless otherwise indicated, all return grilles shall meet the following:

1. Pressure drop shall be less than 0.035 inches w.g. for the indicated airflows, based on neck size shown on plans.
2. Based on airflows and neck size shown on plans, noise criteria rating for corridor applications shall be less than or equal to NC 35. All other applications shall be less than or equal to NC 25.
3. All diffusers, grilles and registers shall be factory furnished devices of aluminum construction. Exterior and exposed edges shall be rolled, or otherwise stiffened or rounded.
4. Color shall be white unless otherwise indicated.
5. Where called for on plans, integral dampers shall be factory fabricated opposed blade .
6. Provide adapter frames to match mounting configurations, and square to round and round to round adapters as required to match neck sizes indicated on plans.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide all required flashing/waterproofing for louver installations for a watertight installation.

C. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

D. Ensure exhaust outlets are located at least 10' away from air intakes. Adjust location of outlet as necessary to maintain this separation.

E. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, unless included with diffuser on plans.

F. Coordinate with other trades as necessary to provide door grilles and undercut doors where called for.

G. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09 90 00.

END OF SECTION

SECTION 238119 - SELF-CONTAINED AIR-CONDITIONERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Packaged terminal air conditioning units.

B. Packaged terminal heat pump units.

C. Wall sleeves.

D. Louvers.

E. Controls.

1.2 REFERENCE STANDARDS

A. AHRI 210/240 - Standard for Performance Rating of Unitary Air Conditioning and Air-Source Heat Pump Equipment; Air-Conditioning, Heating, and Refrigeration Institute; 2008.

B. AHRI 270 - Sound Rating of Outdoor Unitary Equipment; Air-Conditioning, Heating, and Refrigeration Institute; 2008.

1.3 PERFORMANCE REQUIREMENTS

A. Scheduled performance:

1. Cooling capacity: AHRI 210/240.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide drawings indicating dimensions, rough-in connections, and electrical characteristics and connection requirements.

C. Operation and Maintenance Data: Provide maintenance data, parts lists, controls, and accessories. Include trouble-shooting guide.

D. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect finished cabinets from physical damage by leaving factory packing cases in place before installation and providing temporary covers after installation.

1.7 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide a five year warranty to include coverage for refrigeration compressors.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Bard. See 23 04 00 for product substitutions.

2.2 AIR CONDITIONING UNITS

A. Description: Packaged, self-contained, through-the-wall air cooled terminal air conditioning units, with wall sleeve, room cabinet, electric refrigeration system, electric heating, outside air louvers, built-in temperature controls; fully charged with refrigerant and filled with oil.

2.3 CABINET

A. Cabinet: Wall mounted of 18 gage galvanized steel with epoxy coated finish, removable front panel with concealed latches, __color as selected.

B. Discharge Grille and Access Door: Removable punched louver discharge grilles, allowing 4-way discharge air pattern with hinged door in top of cabinet for access to controls.

2.4 CHASSIS

A. Refrigeration System:

1. Direct expansion indoor coil.

2. Hermetically sealed compressor with internal spring isolation, external isolation, permanent split capacitor motor and overload protection.

3. Accumulator.

4. Condenser coil and fan.

B. Coaxial tube in tube condenser with water regulating valve.

1. Reversing valve.

C. Air System: Centrifugal forward curved tangential evaporator fans with two speed permanent split capacitor motor, permanent washable filters, positive pressure ventilation damper with concealed manual operator.

D. Heating Coil: Electric.

E. Condenser Fan: Centrifugal, forward curved type with separate permanent split capacitor motor.

F. Provide hot gas reheat coil as scheduled.

2.5 CONTROLS

A. As scheduled.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Coordinate installation of units with architectural, mechanical, and electrical work.

END OF SECTION

SECTION 238127 - SMALL SPLIT-SYSTEM HEATING AND COOLING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Ducted Split Systems

B. Controls.

C. Refrigerant and condensate piping and insulation.

1.2 REFERENCE STANDARDS

A. AHRI 210/240 - Standard for Performance Rating of Unitary Air Conditioning and Air-Source Heat Pump Equipment; Air-Conditioning, Heating, and Refrigeration Institute; 2008.

B. NFPA 54 - National Fuel Gas Code; National Fire Protection Association; 2009.

C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2009.

D. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association; 2009.

E. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances; National Fire Protection Association; 2010.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner s name and registered with manufacturer.

1.4 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1 DUCTED SPLIT SYSTEMS

A. Air Handling Units

1. Air Handling Units shall be factory fabricated draw through type with filters, DX coils, electric heat and blower as scheduled on drawings, minimum capacities as indicated. Units shall provide capacities scheduled when positioned in configurations shown on drawings. Units shall include integral 24v transformer. Units shall be wired for single point of connection power supply. All units shall be listed with UL and ARI 210/240 certified.

2. Provide concealed design galvanized steel air handling unit intended for ducted supply and return connecitons. Unit shall have filter access panel and filter rack. Casing shall have foil faced R-4.2 (minimum) insulation. All insulating materials shall meet the requirements of NFPA 90A. Knockouts shall be provided for electrical wiring. Units shall have integral primary condensate pan with primary and secondary drain connections. Condensate drain pan shall be sloped toward drain, and of PVC or galvanized steel construction.

3. Fans
   a. Fans shall be forward curved, centrifugal, dynamically and statically balanced. Fan motors shall have permanently lubricated bearings, and thermal overload protection. Fan shall be mounted on vibration isolators.
      1) 1-1/2 to 5 tons: Fans shall be 3 speed.
   b. Performance Ratings: Determined in accordance with AMCA 210 and labeled with AMCA Certified Rating Seal.
   c. Sound Ratings: AMCA 301; tested to AMCA 300.

4. Coils
   a. Refrigerant Coils:
      1) Aluminum fins bonded to copper tube, pressure and leak tested to 375 psig.
      2) Headers: Seamless copper tubes with silver brazed joints.
      3) Liquid Distributors: Brass or copper venturi distributor with seamless copper distributor tubes.
      4) Configuration: Down feed with bottom suction.
   b. Electric Coils:
      1) Assembly: UL listed and labelled, with terminal control box and cover, splice box, coil, casing, and controls.
      2) Coil: Exposed helical coil.
      3) Casing: Die formed channel frame of galvanized steel.
      4) Controls: Automatic reset thermal cut-out, built-in magnetic contactors air flow proving device.
   c. Controls
      1) Controls shall include magnetic contactor for evaporator fan motor, low voltage terminal strip.
      2) 1-1/2 to 5 tons:

(a) Capillary tube or flow control/check valve refrigerant control, unless TXV valve is recommended for application by equipment manufacturer.

5. Filters
   a. 1-1/2 to 5 tons: Section with filter guides, access doors for face loading. 1" deep disposable flat filters.

6. Condensate Piping and Secondary Drian Pan
   a. Condensate piping shall be copper or Schedule 40 PVC. All condensate piping within building shall be insulated with a minimum of 1/2" Armaflex unless otherwise specified.
   b. Secondary drain pans shall be fabricated out of a single sheet of 24 gauge galvanized sheet metal to form a 1-1/2" deep (minimum) seamless pan with formed and sealed corners.

7. Equipment Supports
   a. Equipment supports shall be sized and designed to support the equipment and shall be fabricated from galvanized steel.
   b. See submittal requirements in 15001.

B. OUTDOOR UNITS

1. General
   a. Units: Self-contained, packaged, factory assembled and pre-wired units suitable for outdoor use consisting of cabinet, compressors, condensing coil and fans, integral sub-cooling coil, controls, liquid receiver, charging valves .
   b. Construction and Ratings: In accordance with ARI 210/240. Testing shall be in accordance with ASHRAE Std 23.
   c. Performance Ratings: Seasonal Energy Efficiency Rating (SEER) (and Coefficient of Performance (COP) for Heat Pumps) not less than prescribed by ASHRAE Std 90.1, the Florida Energy Code, and values scheduled.

2. Casing
   a. House components in welded steel frame with galvanized steel panels with weather resistant, baked enamel finish. Surfaces shall be satisfactorily tested to a 500 hour salt spray test. Provide drain holes for elimination of rain.
   b. Mount starters, disconnects, and controls in weatherproof panel provided with full opening access doors.
   c. Provide removable access doors or panels with quick fasteners or piano hinges.

3. Coils
   a. Coils: Aluminum fins mechanically bonded to seamless copper tubing. Provide sub-cooling circuits. Air test under water to 425 psig, and vacuum dehydrate. Seal with holding charge of refrigerant.

b. Coil Guard: Louvered or PVC coated steel wire grille.

4. Fans and Motors
   a. Vertical discharge direct driven, statically and dynamically balanced propeller type condenser fans with aluminum blades and fan guard on discharge.
   b. Weatherproof motors suitable for outdoor use, single phase permanent split capacitor or 3 phase, with permanent lubricated ball bearings and built in current and thermal overload protection.

5. Compressors
   a. Compressor: Hermetic scroll type or hermetic reciprocating, quantity as scheduled. Provide two stage compressors where scheduled on plans.
   b. Mounting: Statically and dynamically balance rotating parts and mount on rubber-in-shear vibration isolators. Units of 10 tons and greater shall have internal spring isolation.
   c. Lubrication System: Units of 7-1/2 tons and greater shall have Reversible, positive displacement oil pump with oil charging valve, oil level sight glass, and magnetic plug or strainer.
   d. Motor: Constant speed 3600 rpm suction gas cooled with electronic sensor and winding over temperature protection, designed for across-the-line starting. Furnish with starter where applicable.
   e. Sump Oil Heater: Evaporates refrigerant returning to sump during shut down. Energize heater continuously when compressor is not operating.

6. Refrigerant Circuits
   a. For each refrigerant circuit, provide:
      1) Filter dryer.
      2) Insulated suction line.
      3) Suction and liquid line service valves and gage ports.
   b. For heat pump units, provide reversing valve, suction line accumulator, flow control check valve, and solid-state defrost control utilizing thermistors.

7. Controls
   a. On unit, mount weatherproof steel control panel, NEMA 250, containing power and control wiring, factory wired with single point power connection..
   b. For each compressor, provide contactor, integral overload protection, solid state time delay, and control power transformer or terminal for controls power. For each condenser fan, provide contactor.
   c. Provide safety controls as follows:
      1) High discharge pressure cutout switch for each compressor.
      2) Low suction pressure cutout switch for each compressor.
      3) Anti-short cycle timer for each compressor.
      4) Low ambient operating controls as indicated on schedule.

8. Equipment Supports
   a. See 15001 for requirements.

C. Thermostat

1. Provide a programmable thermostats with automatic changeover, adjustable deadband, and a minimum range of 55F to 85F. Thermostat shall have separate, adjustable 7 day/24 hr occupied and unoccupied schedules for system (compressor and blower) and ventilation (cycle with compressor or continuous during occupied period).

2. Thermostat shall be compatible with equipment selected and shall be capable of performing control functions indicated. Match number of stages of heating and cooling as indicated on equipment schedules.

3. Provide manufacturer's recommended thermostats capable of optimizing multistage compressors and variable speed air handlers for humidity control where scheduled on plans.

2.2 DUCTLESS SPLIT SYSTEMS

A. Indoor Units

1. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer.

2. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
   a. Construction and Ratings: In accordance with AHRI 210/240 and UL listed.
   b. Manufacturer: System manufacturer.

B. Outdoor Units

1. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.

2.3 REFRIGERANT PIPING AND ACCESSORIES

A. Tubing shall be Type ACR complying with ASTM B 280.

B. Insulate refrigerant suction piping as follows:

1. Above Grade or in PVC conduit: 3/4" thick, preformed, flame retardant, nitrile rubber based elastomeric insulation similar to Armstrong FR Armaflex.

2. Below Grade: 1" thick, pre-formed rigid cellular glass type similar to Pittsburgh Corning Foamglas. Finish with two coats of asphalt base mastic equal to Foster 60-25 reinforced with layer of glass fabric.

3. All insulation materials and coatings shall meet flame spread and smoke developed ratings per NFPA 90A when tested in accordance with ASTM Standard E-84. Smoke developed rating shall be less than or equal to 50, and flame spread rating shall be less than or equal to 25. All coatings and mastics shall be non-flammable in wet state.

C. Pipe Hangers

1. Pipe hangers shall be Auto-Grip, Fee and Mason, Grinnel, or approved equal, steel clevis hangers selected within the manufacturer's published load ratings.

2. Use vibration isolators in hanger rods whenever piping is subject to vibration, or where shown on drawings.

D. Sleeves

1. Sleeves shall be 18 gauge galvanized steel or preformed plastic. Sleeves shall be sized to allow approximately 1/8" gap around the pipe or its insulation.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction in configurations shown on plans.

B. Install in accordance with NFPA 90A and NFPA 90B.

C. For belt driven air handlers, install flexible connections between fan inlet and discharge ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

D. For ducted systems, provide sight glass in liquid line within 12 inches of coil.

E. Condensate Drain Pan and Piping

1. Run condensate drain lines (primary and secondary) from each air handling unit as noted on the Drawings. For primary line, provide a cleanout and trap (minimum depth per manufacturer) to prevent back suction into the air unit. Drain lines shall be sized to match equipment drains, but not less than 3/4". Condensate drain piping (primary and secondary) shall be copper when installed in a plenum rated ceiling cavity or plenum rated room. If in question, contact Design Engineer.

2. Provide secondary drain pan positioned under air handling units, supported by suitable means consistent with standard industry practice or as indicated on plans.

3. Insulate primary drain line piping in unconditioned spaces within the building.

F. Complete structural, mechanical, and electrical connections in accordance with manufacturer's installation instructions.

G. Install outdoor units level on concrete base, location as indicated. Where indicated on plans, install air handlers on concrete base, maintaining adequate clearance for condensate drain trap.

H. Refrigerant Piping

1. Size and install all refrigerant piping to complete the system connecting heat pumps/condensers to air handlers in accordance with the equipment manufacturer's instructions based on equipment size, route of piping (length of run and change in elevation), and good refrigeration system practice including reconnecting to existing heat pump/air conditioning units, where indicated. Braze all joints with silver alloy solder.

2. Refrigerant pipe crossing a passageway in any building shall be not less than 7-1/2 feet above the floor or against the ceiling.

3. Refrigerant piping installed in or below concrete floors shall be encased in pipe duct. Where piping passes through concrete or masonry walls, ceilings, floors, or beams, such piping shall be provided with metal sleeves or thimbles.

4. Insulate refrigerant suction piping.

5. After completion of entire system and before any pipe is covered, test the entire refrigerant circuit to assure that it is absolutely tight. Conduct low-side and high-side tests in accordance with the Florida Building Code for minimum test pressure for the refrigerant used. .

6. After completion of leak testing, evacuate and charge the system utilizing a procedure approved by air conditioning unit's manufacturer.

7. Controls
   a. Furnish all controls and control wiring to provide for proper performance of equipment. Provide auxilliary contactors as necessary to accomplish control sequences.
   b. Install all high voltage (120V or above) control wiring in EMT conduit. Install low voltage control wiring in conduit unless concealed in walls or above finished ceilings not used as supply or return air plenums. Do not run low voltage control wiring in the same conduit as high voltage control or power wiring.

3.2 Install gas fired furnaces in accordance with NFPA 54.

A. Provide vent connections in accordance with NFPA 211.

END OF SECTION

SECTION 260050 - GENERAL ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General Information on Electrical Installation not covered elsewhere. This section applies to all other electrical sections.

1.2 DEFINITIONS

A. For the purposes of this contract, the term "Provide" shall mean to provide all labor, material, transportation, and supervision required to furnish and install.

1.3 PROJECT DESCRIPTION:

A. See Project General Notes in electrical drawings for project description.

1.4 INTERPRETATION:

A. Specifications and Drawings shall be considered as supplementary to each other, requiring materials and labor indicated, specified, or implied by either Specifications or Drawings. Contradictions shall be presented to the Architect / Engineer for resolution.

B. Interpretation of Specifications or Drawings, where deemed necessary, shall be made only by the Architect / Engineer.

1.5 CODES, STANDARDS, ORDINANCES, AND PERMITS:

A. The National Electrical Code (NEC), National Electric Safety Code, Florida Building Code, and OSHA shall establish the minimum requirements for installation, but in addition, all work shall also comply with Federal, State, Local, County or Municipal Code requirements. If there is a conflict between the NEC and these codes, conform to the more stringent of the two. Similarly, if the local Authority Having Jurisdiction has not adopted the latest revision of the NEC and is still using an earlier version, conform to the more stringent of the two.

B. Be familiar with local Code requirements and local Utility Company Standards for electrical service requirements, and make installation in accordance with such requirements.

C. In case of conflict between the Contract Documents and a governing code or ordinance, such conflict shall be immediately brought to the attention of the Architect / Engineer for resolution. Extra payment will not be allowed for Work required by code restrictions except through written agreement with the Architect / Engineer.

D. Apply for, obtain, and pay for all required permits and inspection certificates. Final payment is contingent upon delivery of such permits and certificates to the GOVERNMENT.

1.6 SITE INSPECTION:

A. Visit the site and thoroughly inspect conditions affecting the Work before submitting Bid. Assume responsibility for meeting all existing conditions including access and work space limitations.

1.7 CUTTING AND PATCHING:

A. Refer to Section on Cutting and Patching.

B. Place all sleeves, inserts, conduit hangers, etc. as construction progresses to avoid any unnecessary cutting of structural members. Cooperate with other Contractors in location of electrical outlets that may conflict with location of other equipment.

C. Obtain authorization from the GOVERNMENT for any necessary cutting of building structure to facilitate installation of this work and do not proceed until authorization has been received. Limit necessary cutting and patching to the minimum size required for installation of conduit or apparatus.

1.8 SUBMITTALS:

A. Submit Shop Drawings, catalog sheets, or other descriptive data with sufficient information to establish design, quality and performance. Data shall describe apparatus, equipment, panels, fixtures, and other items requiring descriptive literature. Provide submittals as a single package including all required electrical items. Partial packages will not be reviewed. Submittals items shall be in accordance with the individual specification sections. See Project General Notes in electrical drawings for a list of required submittals.

1.9 MAINTENANCE DATA:

A. Collect and neatly retain maintenance and service data supplied with equipment furnished and installed under this Contract until job completion, at which time deliver to the GOVERNMENT for inclusion in the Maintenance Manual. All such data must be properly identified as for equipment served.

B. Keep one set of prints current of any changes or variations by marking prints in a legible manner, and upon completion of project, deliver prints to the GOVERNMENT. Do not make changes without prior approval of the GOVERNMENT.

1.10 TEMPORARY ELECTRIC SERVICE:

A. Provide complete temporary system of power and lighting wiring for use during construction and for testing of equipment. Comply with OSHA and NEC including personnel ground-fault protection requirements.

1.11 ELECTRIC SERVICE:

A. Provide medium voltage electrical service and service transformer as indicated. Exact locations shown for service are approximate and tentative. Contact Utility in advance and verify availability of electrical

service as indicated. Confirm primary system voltage.

B. Provide all labor, materials and equipment not provided by the Utility in accordance with Utilities' installation policies and procedures without additional cost. Should a significant installation conflict occur, notify the Engineer immediately for resolution before starting any work.

1.12 TELEPHONE SERVICE

A. Provide all labor, materials and equipment not provided by the telephone company in accordance with the telephone company's installation policies and procedures without additional cost. Should a significant installation conflict occur, notify the GOVERNMENT immediately for resolution before starting any work. Note that the point of demarcation is the existing handhole on the South side of Avenue C.

1.13 COORDINATION - GENERAL:

A. Drawings are generally diagrammatic. Review all project Drawings and coordinate all work with General Contractor and different trades prior to installing any work so that interferences between electrical work and ducts, piping, equipment, architectural and structural work will be avoided. Do not install conduits, boxes and fittings in spaces required for ductwork or piping.

B. Furnish all necessary offsets in raceways, fittings, etc., required to properly install work so as to take up minimum space. Install all equipment to provide code required "working space". Furnish and install all materials required to accomplish this without additional cost.

C. In case interference develops, the General Contractor will decide which trade work must be relocated regardless of which was installed first. Damage from interference or rework caused by inadequate coordination with other trades shall be rectified without additional cost.

1.14 COORDINATION - ELECTRICAL/MECHANICAL:

A. Unless specifically required otherwise, all motors, integral starters, control and monitoring devices (including wire and conduit for control circuits), timers, relays, pilot devices and other required control components for mechanical systems will be furnished and installed under Division 15.

B. Unless specifically required otherwise, make all power wiring connections to all water heaters, pumps, machinery, appliances, water coolers and other electrically-operated equipment as indicated on the Drawings or as required. Furnish and install disconnect switches, starters and protective devices as indicated on the Drawings, except for items furnished with integral disconnect switches and/or starters. Coordinate the exact location of receptacles, flexible conduit, and disconnects for mechanical and plumbing equipment with the mechanical or plumbing contractor.

C. Review approved Shop Drawings and verify final electrical characteristics and wiring before rough-in of power feeds to any equipment. When electrical data on approved Shop Drawings differs from contemplated design, make necessary adjustments to wiring, disconnect, and branch-circuit protection for

equipment actually installed.

1.15 WORKING CLEARANCES:

A. Working clearances around electrical equipment requiring service shall comply with NEC requirements. Coordinate and verify clearances from equipment and work furnished by other trades. Should there be any apparent violations of clearance requirements, notify the Design Build Contractor before proceeding with connection or placement of equipment. Rework caused by inadequate coordination shall be rectified at no extra cost.

PART 2 - PRODUCTS:

2.1 MATERIALS:

A. All materials used in this project shall be new, unless otherwise noted, and listed by the Underwriters' Laboratories, Inc. as conforming to its standards where such standards have been established. These materials shall bear the UL label.

B. Before purchasing any equipment, the contractor shall reconfirm the availability of the project's voltage, phase (single phase versus three phase), and service configuration with the electric utility.

PART 3 EXECUTION

3.1 CLEANUP

A. After electrical installation, remove all rubbish, trash and debris from the site and dispose of in an approved manner.

END OF SECTION

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 V AND LESS)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single conductor building wire.

B. Wire and cable for 600 volts and less.

C. Wiring connectors.

1.2 REFERENCES

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2001 (Reapproved 2007).

B. ASTM B 8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2004.

C. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2009).

D. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

E. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; National Electrical Manufacturers Association; 2009 (ANSI/NEMA WC 70/ICEA S-95-658).

F. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2009.

G. NFPA 70 - National Electrical Code, National Fire Protection Association (edition adopted by Authority Having Jurisdiction).

H. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

I. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

1.3 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.1 ALL CONDUCTORS AND CABLES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose indicated.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductor Material:

1. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.

H. Conductor Color Coding:

1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
2. Color Coding Method: Integrally colored insulation.
3. Color Code:
    a. Equipment Ground, All Systems: Green.

2.2 BUILDING WIRE

A. Description: Single conductor insulated wire.

B. Conductor Stranding:

1. Feeders and Branch Circuits:
    a. Size 10 AWG and Smaller: Solid.
    b. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation:

1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

E. Conductor: Copper.

F. Insulation Voltage Rating: 600 volts.

G. Insulation: Thermoplastic material rated 90 degrees C.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conductors and cable in a neat and workmanlike manner in accordance with NECA 1.

C. Installation in Raceway:

1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
2. Pull all conductors and cables together into raceway at same time.
3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

D. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

E. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

F. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.

G. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

H. Make wiring connections using specified wiring connectors.

1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
3. Do not remove conductor strands to facilitate insertion into connector.
4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.

I. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

J. Insulate ends of spare conductors using vinyl insulating electrical tape.

K. Color Code Legend: Provide identification label identifying color code for ungrounded conductors at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

L. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

M. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

N. Install wire and cable securely, in a neat and workmanlike manner, as specified in NECA 1.

O. Route wire and cable as required to meet project conditions.

P. Wire and cable routing indicated is intended to be diagrammatic.

Q. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.

R. Include wire and cable of lengths required to install connected devices within 10 ft (3000 mm) of location shown.

S. No wiring shall be installed until the required raceway system, including junction, outlet and device boxes is completed. Install wiring before painting begins and protect against being painted.

T. Branch circuit sizes are noted on the Drawings and must be continuous without reduction in size throughout their length except where connecting to fixtures or devices.

U. Branch circuit wire sizes shall be increased as required where long runs will cause excessive voltage drop per NEC.

V. Wire circuits as described or indicated on the Drawings to achieve a connected load as scheduled. Should any change be necessary, it must be brought to the GOVERNMENT's attention.

W. Install wire and cable in accordance with the NECA "Standard of Installation."

X. Use wiring methods indicated.

Y. Pull all conductors into raceway at same time.

Z. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

AA. Neatly train and lace wiring inside boxes, equipment, and panelboards.

AB. Clean conductor surfaces before installing lugs and connectors.

AC. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

AD. Use split bolt connectors for copper conductor splices and taps, #4 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

AE. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

3.3 FIELD QUALITY CONTROL

A. Perform inspection, testing, and adjusting in accordance with Section 014000.

B. Perform field inspection and testing in accordance with Section 014000.

C. Test wiring rated 600 volts and less to verify that no short circuits or accidental grounds exist. Perform insulation resistance tests on wiring No. 4 AWG and larger diameter using an instrument which applies voltage of approximately 500 volts to provide direct reading of resistance. Minimum resistance shall be 250,000 ohms.

D. Perform inspections and tests listed in NETA STD ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.

E. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding and bonding components.

1.2 REFERENCES

A. NFPA 70 - National Electrical Code, NFPA (edition adopted by Authority Having Jurisdiction).

1.3 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 10 ohms.

1.4 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience with service facilities within 100 miles of Project.

C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 ELECTRODES

A. Rod Electrodes: Copper.
1. Diameter: 3/4 inch (19 mm).

B. Concrete Encased Electrode:
1. Per NEC 250-50(c), provide concrete encased electrode. The electrode shall be encased in at least 2 inches of concrete, located within and near the bottom of a concrete foundation or footing that is in direct contact with the earth. The electrode shall consist of at least 20' of conductive steel reinforcing bars or rods of not less than 1/2" diameter or 20' of bare copper conductor not smaller than no. 4.

2.2 CONNECTORS AND ACCESSORIES

A. Wire: TW Stranded copper with green coding sized per NEC.

B. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install ground electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.

B. Provide grounding electrode conductor and connect to metal water pipe (if available), ground rods, reinforcing steel in foundation footing, structural steel, and any other items required by NEC Article 250 and local codes. Bond steel together.

C. Provide bonding to meet requirements described in Quality Assurance.

D. Bond equipment such as metallic housing and feeder metallic conduits to grounding conductor. Use grounding bushings, on service conduit and at other points where grounding continuity is broken.

E. Provide a bonding jumper for any equipment, motor, fixture or device to which current carrying conductors are connected that is not bonded directly to the grounded system. Connect bonding jumper to approved lugs and grounding conduit bushings or clamps.

F. Equipment Grounding Conductor: Provide separate, insulated grounding conductor within each feeder and branch circuit raceway (sized per NEC Section 250). Terminate each end on suitable lug, bus, or bushing. Metal raceways shall not be used as the sole method of grounding.

3.2 FIELD QUALITY CONTROL

A. Test grounding system to ensure continuity and that resistance to ground is not excessive (above 10 ohms). Test each ground rod for resistance to ground before making connections to rod; tie grounding system together and test for resistance to ground. Make resistance measurements in dry weather, not earlier than 48 hours after rainfall. Notify engineer before proceeding if resistance to ground is excessive.

END OF SECTION

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Conduit and equipment supports.

B. Anchors and fasteners.

1.2 REFERENCES

A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

B. NFPA 70 - National Electrical Code, NFPA (edition adopted by Authority Having Jurisdiction).

1.3 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 MATERIALS

A. Hangers, Supports, Anchors, and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.

B. Supports: Fabricated of structural steel or formed steel members; galvanized.

C. Anchors and Fasteners:

1. Do not use powder-actuated anchors, spring clips, or beam clamps.
2. Concrete Structural Elements: Use precast inserts, expansion anchors, powder-actuated anchors, or preset inserts.
3. Steel Structural Elements: Use beam clamps, steel spring clips, steel ramset fasteners, or welded fasteners.
4. Concrete Surfaces: Use self-drilling anchors or expansion anchors.
5. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts or hollow wall fasteners.
6. Solid Masonry Walls: Use expansion anchors or preset inserts.
7. Sheet Metal: Use sheet metal screws.
8. Wood Elements: Use wood screws.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install hangers and supports as required to adequately and securely support electrical system components, in a neat and workmanlike manner, as specified in NECA 1.

1. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
2. Obtain permission from GOVERNMENT before drilling or cutting structural members.

B. Rigidly weld support members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

C. Install surface-mounted cabinets and panelboards with minimum of four anchors.

D. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1 inch (25 mm) off wall.

E. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION

SECTION 260534 - CONDUIT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Conduit, fittings and conduit bodies.

1.2 REFERENCES

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.

B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.

C. ANSI C80.5 - American National Standard for Electrical Rigid Aluminum Conduit (ERAC); 2005.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2007.

E. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; National Electrical Manufacturers Association; 2005.

F. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit; National Electrical Manufacturers Association; 2003.

G. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing; National Electrical Manufacturers Association; 2004.

H. NFPA 70 - National Electrical Code, National Fire Protection Association (edition adopted by Authority Having Jurisdiction).

1.3 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Accept conduit on site. Inspect for damage.

B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

C. Protect PVC conduit from sunlight.

PART 2 PRODUCTS

2.1 CONDUIT REQUIREMENTS

2.2 METAL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1.

B. Rigid Aluminum Conduit: ANSI C80.5.

C. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

2.3 PVC COATED METAL CONDUIT

A. Description: NEMA RN 1; rigid steel conduit with external PVC coating.

B. Description: NEMA RN 1; rigid steel conduit with external PVC coating, 20 mil (0.05 mm) thick.

C. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

2.4 FLEXIBLE METAL CONDUIT

A. Description: Interlocked steel construction.

B. Fittings: NEMA FB 1.

2.5 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Description: Interlocked steel construction with PVC jacket.

B. Fittings: NEMA FB 1.

2.6 ELECTRICAL METALLIC TUBING (EMT)

A. Description: ANSI C80.3; galvanized tubing.

B. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron compression type.

2.7 NONMETALLIC CONDUIT

A. Description: NEMA TC 2; Schedule 40 PVC.

B. Fittings and Conduit Bodies: NEMA TC 3.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on drawings.

B. Verify routing and termination locations of conduit prior to rough-in.

3.2 INSTALLATION

3.3 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements using materials and methods listed as part of UL system.

B. Route conduit through roof openings for piping and ductwork wherever possible. Where separate roofing penetration is required, coordinate location and installation method with roofing installation.

END OF SECTION

SECTION 260537 - BOXES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall and ceiling outlet boxes.

B. Floor boxes.

C. Pull and junction boxes.

1.2 REFERENCES

A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

B. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2007.

C. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association; 2008.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2008.

E. NFPA 70 - National Electrical Code, National Fire Protection Association (edition adopted by Authority Having Jurisdiction).

1.3 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Provide products listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 OUTLET BOXES

A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.

1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch (13 mm) male fixture studs where required.

2. Concrete Ceiling Boxes: Concrete type.

3. Boxes for installation in concrete block wall construction shall be gang type, 3-1/2" deep for switch devices and 4" square by 1-1/2" deep, with 1-1/4" single and two gang square corner extension covers for

receptacle and junction purposes. Boxes for installation in brick wall construction shall be gang type, 3-1/2" deep. Boxes installed in plastered walls shall be 4" square by 1-1/2" deep, with 3/4" single and two gang plaster covers. All boxes shall have internal mounting ears or threaded tappings.

B. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer. Provide threaded hubs.

C. Wall Plates for Finished Areas: As specified in Section 262726.

2.2 FLOOR BOXES

A. Floor Boxes: NEMA OS 1, fully adjustable, 1-1/2 inches (38 mm) deep.

B. Material: Cast metal.

2.3 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel. Boxes shall be 1 1/2" deep minimum. Boxes to which fixtures are installed shall have studs and straps to support fixture weight.

B. Pull and junction boxes shall be constructed of code gauge galvanized sheet steel and fitted with screw covers held in place with corrosion resistant machine screws.

C. Provide boxes where noted on Drawings or where necessary to facilitate conductor pulling and splicing. Splicing of conductors is to be avoided as much as possible with continuous lengths being preferred. Box sizes shall conform to sizes required by NEC or as indicated on the Drawings (if larger than required by NEC).

D. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:
1. Material: Galvanized cast iron.
2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

E. In-Ground Cast Metal Box: NEMA 250, Type 6, outside flanged, recessed cover box for flush mounting:
1. Material: Galvanized cast iron.
2. Cover: Smooth cover with neoprene gasket and stainless steel cover screws.

F. Fiberglass Handholes: Die molded glass fiber hand holes:
1. Cable Entrance: Pre-cut 6 x 6 inch (150 x 150 mm) cable entrance at center bottom of each side.
2. Cover: Glass fiber weatherproof cover with nonskid finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify locations of floor boxes and outlets in offices and work areas prior to rough-in.

3.2 INSTALLATION

A. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.

B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 70.

C. Coordinate installation of outlet boxes for equipment connected under Section 262717.

D. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.
1. Adjust box locations up to 10 feet (3 m) if required to accommodate intended purpose.

E. Orient boxes to accommodate wiring devices oriented as specified in Section 262726.

F. Maintain headroom and present neat mechanical appearance.

G. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

H. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches (150 mm) from ceiling access panel or from removable recessed luminaire.

I. Install boxes to preserve fire resistance rating of partitions and other elements.

J. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

K. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.

L. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

M. Use flush mounting outlet box in finished areas.

N. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

O. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches (150 mm) separation. Provide minimum 24 inches (600 mm) separation in acoustic rated walls.

P. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

Q. Use stamped steel bridges to fasten flush mounting outlet box between studs.

R. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

S. Use adjustable steel channel fasteners for hung ceiling outlet box.

T. Do not fasten boxes to ceiling support wires.

U. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches (305 mm) of box.

V. Use gang box where more than one device is mounted together. Do not use sectional box.

W. Use gang box with plaster ring for single device outlets.

X. Use cast outlet box in exterior locations exposed to the weather and wet locations.

Y. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.

Z. Set floor boxes level.

AA. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.

3.3 ADJUSTING

A. Adjust floor boxes flush with finish flooring material.

B. Adjust flush-mounting outlets to make front flush with finished wall material.

C. Install knockout closures in unused box openings.

3.4 CLEANING

A. Clean interior of boxes to remove dust, debris, and other material.

B. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates and labels.

1.2 REFERENCES

A. NFPA 70 - National Electrical Code, National Fire Protection Association (edition adopted by Authority Having Jurisdiction).

1.3 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.1 NAMEPLATES AND LABELS

A. Nameplates: Engraved three-layer laminated plastic, white letters on black background.

B. Locations:
1. Each electrical distribution and control equipment enclosure.

C. Letter Size:
1. Use 1/8 inch (3 mm) letters for identifying individual equipment and loads.
2. Use 1/4 inch (6 mm) letters for identifying grouped equipment and loads.

D. Labels (for Power Outlets): Embossed adhesive tape, with 1/8 inch (3 mm) black letters on clear background. Use only for identification of appliances and equipment with their own branch circuits and for dedicated computer circuits. Label outlet with name of load, panel and circuit number.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

3.2 INSTALLATION

END OF SECTION

SECTION 261219.10 - PAD-MOUNTED TRANSFORMER

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This specification covers the electrical and mechanical requirements for single phase, 60 hertz, less–flammable fluid filled, self cooled, pad mounted, distribution transformer for use on an underground electric distribution system.

1.2 RELATED WORK (NOT USED)

1.3 SUBMITTALS

A. The Contractor shall submit shop drawings in accordance with submittal section, Submittals and Acceptance.

1.4 WORK SEQUENCE (NOT USED)

1.5 REFERENCE STANDARDS

Reference standards and recommended practices referred to in this Specification Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American Society for Testing and Materials (ASTM)

1. ASTM A167—Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

B. Institute of Electrical and Electronics Engineers

1. IEEE 386—Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600 V.
2. IEEE C57.12.00—Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers.
3. IEEE C57.12.25—Pad-mounted, Compartmental-type, Self-cooled, Single-phase Distribution Transformers with Separable Insulated High-voltage Connectors; High Voltage, 34 500 Grdy/ 19 920 Volts and Below; Low Voltage, 240/120 Volts; 167 kVA and Smaller Requirements
4. IEEE C57.12.28—Standard for Pad-Mounted Equipment – Enclosure Integrity.

5. IEEE C57.12.90—Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers.

1.6 QUALITY ASSURANCE

A. All transformers manufactured under this specification shall be tested in accordance with Section 5 of ANSI\IEEE C57.12.25.

B. All transformers shall be tested for no load (85° C) and total (85° C) losses, percent impedance (85° C), and exciting current (100% voltage) and subjected to a full wave voltage impulse. Guaranteed loss data shall be provided as part of the bid and actual loss data shall be provided with each transformer shipment.

C. The transformer design shall be tested for short circuit withstand capability in accordance with ANSI\IEEE C57.12.90.

1.7 WARRANTIES

A. Warranties shall be in accordance with General Conditions, Supplementary Conditions, and Specifications, Warranties and Bonds.

1.8 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall adhere to the requirements specified in specification, Delivery, Storage, and Handling, for storing and protecting the items specified in this Section.

1.9 QUALIFICATIONS (NOT USED)

1.10 TESTING REQUIREMENTS (NOT USED)

1.11 MAINTENANCE (NOT USED)

1.12 OPERATIONS AND MAINTENANCE (O&M) MANUALS

A. Operations and Maintenance Manuals shall be in accordance with General Conditions, Supplementary Conditions, and Specification Section, Operations and Maintenance Manuals.

1.13 CODES, INSPECTIONS, AND FEES (NOT USED)

1.14 PROJECT REQUIREMENTS (NOT USED)

1.15 APPROVED MANUFACTURERS

A. Cooper Power Systems, General Electric, ABB, and Howard Industries.

1.16 RATINGS

A. Less-flammable fluid insulated, two winding, 60 hertz self cooled type. All ratings shall be based on not exceeding a 65 degree C. winding temperature rise above a 30 degree C average ambient temperature. The high voltage basic impulse insulation level (BIL) shall be 125 kV. The low voltage basic impulse insulation level (BIL) shall be 30 kV.

B. High voltage: 14400 volt (taken from a 24940 Grd.Y/14400 volt system). Confirm voltage.

C. Low voltage: 120/240 as indicated on the contract drawings.

D. Size (kVA): 100 as indicated on the contract drawings.

E. Tap changer shall be externally operated, manual type for changing tap setting when the transformer is de-energized. Provide four 2.5 percent full capacity taps, two above and two below rated primary voltage.

PART 2 PRODUCTS

2.1 GENERAL

A. The transformer shall conform to ANSI\IEEE C57.12.25 and ANSI\IEEE C57.12.28-1999, except as otherwise modified herein.

B. The transformer shall be a pad-mounted compartmental type consisting of a sealed transformer tank and a high and low voltage terminating compartment. The transformer tank and terminating compartment shall be assembled as an integral unit, tamper resistant and weatherproof for mounting on a pad.

C. Transformers shall be designed to comply with the short circuit capability requirements of ANSI\IEEE C57.12.00.

D. Transformer cores shall be constructed of high grade, cold reduced, grain oriented silicon steel with low hysteresis and eddy current losses. Transformer cores shall not be constructed of amorphous metal.

E. All insulating paper used as layer insulation in transformer coils shall be bonded type, coated on both sides with a thermosetting adhesive and properly cured prior to impregnating with oil.

2.2 BUSHINGS AND TERMINALS

A. The terminal arrangement shall be as specified in the ANSI\IEEE C57.12.25 for Type 2 terminal arrangements with minimum dimensions as specified in Figure 2 of ANSI\IEEE C57.12.25, for a rating of 15.2 kV, except that the distance between the H1B (high voltage) bushing and the X3 (low voltage) bushing shall be a minimum of 10.0 inches when measured horizontally from the center of each bushing.

B. The transformer shall be supplied with 15.2/26.3 kV class bushing wells and loadbreak bushing inserts which conform to the requirements of ANSI\IEEE 386-2006. Bushing wells shall be externally clamped.

C. The transformer shall provide loop feed capability. The minimum current carrying capabilities of components for the loop primary cable system shall be 200 amperes (continuous) and 10,000 amperes symmetrical (momentary).

D. The low voltage terminals shall be in accordance with Figure 4(c) of ANSI\IEEE C57.12.25. Bushings shall be epoxy and shall be externally clamped. The low voltage terminal stud bolts shall be copper, the neutral bushing stud bolt shall be provided with two (2) nuts on the stud.

E. The low voltage neutral shall be a fully insulated bushing. A ground pad shall be provided on the outer surface of the tank with a removable ground strap, suitably sized for the rating of the transformer provided and connected between the low voltage neutral bushings and the ground pad.

2.3 HIGH AND LOW VOLTAGE COMPARTMENT

A. The high and low voltage compartment shall comply with ANSI C57.12.25.

B. The high voltage portion of the compartment shall contain the high voltage bushing wells, fuses, non-load tap changer, disconnect switches, and cable accessory parking stand (s).

2.4 ACCESSORY EQUIPMENT

A. Accessory equipment shall be provided in accordance with ANSI\IEEE C57.12.25. Provide a spare bayonet fuse in a weatherproof bag with each transformer.

B. Lifting provisions shall be of adequate strength and size to allow for the lifting of the complete transformer assembly when filled with oil and shall be arranged on the tank to provide a suitable lift.

C. Terminal designations shall be as shown in Figure 2 of ANSI\IEEE C57.12.25. The identification of the terminal connection shall be as shown on the instruction nameplate.

D. A permanently marked corrosion resistant instruction nameplate shall be located in the low voltage portion of the compartment and be in accordance with all provisions contained in ANSI\IEEE C57.12.25, paragraph 6.4.

E. Extension provisions for mounting a user identification plate are required. This provision shall be placed immediately below the nameplate. The extension shall have a minimum horizontal width of 3-1/4 inches and shall be provided with two 0.104 inch diameter holes, 3 inches between center lines, and shall extend 1 inch vertical below the nameplate with center line of holes ½ inch vertically below the nameplate.

2.5 DIELECTRIC FLUID

A. Transformers shall be furnished complete with fluid that does not contain more than 1 ppm PCBs (see subparagraph (4) below) and shall be labeled as not contaminated.

B. The transformer shall be of a sealed-tank construction.

C. The transformer shall remain effectively sealed for a top oil temperature range of -5 degrees C. to +105 degrees C.

2.6 TANK

A. The tank construction shall comply with ANSI\IEEE C57.12.25.

B. The tank shall be of all-welded steel construction. There shall be no exposed screws, bolts, or other fastening devices which are externally removable. The top shall be pitched to facilitate water run-off.

C. An automatic pressure relief valve (Qualitrol Series 202 or equivalent) designed to relieve excessive internal pressures shall be installed on each transformer.

D. Tank grounding provisions shall be as specified in ANSI\IEEE C57.12.25-1990 for a type 2 arrangement.

2.7 ASSEMBLY AND ENCLOSURE SECURITY

A. The assembled unit shall meet the enclosure security provisions of ANSI\IEEE C57.12.28-2005 and be suitable for mounting on a concrete pad.

B. Front sill, hood, and tank base of single compartment transformers shall be corrosion resistant and shall be stainless steel, no less that No. 13 U. S. gage, conforming to ASTM A167, Type 304 or 304L. Base shall include any part of the pad-mounted transformer that is within 1.5 inches of the concrete pad.

C. The transformer door shall be fastened to the case with stainless steel hinges and hinge pins. The hinge pins shall be held in place by a mechanical stop which will allow removal of the door only in the fully open position.

D. Provisions shall be made for padlocking the cover when closed. A captive penta head bolt shall be provided for securing the cover. Locking provisions shall be recessed, in accordance with ANSI\IEEE C57.12.28-2005.

2.8 ENCLOSURE COATING SYSTEM AND LABELS

A. The enclosure shall have a corrosion resistant coating system conforming to the requirements of ANSI\IEEE C57.12.28-2005

B. The finish coat shall be Munsell-7GY 3.29/1.5 pad-mount green. The paint thickness shall be a minimum of 2.5 mils.

C. Transformers shall be provided with the following labels, designed for outside application, permanently affixed to the front of each unit (see Figure 1, this specification):

1. kVA rating label

2. NEMA “Mr. Ouch” Warning Label, English/Spanish bilingual, horizontal design.

3. “No PCBs” label in conformance with EPA 40 CFR Part 761.

2.9 OVERCURRENT PROTECTION

A. Provide bayonet oil-immersed, expulsion fuses in series with oil-immersed, partial-range, current-limiting fuses. Bayonet fuse links shall sense both high current and high oil temperature in order to provide thermal protection to the transformer. Coordinate transformer with expulsion fuse clearing low-current faults and current-limiting fuse clearing high-current faults beyond the interrupting rating of the expulsion fuse. In order to eliminate or minimize oil spills, the bayonet fuse assembly shall include an oil retention valve inside the housing which closes when the fuse holder is removed and an external drip shield. Warning shall be conspicuously displayed adjacent to the bayonet fuse cautioning against removing or inserting fuses unless the transformer has been de-energized and the tank pressure has been released.

1. Bayonet fuse assembly: 150 kV BIL.
2. Oil-immersed current-limiting fuses: NEMA C37.47; 50,000 rms amperes symmetrical interrupting rating at the system voltage specified.

3. Disconnect Switches: Provide single pole, single throw primary oil immersed switches to permit closed transition loop feed and sectionalizing. Each switch shall be rated at 25 kV, 125 kV BIL, with a continuous current rating and load-break rating of 200 amperes, and a make-and-latch rating of 10,000 rms amperes symmetrical. Locate the switch handles in the high-voltage section.

2.10 IMPEDANCE

A. The percent impedance (%IZ) as measured on the rated voltage shall be as follows:

kVA rating	Maximum %IZ	Minimum %IZ
25 through 75	3.00	1.50
100 through 250	3.00	1.60

PART 3 EXECUTION

3.1 INSTALLATION

A. General: Electrical installations shall conform to ANSI\IEEE C2, NFPA 70, and to the requirements specified herein. Provide new equipment and materials unless indicated or specified otherwise.

3.2 GROUNDING

A. General: NFPA 70 and ANSI\IEEE C2, except that grounds and grounding systems shall have a resistance to solid earth ground not exceeding 25 ohms.

B. Grounding Electrodes: Provide driven ground rods. Connect ground conductors to the upper end of the ground rods by exothermic weld, Cadweld or approved equal, or compression connectors that conform to the requirements of IEEE 837. Provide compression connectors at equipment end of ground conductors.

3.3 INSTALLATION OF EQUIPMENT AND ASSEMBLIES

A. General: Install and connect pad-mounted transformer furnished under this section as indicated on project drawings, the approved shop drawings, and as specified herein.

B. Install secondary conduits in splay opening so that secondary feeder cables can be trained and be terminated without blocking access to the drain valve at the back of the secondary compartment.

3.4 FOUNDATION FOR EQUIPMENT AND ASSEMBLIES

A. General: Mount transformer on concrete slab as shown in the contract drawings.

3.5 CERTIFIED TEST REPORTS AND DATA REQUIRED

A. All approval drawings showing complete dimensional data, accessories and estimated weight shall be submitted for approval prior to fabrication.

B. At the time of delivery, the manufacturer shall provide a certified test report for all transformers in a given order, indicating the actual loss data for each unit delivered. The certified test reports shall be included with the shipment, with an additional copy directed to the Owner.

3.6 FIELD QUALITY CONTROL

A. Upon receipt, all transformers will be visually inspected by Camp Blanding personnel to determine compliance with the specifications.

END OF SECTION

SECTION 262416 - PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Overcurrent protective devices for panelboards.

1.2 REFERENCES

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Federal Specification; Revision D, 2006.

B. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; National Electrical Contractors Association; 2009.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2008.

E. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches; National Electrical Manufacturers Association; 1993.

F. NEMA PB 1 - Panelboards; National Electrical Manufacturers Association; 2006.

G. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; National Electrical Manufacturers Association; 2007.

H. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2009.

I. NFPA 70 - National Electrical Code, National Fire Protection Association (edition adopted by Authority Having Jurisdiction).

J. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

K. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

L. UL 67 - Panelboards; Current Edition, Including All Revisions.

M. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures;

Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

B. Provide catalog data for Transient Voltage Surge Suppression Devices.

1.4 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Square D, www.squared.com (no substitutions allowed).

2.2 ALL PANELBOARDS

A. Provide products listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose indicated.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet (2,000 m).
2. Ambient Temperature:

a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

C. Short Circuit Current Rating:

D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

F. Bussing: Sized in accordance with UL 67 temperature rise requirements.

1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

2. Boxes: Galvanized steel unless otherwise indicated.

a. Provide wiring gutters sized to accommodate the conductors to be installed.

3. Fronts:

a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.

b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.

4. Lockable Doors: All locks keyed alike unless otherwise indicated.

I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

2.3 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase and Neutral Bus Material: Aluminum.

2. Ground Bus Material: Aluminum.

D. Circuit Breakers:

1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.

E. Enclosures:

1. Provide surface-mounted enclosures unless otherwise indicated.

F. Description: NEMA PB 1, circuit breaker type.

G. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.

H. Minimum integrated short circuit rating: As indicated.

I. Molded Case Circuit Breakers: NEMA AB 1, bolt-on circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.

J. Enclosure: NEMA PB 1, enclosure type as indicated on drawings.

K. Cabinet Front: Surface type, fastened with concealed trim clamps, hinged door with flush lock, metal directory frame, finished in manufacturer's standard gray enamel.

L. Provide blank covers as necessary to cover unused spaces in panelboard. Blank covers shall be manufactured by the manufacturer of the panelboard and intended for this purpose.

2.4 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
2. Phase and Neutral Bus Material: Aluminum.
3. Ground Bus Material: Aluminum.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:

1. Provide surface-mounted or flush-mounted enclosures as indicated.
2. Provide clear plastic circuit directory holder mounted on inside of door.

F. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.

G. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard; provide insulated ground bus where scheduled.

H. Minimum Integrated Short Circuit Rating: As indicated.

I. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Plug-in circuit breakers are not acceptable.

1. Type HACR for air conditioning equipment circuits.
2. Do not use tandem circuit breakers.

J. Enclosure: NEMA PB 1, as indicated on drawings.

K. Cabinet Box: 6 inches (153 mm) deep, 20 inches (508 mm) wide for 240 volt and less panelboards, 20 inches (508 mm) wide for 480 volt panelboards.

L. Cabinet Front: Flush or Surface Mount as indicated on drawings. Cabinet front with concealed trim

clamps, concealed hinge, metal directory frame, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

M. Provide blank covers as necessary to cover unused spaces in panelboard. Blank covers shall be manufactured by the manufacturer of the panelboard and intended for this purpose.

2.5 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:

1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

2. Interrupting Capacity:

a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:

b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

3. Conductor Terminations:

a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

2.6 TRANSIENT VOLTAGE SURGE SUPPRESSION.

A. Provide Transient Voltage Surge Suppression (TVSS) where indicated on the Drawings . The TVSS device shall have a surge current rating as indicated on the drawings and shall be service rated, where required. Maximum ul 1449 2nd edition clamping voltage (c3, 20kv, 10ka, combination wave) shall be 1,150 Volts line to neutral and 1,950 Volts line to line for 480 Volt systems and 450 Volts line to neutral and 800 Volts line to line for 208 or 240 Volt systems The TVSS device shall be UL listed and shall meet all criteria of UL 1449, current edition. Additionally, the device shall contain visual fault indication. The TVSS device shall be installed in accordance with manufacturer's recommendations, and shall be installed as close as possible to the incoming panel feeder using a spare circuit breaker (confirm size of circuit breaker with TVSS manufacturer). Provide integral TVSS when required in design drawings. If installed at a enclosed main circuit breaker, provide overcurrent protection and disconnect.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install panelboards securely, in a neat and workmanlike manner in accordance with NECA 1 (general workmanship), NECA 407 (panelboards), and NEMA PB 1.1.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required supports in accordance with Section 260529.

E. Install panelboards plumb.

F. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

G. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.

H. Provide minimum of six spare 1 inch (27 mm) trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.

I. Provide grounding and bonding in accordance with Section 260526.

J. Install all field-installed branch devices, components, and accessories.

K. Install panelboards in accordance with NEMA PB 1.1 and NECA 1.

L. Install panelboards plumb. Install recessed panelboards flush with wall finishes.

M. Height: 6 feet (1800 mm) to top of panelboard; install panelboards taller than 6 feet (1800 mm) with bottom no more than 4 inches (100 mm) above floor.

N. Provide filler plates to cover unused spaces in panelboards.

O. Provide computer-generated circuit directory for each lighting and appliance panelboard, and each power distribution panelboard provided with a door, clearly and specifically indicating the loads served. Identify spares and spaces.

P. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

Q. Provide identification nameplate for each panelboard in accordance with Section 260553.

R. Provide arc flash warning labels in accordance with NFPA 70.

S. For panels installed flush in finished walls, provide spare conduits out of each recessed panelboard to an accessible location above ceiling. Identify each as SPARE.

1. Minimum spare conduits: 5 empty 1 inch (DN27).

T. Ground and bond panelboard enclosure according to NEC.

3.2 FIELD QUALITY CONTROL

A. Perform inspection, testing, and adjusting in accordance with Section 014000.

B. Inspect each circuit breaker visually.

C. Perform serveral mechanical on-off operations for each circuit breaker.

D. For circuit breakers 600A and larger, Inspect and test in accordance with NETA STD ATS, except Section 4.

E. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA STD ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than 600 amperes. Tests listed as optional are not required.

F. Correct deficiencies and replace damaged or defective panelboards or associated components.

G. For circuit breakers 600A and larger, perform inspections and tests listed in NETA STD ATS, Section 7.5 for switches, Section 7.6 for circuit breakers.

H. For circuit breakers 600A and larger, determine that circuit breaker will trip on overcurrent condition, with tripping time to NEMA AB 1 requirements. Include description of testing and results in test report.

END OF SECTION

SECTION 262717 - EQUIPMENT WIRING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical connections to equipment.

1.2 REFERENCES

A. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2005).

B. NEMA WD 6 - Wiring Devices - Dimensional Requirements; National Electrical Manufacturers Association; 2002 (R2008).

C. NFPA 70 - National Electrical Code, National Fire Protection Association (edition adopted by Authority Having Jurisdiction).

1.3 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.4 COORDINATION

A. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.

B. Determine connection locations and requirements.

C. Sequence rough-in of electrical connections to coordinate with installation of equipment.

D. Sequence electrical connections to coordinate with start-up of equipment.

PART 2 PRODUCTS

2.1 MATERIALS

A. Disconnect Switches: As follows and and in individual equipment sections:

1. Safety switches shall be quick-make, quick-break, heavy duty type in sheet steel enclosure, except as required for rain tight installations, with door cover interlock. Provide fused type safety switches and fuses where indicated on the Drawings or as required by Code. Fused switches shall utilize Class R fuseholders and fuses, unless indicated otherwise.

B. Wiring Devices: As specified in Section 262726.

C. Flexible Conduit: As specified in Section 260534.

D. Wire and Cable: As specified in Section 260519.

E. Boxes: As specified in Section 260537.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make all final power feed connections to starters and/or motorized equipment installed by Heating and Air Conditioning and Plumbing Contractors as indicated or required. Refer to Electrical Sections of other Contractors' Specifications for further information.

C. For air handling equipment with separate "field-installed" heater unit, provide fuse block with fuses, wiring and power connections for fan motor tapped to unit disconnect switch.

D. Verify all equipment for service and characteristics provided prior to rough-in and connection. Provide a grounding conductor for all equipment connected with flexible conduit and bond to conduit system and metallic frame of equipment.

E. Be responsible for securing and installing proper insulated conductors required for equipment of higher temperature range beyond that of specified branch circuit type.

F. Make conduit connections to equipment using flexible metal conduit. Use liquidtight flexible metal conduit with watertight connectors in damp or wet locations and for all motors and vibrating equipment.

G. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

H. Provide receptacle outlet to accommodate connection with attachment plug.

I. Provide cord and cap where field-supplied attachment plug is required.

J. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

K. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

L. Install terminal block jumpers to complete equipment wiring requirements.

M. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 262726 - WIRING DEVICES

PART 2 PRODUCTS

1.1 MANUFACTURERS.

A. All devices shall be specification grade and shall be the product of one manufacturer throughout the project except as otherwise noted.

1.2 ALL WIRING DEVICES

A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.3 WALL SWITCHES

A. All Wall Switches: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

B. Wall Switches: NEMA WD 1, Heavy Duty, AC only general-use snap switch, quiet type with side wire terminals. Switches shall be single or multi-pole as indicated on the Drawings. Provide Leviton Decora Switches, or equal, if indicated on drawings.

1. Body and Handle: plastic with toggle handle unless otherwise indicated. Color shall be as determined by GOVERNMENT.

2. Ratings:

a. Voltage: 120 - 277 volts, AC.

b. Current: 20 amperes.

1.4 WALL DIMMERS

A. All Wall Dimmers: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

B. Wall Dimmers: Semiconductor dimmer for incandescent lamps, Type as indicated on drawings, complying with NEMA WD 6 and WD 1.

1. Body and Handle: plastic with linear slide unless otherwise indicated. Color as determined by GOVERNMENT.

2. Power Rating: Match load shown on drawings; 600 watts minimum.

C. Provide accessory wall switches to match dimmer appearance when installed adjacent to each other.

1.5 RECEPTACLES (NOT THIS SECTION DOES NOT APPLY TO TARGET OR CAMERA RECEPTACLES).

A. All Receptacles: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.

2. NEMA configurations specified are according to NEMA WD 6.

B. Receptacles: Heavy duty, complying with NEMA WD 6 and WD 1.

1. Duplex receptacles shall be straight blade, grounding type, with side wiring terminals. Conductors shall be connected to all receptacles using screws (not spring connectors).

2. Device Body: plastic unless otherwise indicated. Color as determined by GOVERNMENT.

3. Configuration: NEMA WD 6, type as specified and indicated.

C. Convenience Receptacles: Type 5 - 20.

D. Duplex Convenience Receptacles.

E. GFCI Receptacles: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements. Also, provide GFCI receptacles where indicated. GFCI type receptacles shall have "test" and "reset" buttons.

F. Weather proof receptacles shall be in a cast metal box with gasketed, weatherproof, cast-metal cover plate and gasketed cap over each receptacle opening. Provide caps with a spring-hinged flap. Weatherproof receptacles shall be UL listed for use in "wet locations with plug in use" and shall be GFCI rated.

G. Floor-mounted receptacles shall have a brass plate and cover, unless noted otherwise.

H. Special purpose outlets shall be as indicated on the Drawings and have matching cover plates.

1.6 WALL PLATES

A. All Wall Plates: Comply with UL 514D.

1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.

2. Size: Standard; _____.

3. Screws: Metal with slotted heads finished to match wall plate finish.

B. Decorative Cover Plates: smooth plastic unless otherwise indicated on drawings. Color as determined by GOVERNMENT.

C. Weatherproof Cover Plates: Gasketed cast metal with hinged.

END OF SECTION

SECTION 262817 - ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Enclosed circuit breakers.

1.2 REFERENCES

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Federal Specification; Revision D, 2006.

B. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2008.

D. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2009.

E. NECA (INST) - NECA Standard of Installation; National Electrical Contractors Association; 1993.

F. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches; National Electrical Manufacturers Association; 1993.

G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

I. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.

1.4 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Perform Work in accordance with NECA Standard of Installation.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Square D, www.squared.com (no substitutions allowed).

2.2 ENCLOSED CIRCUIT BREAKERS

A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.

B. Provide products listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose indicated.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet (2,000 m).
2. Ambient Temperature: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

D. Short Circuit Current Rating:

E. Conductor Terminations: Suitable for use with the conductors to be installed.

F. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.

G. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

H. Provide externally operable handle with means for locking in the OFF position.

2.3 MOLDED CASE CIRCUIT BREAKERS

A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

B. Interrupting Capacity:

1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

C. Conductor Terminations:

1. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

D. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

E. Circuit Breakers: NEMA AB 1.

2.4 ACCESSORIES

A. Enclosures:

1. Finish: Manufacturer's standard enamel finish, gray color.

B. Provide accessories as scheduled.

C. Provide products suitable for use as service entrance equipment where so applied.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install enclosed circuit breakers where indicated, in accordance with manufacturer's instructions.

B. Install enclosed circuit breakers securely, in a neat and workmanlike manner in accordance with NECA 1.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required supports in accordance with Section 260529.

E. Install enclosed circuit breakers plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed circuit breakers such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 260526.

H. Height: 5 feet (1.6 M) to operating handle.

I. Provide identification nameplates for each enclosed circuit breaker in accordance with Section 260553.

J. Provide arc flash warning labels in accordance with NFPA 70.

3.2 FIELD QUALITY CONTROL

A. Perform inspection, testing, and adjusting in accordance with Section 014000.

B. Inspect and test in accordance with manufacturer's instructions and NETA STD ATS, except Section 4.

C. Perform inspections and tests listed in NETA STD ATS, Section 7.6.1.1 for circuit breakers used for service entrance and for circuit breakers larger than 600 amperes. Tests listed as optional are not required.

D. Correct deficiencies and replace damaged or defective enclosed circuit breakers.

E. Inspect and test each circuit breaker.

F. Inspect each circuit breaker visually.

G. Perform several mechanical ON-OFF operations on each circuit breaker.

H. Verify circuit continuity on each pole in closed position.

I. For circuit breakers 600A or larger, determine that circuit breaker will trip on overcurrent condition, with tripping time to NEMA AB 1 requirements. Include description of testing and results in test report.

END OF SECTION

SECTION 262818 - ENCLOSED SWITCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fusible switches.

B. Nonfusible switches.

1.2 RELATED SECTIONS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Nameplates.

D. Section 262813 - Fuses.

1.3 REFERENCES

A. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

B. NECA (INST) - NECA Standard of Installation; National Electrical Contractors Association; 1993.

C. NEMA FU 1 - Low Voltage Cartridge Fuses; National Electrical Manufacturers Association; 2002 (R2007).

D. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association; 2001 (R2006).

E. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2009.

1.4 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Square D, www.squared.com (no substitutions allowed).

2.2 COMPONENTS

A. Fusible Switch Assemblies: NEMA KS 1, Type HD enclosed load interrupter knife switch.

1. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
2. Handle lockable in OFF position.
3. Fuse clips: Designed to accommodate NEMA FU1, Class R fuses.

B. Nonfusible Switch Assemblies: NEMA KS 1, Type HD enclosed load interrupter knife switch.
1. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
2. Handle lockable in OFF position.

C. Enclosures: NEMA KS 1.
1. Interior Dry Locations: Type 1.
2. Exterior Locations: Type 3R.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install enclosed switches in accordance with manufacturer's instructions.

B. Install enclosed switches securely, in a neat and workmanlike manner in accordance with NECA 1.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required supports in accordance with Section 260529.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 260526.

H. Provide identification nameplate for each enclosed switch in accordance with Section 260553.

I. Provide arc flash warning labels in accordance with NFPA 70.

J. Install fuses in fusible disconnect switches.

K. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

3.2 FIELD QUALITY CONTROL

A. Visually and mechanically confirm that safety switch is working.

B. For switches rated 200A and greater, inspect and test in accordance with NETA STD ATS, except Section 4.

C. For switches rated 200A and greater, perform inspections and tests listed in NETA STD ATS, Section 7.5.

D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

END OF SECTION

SECTION 264113 - LIGHTNING PROTECTION FOR STRUCTURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Strike (air) terminals and interconnecting conductors.

B. Grounding and bonding for lightning protection.

1.2 REFERENCES

A. LPI-175 - Lightning Protection Installation Standard; Lightning Protection Institute; 2004.

B. NFPA 780 - Standard for the Installation of Lightning Protection Systems; National Fire Protection Association (edition adopted by Authority Having Jurisdiction)

C. UL 96 - Lightning Protection Components; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.3 SYSTEM DESCRIPTION

A. Lightning Protection System: Conductor system consisting of air terminals on roofs; bonding of structure and other metal objects; grounding electrodes; and interconnecting conductors.

1.4 SUBMITTALS

A. See Administrative Section for submittal procedures.

B. Shop Drawings: Indicate location and layout of air terminals, grounding electrodes, and bonding connections to structure and other metal objects. Include terminal, electrode, and conductor sizes, and connection and termination details.

C. Product Data: Provide dimensions and materials of each component, indication of testing agency listing, and installation instructions.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with NFPA 780 and UL 96A and provide UL Master Label.

B. Designer Qualifications: Person or entity, employed by installer, who specializes in lightning protection system design with minimum three years documented experience.

C. Field Quality Control Testing Agency Qualifications: Firm capable of and experienced in grounding and bonding testing with documented experience and minimum of three project references.

PART 2 PRODUCTS

2.1 LIGHTNING PROTECTION SYSTEM

A. Lightning Protection System: Provide complete system complying with NFPA 780, including air terminals, bonding, interconnecting conductors and grounding electrodes.

1. Provide system that protects:
    a. The entire structure.
    b. Open air areas within 100 feet (30 meters) of exterior walls at grade level.
    c. Open air areas within building footprint.
2. Coordinate with other grounding and bonding systems specified.

2.2 COMPONENTS

A. All Components: Complying with applicable requirements of UL 96.

B. Air Terminals: Copper, solid (unless base is in direct contact with aluminum, then provide aluminum), 12 or 24 inches, with adhesive bases for single-ply roof installations.

C. Grounding Rods: Solid copper or copper clad steel.

D. Connectors and Splicers: Bronze (provide aluminum if in direct contact with aluminum roof or components).

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated on shop drawings.

B. Coordinate work with installation of roofing and exterior and interior finishes.

3.2 INSTALLATION

A. Install in accordance with referenced system standards and as required for specified certification.

B. Install in accordance with NFPA 780, UL 96A, and LPI-175.

C. Connect conductors using mechanical connectors. Protect adjacent construction elements and finishes from damage.

D. Bond exterior metal bodies on building to lightning protection system and provide intermediate level interconnection loops 60 feet (18 m) on center.

E. Per NFPA 80, 12 inch air terminals shall be spaced at no more than 20 feet. 24 inch air terminals shall be spaced at no more than 25 feet. Provide main conductors between air terminals.

F. Per NFPA 780 for roofs that exceed 50 feet in width, provide cross-run conductors connected to the main perimeter cable. Cross-run conductors shall be connected to the main perimeter cable at intervals not exceeding 150 feet.

G. Per NFPA 780, structures exceeding 250 feet in perimeter shall have a down conductor every 100 feet of perimeter or fraction thereof. Every structure shall have at least two down conductors.

H. Connect ground conductors to ground rods by brazing, welding or exothermic connectors listed for the purpose. Connections shall be suitable for direct burial. Provide ground counterpoise if indicated, or if required by NFPA 780 or local codes.

3.3 FIELD QUALITY CONTROL

A. Perform field inspection per NFPA 780, B-1.2..

B. Perform visual inspection as specified in NFPA 780 as if this were a periodic follow-up inspection.

C. Perform continuity testing as specified in NFPA 780 as if this were testing for periodic maintenance.

D. Provide

END OF SECTION

SECTION 265100 - INTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

D. Ballasts.

E. Lamps.

F. Luminaire accessories.

1.2 REFERENCES

A. ANSI C78.379 - American National Standard for Electric Lamps -- Reflector Lamps -- Classification of Beam Patterns; 2006.

B. ANSI C82.1 - American National Standard for Lamp Ballast - Line Frequency Fluorescent Lamp Ballast; 2004.

C. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

D. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; National Electrical Contractors Association; 2006.

E. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; National Electrical Contractors Association; 2006.

F. NEMA WD 6 - Wiring Devices - Dimensional Requirements; National Electrical Manufacturers Association; 2002 (R2008).

G. NFPA 70 - National Electrical Code, National Fire Protection Association (edition adopted by Authority Having Jurisdiction).

H. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association (edition adopted by Authority Having Jurisdiction).

I. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

J. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Product Data (including ballasts and lighting contactors): Provide dimensions, ratings, and performance data.

1.4 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Conform to requirements of NFPA 70 and NFPA 101.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.5 EXTRA MATERIALS

A. Furnish one replacement lamp for each lamp type.

PART 2 PRODUCTS

2.1 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products that comply with requirements of NFPA 70 and NFPA 101.

D. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

2.2 EMERGENCY LIGHTING UNITS

A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery

power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

C. Battery:

1. Size battery to supply all connected lamps, including emergency remote heads where indicated.

D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

F. Provide accessories and fittings as recommended by manufacturer to properly and completely install and wire fixtures.

G. Electrical Characteristics: 120 volts, 60 Hz, unless otherwise indicated.

2.3 LUMINAIRES

A. Furnish products as indicated in Schedule included on the Drawings. Confirm that the fixtures scheduled are the correct, voltage, wattage, size and mounting type and are listed for location used (i.e. damp or wet locations) before ordering fixtures, ballasts, and lamps. For substitutions, see section 16050.

B. Although not specifically shown or specified, all light fixtures shall be provided with all necessary optional accessories and mounting hardware for installation as indicated or required.

C. Provide insulated ceiling (i.c.) rated fixtures where recessed incandescent, compact fluorescent, or low voltage light fixtures come into direct contact with insulation.

2.4 EXIT SIGNS

A. All Exit Signs: Internally illuminated with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

1. Number of Faces: Single or double as indicated or as required for the installed location.
2. Directional Arrows: As indicated or as required for the installed location.

B. Exit Signs: Exit sign fixture suitable for use as emergency lighting unit.

1. Provide fixtures complying with NFPA 101.
2. Lamps: Compact fluorescent.
3. Mounting: As indicated.

2.5 BALLASTS AND CONTROL UNITS

A. All Ballasts:

1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

2.6 LAMPS

A. All Lamps:

1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.

2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.

3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.

4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect to be inconsistent in perceived color temperature.

B. Lamp Types: As specified for each fixture.

C. Reflector Lamps: Beam patterns in accordance with ANSI C78.379.

2.7 ACCESSORIES

PART 3 EXECUTION

3.1 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 260537 as required for installation of luminaires provided under this section.

B. Install products according to manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship), NECA 500 (commercial lighting), and NECA 502 (industrial lighting).

D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

E. Install fixtures securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting).

F. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.

G. Support luminaires larger than 2 x 4 foot (600 x 1200 mm) size independent of ceiling framing.

H. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.

I. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.

J. Support fixtures (2 x 4 foot and smaller) to be recessed in readily removable tile ceilings (lay-in type)

from the T-bar tile support and connect to remote mounted 4" square (minimum size, conform to NEC) junction boxes with approved six foot long (four feet long for plenum ceilings), 3/8" flexible conduit "fixture whip" with grounding conductor bonded between conduit system and fixture.

K. Connect single-connected fixtures, surface or stem hung, with heat resistant fixture wire. Connect multiple-connected fluorescent fixtures, surface or stem hung, with type THHN heat resistant thermoplastic wire of a size indicated for branch circuit.

L. Install clips to secure recessed grid-supported luminaires in place.

M. Provide sloped ceiling adaptors and all other required hardware as necessary to properly install ceiling mounted light fixtures in sloped ceilings.

N. Install wall mounted luminaires, emergency lighting units, and exit signs at height as indicated on Drawings.

O. Install accessories furnished with each luminaire.

P. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within fixture; use flexible conduit.

Q. Connect luminaires and exit signs to branch circuit outlets provided under Section 260537 using flexible conduit.

R. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

S. Bond products and metal accessories to branch circuit equipment grounding conductor.

T. Install specified lamps in each emergency lighting unit, exit sign, and luminaire.

U. Emergency Lighting Units:

V. Exit Signs:

W. Install lamps in each luminaire.

3.2 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.

E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.3 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.

C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

D. Aim and adjust fixtures as indicated.

E. Position exit sign directional arrows as indicated.

3.4 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

B. Clean electrical parts to remove conductive and deleterious materials.

C. Remove dirt and debris from enclosures.

D. Clean photometric control surfaces as recommended by manufacturer.

E. Clean finishes and touch up damage. Also remove all instruction tags.

3.5 CLOSEOUT ACTIVITIES

3.6 PROTECTION

A. Relamp luminaires that have failed lamps at Substantial Completion.

3.7 SCHEDULE - See Drawings

END OF SECTION

SECTION 265600 - EXTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior luminaires.

B. Ballasts.

1.2 REFERENCES

A. ANSI C78.379 - American National Standard for Electric Lamps -- Reflector Lamps -- Classification of Beam Patterns; 2006.

B. ANSI C82.1 - American National Standard for Lamp Ballast - Line Frequency Fluorescent Lamp Ballast; 2004.

C. ANSI C82.4 - American National Standard for Ballasts for High-Intensity-Discharge and Low Pressure Sodium Lamps (Multiple-Supply Type); 2002.

D. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.

E. NECA/IESNA 501 - Recommended Practice for Installing Exterior Lighting Systems; 2006.

F. NFPA 70 - National Electrical Code, National Fire Protection Association (Edition Adopted by Authority Having Jurisdiction).

G. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. Product Data (including photocells, timers, and lighting contactors): Provide dimensions, ratings, and performance data.

1.4 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 LUMINAIRES

A. Furnish products as indicated in Schedule included on the Drawings. For substitions, see Section 16050. Confirm mounting, type, voltage and wattage is correct before ordering.

2.2 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

2.3 BALLASTS

A. All Ballasts:

1. Provide ballasts containing no polychlorinated biphenyls (PCBs).

2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

B. Fluorescent Ballasts: ANSI C82.1, high power factor type electromagnetic ballast, suitable for lamps specified.

1. Provide low-temperature ballast suitable for lamps specified.
2. Voltage: Match luminaire voltage.

C. High Intensity Discharge (HID) Ballasts: ANSI C82.4, metal halide or high pressure sodium lamp ballast (as indicated in schedule on drawings), suitable for lamp specified.

1. Voltage: Match luminaire voltage.

2.4 TIME-SWITCHES AND OTHER LIGHTING CONTROL

A. Time switch controls shall be as noted on the Drawings and shall be multi-pole, single throw, rated 20 amperes per pole (minimum), with astronomic dial properly selected for latitude of installation and 16 hour (minimum) spring reserve carry-over in event of power failure. Time switch shall be in NEMA 3R surface

mounted enclosure unless otherwise noted.

B. Lighting contactors shall be meet NEMA ICS and shall be electrically held. Contacts shall be rated as indicated.

C. Photocells shall be hermetically sealed cadmium-sulfide or silicon diode type cell rated for voltage of fixtures used with a minimum of 240 volts ac. Switch shall turn on at or below 3 footcandles and off at 2 to 10 footcandles. A time delay shall prevent accidental switching from transient light sources.

PART 3 EXECUTION

3.1 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 260537 as required for installation of luminaires provided under this section.

B. Install products according to manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship) and NECA/IESNA 501 (exterior lighting).

D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

E. Install accessories furnished with each luminaire.

F. Bond products and metal accessories to branch circuit equipment grounding conductor.

G. Install lamps in each luminaire.

H. Bond luminaires, metal accessories, and metal poles to branch circuit equipment grounding conductor. Provide supplementary grounding electrode at each pole.

3.2 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.3 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

B. Clean electrical parts to remove conductive and deleterious materials.

C. Remove dirt and debris from enclosure.

D. Clean photometric control surfaces as recommended by manufacturer.

E. Clean finishes and touch up damage.

3.4 PROTECTION OF FINISHED WORK

3.5 SCHEDULE - See Drawings

END OF SECTION

SECTION -271005 - J6 BASIC TELEPHONE AND INTERNET TECHNOLOGY CABLING STANDARDS FOR NEW AND RENOVATED CONSTRUCTION PROJECTS

1.1 GENERAL

New building construction should be given no less attention to structural communications details as is currently given to electrical power, water and waste treatment facilities. The following are basic guidelines to establish a starting point. Detailed guidelines will be presented in the drawings and specifications prepared by the AE and forwarded to the customer for review.

The contractor will furnish and install with all accessories an EIA/TIA Category 6e or above Enhanced Building Premise Distribution Wiring System (PDS). The PDS will serve as a vehicle for the transport of high speed data and voice signals throughout the facility(s), starting from the demarcation point to the outlet(s) located at various locations described in the contract drawings and described herein. All equipment will meet the specified requirements and be UL listed to include appropriate markings.

Note that this specification applies to telecommuncations systems for voice and NIPRnet data and do not apply to the LFSH target system itself.

REFERENCES

A. EIA/TIA-568- Commercial Building Telecommunications Wiring Standard.
B. EIA/TIA 569- Commercial Building Standard for Telecommunications Pathways/Spaces.
C. EIA/TIA TSB36- Technical Service Bulletin-Additional Information for Unshielded Twisted Pair CAT 6e cable and above.
D. TSB-40- TSB Telecommunications
E. UL Cable certification Program
F. UL Testing Bulletin
G. NEMA
H. ASTM
I. Yearly National Electric Code
J. IEEE 802.3, 1000 Base-T Ethernet
K. Transmission speed requirement for fast Ethernet is 1000 Mbps.
L. Federal, State and local building codes

1.2 SUBMITTALS

A. Submit under appropriate submission annex number.

B. Submit a complete parts list of data communications equipment with manufacturers part numbers included before, during and after the completion of job.

C. Submit manufacturers catalog information showing dimensions, technical information and configuration. Provide data for the following.

1. Wire and cable specifications.
2. Raceways and fittings
3. Connectors, outlets, jacks and other required hardware.
4. Fiber and copper cable termination devices.
5. Distribution frames and equipment racks.

D. Submit manufacturers technical data sheet for cabling to include the following:

1. Mutual Capacitance (pf/ft).
2. Attenuation.
3. DC resistance.

E. Submit a plan to produce the following to be posted in all the Telecommunications Rooms and protected with a rigid frame under a clear plastic cover.

Cable Schedule: The schedule will reflect all incoming and outgoing cables and their designations, origins and destinations. Also, the schedule will show the Patch Panel port assignments to a particular Voice/Data outlet by number and room location.

Cabling Administration Drawing: The drawing will display building floor plans highlighting in bold print the Voice/Data outlet number, location, and room number. Also, electronic/CD and hard copy of ISP and OSP cabling " As Build". Failure to comply will result in no acceptance.

F. Submit a plan and method to test each data and voice conductor end to end. Describe what device is being used with model and type of tester. The results of each cable shall be forwarded in electronic format to this office within 1 week after completion of phase or project. Failure to comply will result in no acceptance.

1. Length of conductor and db loss.
2. Mutual Capacitance

3. Attenuation
4. DC resistance.
5. Record of opens, shorts, false crosses, grounds and plans for resolution.

1.3 QUALIFICATIONS

Company specializing in manufacturing products specified in this section will have a minimum of 3 years experience. The contractor shall be experienced in all aspects of the work to be performed. Included as part of the contractors bid the contractor will disclose all sub-contractors that will be utilized to include name of the sub-contractor(s), list of completed jobs of equal size, resume of the project foreman and supporting documentation to justify qualifications of all personnel. A Registered Communications Distribution Designer (RCDD) will be employed to insure that BICSI guidelines are followed.

1.4 DEFINITIONS

A. BEP. Building Entrance Protector.
B. FDP. Fiber Distribution Panel.
C. PP. Patch Panel.
D. LAN. Local Area Network
E. ISP. Inside Plant.
F. OSP. Outside Plant
G. TGB. Telecommunications Grounding Bar
H. TR. Telecommunications Room.

1.5 TELECOMMUNICATIONS ROOM REQUIREMENTS

The TR will be a dedicated, environmentally controlled room with secured 48”double access doors. Minimum option will be 32" single door.
The TR side walls and back wall will be lined with 4' x 8' x ¾" fire rated plywood or covered on both sides and edges with two coats of gray fire retardant paint.

B. All conduits will enter the TR at a location to allow smooth cable routing to terminating equipment and equipment racks. Conduits must be sufficient in size and quantity to serve VOICE, DATA, TV, VTC, IDS,

FIRE and any other means of life safety. Conduits entering the TR from overhead will be attached to the top of the plywood backboard using channel stock and conduit brackets. Evenly cut and ream conduit ends and install bushings. It is especially important to adhere to a minimum conduit bend radius of not less than 10 times the diameter of the conduit. Conduits entering from below grade will extend no more than 4" AFF. Inner ducts will extend no more than 4" beyond the end of the outer duct. Conduits will be labeled and /or tagged to reflect purpose and destination. All empty conduits and inner ducts will be equipped with pull strings. At least one (1) underground/under slab conduit in each duct bank routing will be equipped with metallic trace wire. All active and empty conduits will be neatly sealed and/or capped to prevent outside element intrusion.

A. Equipment racks (19" x 84") will be floor mounted with at least 30" clearance at the front and back. The equipment racks will be secured at the top in three directions to the TR plywood walls with ladder rack. Depending on the quantity of terminations, equipment and availability of floor space, 19" x 24" wall mounted racks may be an option.

C. For renovated buildings, the TR ground will be connected to the existing ground system. For new buildings, a Cad Welded Grounding System will circle the entire building 24" below grade and connect to 10' x 5/8" ground rods spaced every 40 feet. The system will connect to the building power ground and will not exceed 5 Ohms. Metal roofed buildings will also be connected to the ground system. Heavy gauge cabling will extend into the TR and terminate on the Telecommunications Grounding Busbar (TGB).

D. Install a 2" x 12" Telecommunications Grounding Busbar (TGB) centrally located on the back plywood wall 18" AFF. Depending on the distance from the building primary ground source, serve the TGB by way of a #3/0 to #6 AWG ground cable. The TGB will be pre drilled for secondary distribution and mounted with 2" standoff insulated brackets. Secondary #6 AWG ground cables will extend to the BEP and all metal framework.

E. Install a standard, 20 amp, quad, 120volt AC receptacle or a 20 amp, 120 volt AC, twist lock receptacle, on the backboard wall, to line up with at least two positions of the overhead ladder rack supports. The top of the receptacles will be mounted 80" AFF.

1.6 BASIC CABLING REQUIREMENTS

A. Fiber Optic single mode, multimode and/or hybrid cables may be used as specified. The cables will be loose tube in design and will always be installed from point to point in conduit. These cables will be used for interconnection of voice or data systems from outside sources, linking buildings, main distribution frames (MDF) and equipment.

B. Category 6e cable and above will be used for intra building data and voice connections unless otherwise specified herein. CAT6e cable will be unshielded twisted pair (UTP), 24 gauge, 4 pair and rated to transmit at a minimum of 1000 Mbps. Each pair shall have the necessary insulation and twist rate per foot to accommodate the 1000Mbps speed. The outer jacket will be of Plenum (CMP) material. PVC (CMR) jacket cabling may be used in homerun metallic conduits or cable trays in areas which are not part of the building air distribution system. Upon entering the TR, the cables will be formed into a 10' slack coil secured in "D" rings on the back plywood wall. The color of the outer jacket of the two data cables will be GRAY and YELLOW and the voice cables will be BLUE, all with UL listed markings visible. All CAT6e cables installed direct buried or in conduits under slabs will be designed as direct buried with moisture resistant gels.

C. Outlying buildings less than 290 feet from the main building may be served with shielded direct buried CAT5e copper cable and terminated in the appropriate sized BEP. If more than three (3) drops are being served, use multimode fiber optic cable.

D. Patch Cables will be provided in sufficient quantity to connect all work station Patch Panel appearances to the switch. The cables will be CAT6e rated with RJ45 plugs on each end. Fifty percent will be 1 meter and fifty percent 2 meters in length.

1.7 EQUIPMENT RACKS

A. All floor mounted equipment racks will be anchored to the floor and secured at the top to ladder racks.
B. All racks will be grounded to the TGB with #6 AWG ground wire.
C. Fiber Distribution Panels (FDP) will be mounted at the top of the rack.
D. Patch Panels representing Group "A" will be mounted below the FDP and will terminate the GRAY CAT6e data cables.

E. Patch Panels representing Group "B" will be mounted below Group "A" and will terminate the YELLOW CAT6e data cables.

F. Patch Panels representing Group "C" will be mounted below Group "B" and will terminate the BLUE CAT6e voice cables.

G. Patch Panels representing the BEP (Building Entrance Protector) will be mounted below Group "C" and extend to the backboard by way of house cables and terminate on 66 blocks adjacent to the assigned BEP.

H. The equipment racks will be equipped with 2RM Horizontal Cable Management in between the Patch Panels and 5 inch Vertical Cable Management on the sides.

I. Space must be available below the Patch Panels for mounting switches, servers, transceivers, shelves and UPS. If space is a problem, install a second rack.

J. Homaco or Chatsworth, or approved equal.

1.8 CABLE TERMINATION DEVICES.

A. Fiber Distribution Panel (FDP).

The FDP will be designed for 19" rack mounting and sized to match the incoming service cable. Panels will be constructed of high galvanized steel with stainless steel hardware and a painted corrosion resistant enamel black finish. Enclosures will have interlocking doors front and back. All holes will have grommets. The OSP fiber optic service cable will enter the TR through a conduit positioned to allow smooth routing on the plywood wall to neatly form a 10' slack coil and continue up the wall, across the ladder rack into the FDP. Care must be taken to maintain the acceptable bend radius for the particular size cable. Single mode cables will terminate with Blue SC connectors and Multimode cables will terminate with Beige SC connectors. All fibers will be fusion spliced. Crimped style connectors are not to be used. Connectors will be Zirconia Ceramic tip/nickel plated zinc body. Splice loss will not exceed 0.3db. Corning or approved equal.

B. Patch Panels (PP)

All Patch Panels will be CAT6e rated and designed for 19" rack mounting. The panels may vary in size between 12 and 96 port depending on the capacity requirement. The CAT6e cables will connect to the110 terminating strips using the 568 A wiring application. The 25 pair house cable serving the BEP will extend from a 66 block mounted on the plywood wall adjacent to the BEP to the rack mounted patch

panel designated for the BEP. One pair will be terminated on each port 1 through 23 and two pair on port 24. This configuration will be used for FAX lines or any other requirement for analog service. Install Patch Panels designed to receive color coded RJ45 snap in jacks. Leviton, or approved equal.

C. Jacks (RJ45)

Voice/data outlet boxes will be spaced every 10' in open areas and at least two in every 100 square foot office.

At each location there will be an outlet box within close proximity to a 120 volt AC power outlet.

Each location providing voice and data service will be designed with at least two (2) CAT6e cables. One for data (Gray) and one for voice (Blue). Some application may require three (3) CAT6e cables (Gray and Yellow) for data and one for voice (Blue). Other locations may vary in the number of cables and jacks required

In the basic 3 port design, cables will terminate in RG45 jacks mounted on 3 port face plates. The Gray and Yellow cables will connect to the top and middle port for data and the Blue cable on the bottom port for voice. Two (2) port application will be Gray on top and Blue on the bottom.
CAT6e cables will connect to the jacks using 568 A wiring application.

The RJ45 jacks shall match the cables in color and be made of high impact, flame retardant UL-rated94V-0 thermoplastic. The jacks will be designed with integral locking mechanism which, upon insertion into the face plate port will provide maximum pullout strength at the interface. Jacks will be 8 conductors, CAT6e rated. Leviton or approved equal.

2.1 EXECUTION

A. Verify that outlets are installed at proper height. Verify wall openings are neatly cut and will be completely covered by wall plate
B. Installation of all data cables shall not exceed the manufacturers bend radius.
C. When terminating a CAT6e cable it will not exceed the untwisting of ½ inch.
D. Cables will not be spliced
E. Stripping of unused wire to cross-connect is not acceptable
F. All cable runs will be installed and supported in accordance with all EIA/TIA standards and NEC codes. Cables parallel to electrical conduits will maintain 6" in separation.

G. Cables shall be installed unbroken from the originating point to the end user outlet. Terminate all cables with appropriate hardware and connectors. Spare conductors will be labeled on both ends as such.

2.2 TESTING

A. Copper Data and Voice cable test: The data system shall be fully tested to meet the specifications described in this document. Submit a written report in accordance with the approved testing plan described in above paragraph 1.2. Record and submit after the completion of the phase or project.

B. Inspect all cabling and wire for physical damage and proper connection. Replace damaged cables with new ones.

C. Verify continuity of each conductor of twisted pair cables. Ensure that the conductors are not crossed, shorted or grounded. Verify continuity of each fiber in fiber optic cables. Ensure that the each are free of faults and meet the db loss requirements.

2.3 LABELING TELECOMMUNICATION COMPONENTS

A. Horizontal and backbone subsystem cables will be labeled at each end of the cable. Additional labeling may be required at the intermediate locations such as conduits ends, pull boxes and long runs in open cable trays.

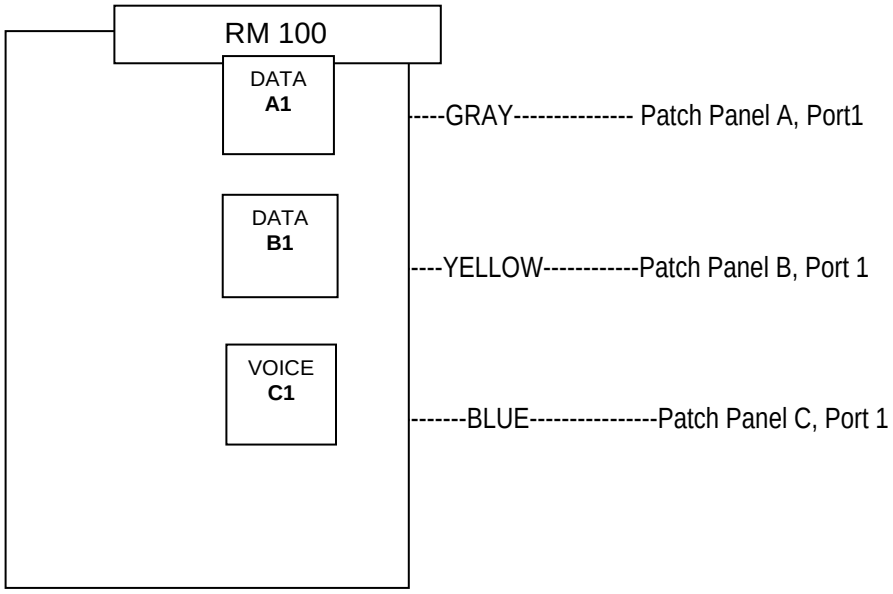
B. Labeling will start at the closest room to the communications closet and continue in a logical manner clockwise until each location is designated.

C. Work station outlets in each room will be numbered sequentially in a clockwise fashion beginning with the first outlet to the left of the primary entrance door. The RJ45 jacks on the outlet faceplates will be aligned vertically. The jacks will be designated A, B and C from top to bottom which will correspond to the Patch Panels designated A, B and C in the Telecommunications Room.

D. The work station outlets will be numbered in clockwise order 1, 2, 3 etc. As an example, Room 100 is equipped with 3 work station outlets. The top of the first outlet faceplate will reflect "RM 100" and the three jacks will be labeled A1, B1 and C1. The second outlet will be "RM 100", A2, B2 and C2. The third, "RM 100", A3, B3 and C3.

E. Patch Panels in the TR will be labeled A, B, and C to correspond to the three jacks on the outlet faceplates. To follow through with the Room 100 example, the first three ports on Patch Panel A will be labeled Room 100, 1, 2, and 3. Patch Panel B will be labeled Room 100, 1, 2, and 3. And Patch Panel C will be labeled Room 100, 1, 2, and 3. If the next room number is 102 and it has 5 outlet boxes, the next 5 ports on each Patch Panel A, B, and C will be labeled "RM 102", 1, 2, 3, 4 and 5. The Patch Panel ports will be numbered as they appear in a particular room, not by the physical port number.

F. The example below will illustrate how the jacks in the first outlet box in room 100 will be connected by the CAT6e cables to the Patch Panels in the TR. The color of the jacks on both the Station Outlet box faceplate and Patch Panel and the CAT6e cable for group "A" will be GRAY. Group "B" will be YELLOW and Group "C" will be BLUE. If the design drawings, show two versus three jacks in a standard workstation outlet, provide two RF-45 jacks.



G. To reiterate the guidelines on Page 2, Paragraph 1.2, E, post in a prominent location in each Telecommunications Room and protect with rigid frame under a clear plastic cover the following: List incoming and outgoing cables and their designation, origins and destinations. Also, a building floor plan reflecting, in bold print, all outlet locations with appropriate labeling and room numbers.

3.0 WARRANTY

A. Provide Voice and Data products including modular jacks, face plates, patch panels, patch cords, equipment racks, protectors and CATx levels of cable with manufacturers 20 year guarantee.

B. A full one-year, unlimited warranty for all contractor provided materials and workmanship. The warranty shall begin the day after acceptance by the FLARNG.

C. Service shall include full replacement cost including material and labor required to replace any failed component.

D. The contractor will be responsible for the repair and /or replacement of any damage to the customer premise property. Excavated areas will be returned to a state of normal landscape appearance.

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing site utilities.
7. Temporary erosion- and sedimentation-control measures.

1.2 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.3 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises at a location determined by the owner.

C. Utility Locator Service: Notify utility locator service for area where Project is located a minimum 48 hrs. before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and tree protection measures are in place.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving." Or as defined in the geotechnical report.

1. Obtain approved borrow soil material off-site when adequate satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction. Any benchmark disturbed must be re-established or a new one provided.

B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

A. General: Protect trees and plants remaining on-site according to the tree protection detail in the plans.

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

3.4 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.

1. Arrange with utility companies to shut off indicated utilities.

B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches (450 mm) below exposed subgrade.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm), and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to as necessary to remove all vegetative material, roots, and organics and in a manner to prevent intermingling with underlying subsoil or other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water. Utilize silt fence around stockpiles as needed to control any turbid runoff.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preparing sub-grades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for concrete slabs-on-grade.
4. Sub-base course for concrete walks and pavements.
5. Sub-base course and base course for asphalt paving.
6. Excavating and backfilling for utility trenches.
7. Gravel Pavement

1.2 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the sub-base course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Sub-base Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. Sub-grade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below sub-base, drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

L. Gravel Pavement: Crushed concrete in accordance with the current Florida Dept. of Transportation – Standard Specifications for Road and Bridge Construction, Section 204 (Graded Aggregate Base).

1.3 QUALITY ASSURANCE

A. Pre-excavation Conference: Conduct conference at a time and location as determined by the owner or owner's representative.

1.4 PROJECT CONDITIONS

A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.

B. Do not commence earth moving operations until plant-protection measures have been implemented.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, according to ASTM D 2487, Groups A-1, and A-3 according to AASHTO M 145,.or a combination of these groups; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. See the geotechnical report for detailed soil engineering, characteristics and construction recommendations.

1. Liquid Limit: 25.
2. Plasticity Index: 6.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145, or a

combination of these groups. See the geotechnical report for detailed soil engineering, characteristics and construction recommendations.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 10 percent passing a No. 200 (0.075-mm) sieve.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 100 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

2.2 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility; colored to comply with local practice or requirements of authorities having jurisdiction.

B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored to comply with local practice or requirements of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.3 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.4 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.5 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches (300 mm) each side of pipe or conduit or as otherwise indicated on the plans.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material, 4 inches (100 mm) deeper elsewhere, to allow for bedding course.

D. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.

3.6 SUBGRADE INSPECTION

A. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades. See the geotechnical report for detailed soil engineering, characteristics and construction recommendations.

B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.7 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi (17.2 MPa), may be used when approved by Architect or Structural Engineer.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.8 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.9 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in "Cast-in-Place Concrete" Section 033053 "Miscellaneous Cast-in-Place Concrete."

D. Trenches under Roadways: Provide 4-inch- (100-mm-) thick, concrete-base slab support for piping or conduit less than 30 inches (750 mm) below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete before backfilling or placing roadway sub-base course. Concrete is specified in "Cast-in-Place Concrete" Section 033053 "Miscellaneous Cast-in-Place Concrete."

E. Place and compact initial backfill of sub-base material satisfactory soil, free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the pipe or conduit.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

F. Place and compact final backfill of satisfactory soil to final subgrade elevation.

G. Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.10 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

3.11 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.12 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. Under structures, building slabs, steps, and pavements, scarify and re-compact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill soil material at 98 percent.
2. Under walkways, scarify and re-compact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 95 percent.
3. Under turf or unpaved areas, scarify and re-compact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 85 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 90 percent.

3.13 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch (25 mm).
2. Walks: Plus or minus 1 inch (25 mm).
3. Pavements: Plus or minus 1/2 inch (13 mm).

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

3.14 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place sub-base course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared sub-grade, place sub-base course and base course under pavements and walks as follows:

1. Shape sub-base course and base course to required crown elevations and cross-slope grades.

2. Place sub-base course and base course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
3. Compact sub-base course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98 percent of maximum dry unit weight according to ASTM D 1557.

3.15 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Place drainage course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 98 percent of maximum dry unit weight.

3.16 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; re-compact and retest until specified compaction is obtained.

E. All testing shall be in accordance with the project geotechnical report for location and frequency of testing as prepared by Universal Engineering Sciences.

3.17 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Driveways.
2. Roadways.
3. Parking lots.
4. Curbs and gutters.
5. Walks.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Samples: For each exposed product and for each color and texture specified.

D. Other Action Submittals:

1. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.3 QUALITY ASSURANCE

A. Ready-Mix-Concrete 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.

B. ACI Publications: Comply with ACI 330.1-03 unless otherwise indicated.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn steel wire into flat sheets.

C. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 ; deformed.

E. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.

F. Deformed-Steel Wire: ASTM A 496/A 496M.

G. Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars ; zinc coated (galvanized) after fabrication according to ASTM A 767/A 767M, Class I coating. Cut bars true to length with ends square and free of burrs.

H. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified.

2.2 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Portland Cement: ASTM C 150, white portland cement Type I/II. Supplement with the following:

a. Fly Ash: ASTM C 618, Class C.
b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

2. Blended Hydraulic Cement: ASTM C 595, Type IS, portland blast-furnace slag or Type IP, portland-pozzolan cement.

B. Normal-Weight Aggregates: ASTM C 33, or F.D.O.T Standard Specification, Section 902, uniformly graded. Provide aggregates from a single source.

C. Water: Potable and complying with ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

F. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.

1. Color: White.

2.3 FIBER REINFORCEMENT

A. Synthetic Fiber: Monofilament or fibrillated polypropylene fibers engineered and designed for use in concrete paving, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches (13 to 38 mm) long.

2.4 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, and per ACI 330.1-3.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

F. White, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B, dissipating.

2.5 RELATED MATERIALS

A. Joint Fillers: AASHTO M153 or AASHTO M213, ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork in preformed strips.

B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

2.6 PAVEMENT MARKINGS

A. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than 45 minutes unless otherwise specified by FDOT specifications.

1. Color: As indicated on plans.

B. Pavement-Marking Paint: MPI #97 Latex Traffic Marking Paint.

1. Color: As indicated on plans.

2.7 WHEEL STOPS

A. Wheel Stops: Precast, air-entrained concrete, Solid, integrally colored, 96 percent recycled HDPE, or commingled postconsumer and postindustrial recycled rubber or plastic; UV stabilized.

1. Color: Yellow.
2. Dowels: Galvanized steel, 3/4 inch in diameter, 16-inch minimum length.
3. Adhesive: As recommended by wheel stop manufacturer for application to concrete pavement.

2.8 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 330.1-3, with the following properties:

1. Compressive Strength (28 Days): 4000 psi (27.6 MPa).
2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
3. Slump Limit: 4 inches (100 mm).
4. Air Content: 5-1/2 percent plus or minus 1.5 percent.

B. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

C. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd. (0.60 kg/cu. m).

D. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions.

2.9 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M. Furnish batch certificates for each batch discharged and used in the Work.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Proof-roll prepared subbase surface below concrete paving identify soft pockets and areas of excess yielding.

B. Remove loose material from compacted subbase surface immediately before placing concrete.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

3.4 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth and at most one- third of the concrete thickness, and to match jointing of any existing adjacent concrete paving.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 3/8-inch (10-mm) radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.5 CONCRETE PLACEMENT

A. Moisten subbase to provide a uniform dampened condition at time concrete is placed.

B. Comply with ACI 330.1-03 requirements for measuring, mixing, transporting, placing, and consolidating concrete.

C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

D. Screed paving surface with a straightedge and strike off.

E. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

3.6 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch (1.6 to 3 mm) deep with a stiff-bristled broom, perpendicular to line of traffic.

C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on paving surface according to manufacturer's written instructions.

1. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
2. After curing, lightly work surface with a steel wire brush or abrasive stone and water to expose nonslip aggregate.

3.7 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to 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.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound or a combination of these.

3.8 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 1/4 inch.
2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
3. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/2 inch (13 mm).
4. Joint Spacing: per ACI 330.1-3.
5. Contraction Joint Depth: Maximum 1/3, minimum 1/4 slab thickness.
6. Joint Width: 1/8 – 1/4 inch.

3.9 PAVEMENT MARKING

A. Allow concrete paving to cure for a minimum of 28 days and be dry before starting pavement marking.

B. Sweep and clean surface to eliminate loose material and dust.

C. Apply paint with mechanical equipment to produce markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).

3.10 WHEEL STOPS

A. Install wheel stops in bed of adhesive applied as recommended by manufacturer.

B. Securely attach wheel stops to paving with not less than two galvanized-steel dowels located at one-quarter to one-third points. Install dowels in drilled holes in the paving and bond dowels to wheel stop. Recess head of dowel beneath top of wheel stop.

3.11 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

C. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 323113 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

1. This Section includes the following:
   a. Chain-Link Fences: Industrial.
   b. Gates: Swing.

2. Related Sections include the following:

   a. Earth Moving: Site Clearing & Earthwork - 312000.

1.3 PERFORMANCE REQUIREMENTS

1. Structural Performance: Provide chain-link fences and gates capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

   a. Minimum Post Size and Maximum Spacing for Wind Velocity Pressure: Determine based on mesh size and pattern specified, and on the following minimum design wind pressures and according to CLFMI WLG 2445:
      1) Wind Speed: 110 mph.
      2) Fence Height: 6 feet.
      3) Line Post Group: IA, ASTM F 1043, Schedule 40 steel pipe.
      4) Wind Exposure Category: C.

1.4 SUBMITTALS

1. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.
   a. Fence and gate posts, rails, and fittings.
   b. Chain-link fabric, reinforcements, and attachments.
   c. Gates and hardware.

2. Shop Drawings: Show locations of fences, gates, posts, rails, tension wires, details of extended posts, extension arms, gate swing, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, gate elevations,

sections, details of post anchorage, attachment, bracing, and other required installation and operational clearances.

3. Product Certificates: For each type of chain-link fence, operator, and gate, signed by product manufacturer.

   a. Strength test results for framing according results for framing according to ASTM F 1043.1043.

4. Qualification Data: For Installer.
5. Maintenance Data: For the following to include in maintenance manuals:
   a. Gate.

1.5 QUALITY ASSURANCE

1. Installer Qualifications: An experienced installer who has completed chain-link fences and gates similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

   a. Engineering Responsibility: Preparation of data for chain-link fences and gates, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

1.6 PROJECT CONDITIONS

1. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Available Manufacturers: Subject to compliance with requirements.

2.2 CHAIN-LINK FENCE FABRIC

1. General: Height indicated on Drawings. Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with ASTM F668, Federal specification RR-F-191 Type IV, AASHTO M-181 Type IV (Class 2a – Extruded and Adhered), and requirements indicated below:

   a. Fabric: Vinyl clad 2” x 9 ga. with a diameter of0.148 inch .
      1) Mesh Size: 2 inches x 9 gauge.

   b. Selvage: Knuckled at both selvages.

c. Wire Coating: Vinyl (color - brown)

2.3 INDUSTRIAL FENCE FRAMING

1. Posts and Rails: Comply with ASTM F 1043 for framing, and the following:

   a. Group: IA, round steel pipe, Schedule 40.
   b. Fence Height: as indicated on drawings.
   c. Strength Requirement: Light industrial according to ASTM F 1043.
   d. Post Size and Thickness:
      1) Rail: 1.66 inches. (where applicable)
      2) Line Post: 2.375 inches.
      3) End, Corner and Pull Post: 3.0 inches.
      4) Swing Gate Post: According to ASTM F 900.
   e. Coating for Steel Framing: (Vinyl clad – color - brown)
      1) Metallic Coating:
         a) Type A, consisting of not less than minimum 2.0-oz./sq. ft. average zinc coating per ASTM A 123/A 123M.

2.4 TENSION WIRE

1. General: Provide horizontal tension wire at the following locations:

   a. Location: Extended along top and bottom of fence fabric.

   b. Secured: Secured with 9 ga. PVC clad not to exceed 24” (5 per panel).

2. PVC Coated Tension Wire: 0.177-inch diameter, marcelled tension wire complying with ASTM A 817, ASTM A 824, and the following:

   a. Metallic Coating: Type II, zinc coated (galvanized) by hot-dipped or electrolytic process, with the following minimum coating weight:
      1) Matching chain-link fabric coating weight.

2.5 INDUSTRIAL SWING GATES

1. General: Comply with ASTM F 900 for single swing gate types.

   a. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1043 and ASTM F 1083 for materials and protective coatings.

2. Frames and Bracing: Fabricate members from round, PVC coated steel tubing with outside dimension and weight according to ASTM F 900 and the following:

   a. Gate Fabric Height: As indicated.
   b. Leaf Width: As indicated.
   c. Frame Members:

1) PVC Coated schedule 40 pipe: 1.66 inches round.

3. Frame Corner Construction:

   a. Welded, adjustable truss rods for panels 5 feet wide or wider.

4. Hardware: PVC coated fork type or plunger-rod type latches permitting operation from both sides of gate, hinges, and keepers for each gate leaf more than 5 feet wide. Pad lock accessible from both sides of gate.

   a. Hinge: Size and material to suit gate size, non-lifting type, offset to permit 180-degree opening. PVC coating to match. Provide 1-1/2 pair of hinges for each leaf over 6-foot nominal height.

2.6 FITTINGS

1. Post and Line Caps: Provide for each post.

   a. Line post caps with loop to receive tension wire or top rail.

2. Rail and Brace Ends: Where applicable, attach rails securely to each gate, corner, pull, and end post.
3. Rail Fittings: Provide the following:

   a. Connecting Sleeves: Pressed-steel 1 5/8" x 6" PVC coated tubing not less than 6 inches long.
   b. Corner end and pull: components: brace bands and rail ends 1 5/8", 3/8" truss rods with maliable tightener for bracing and trussing in the fence line to line posts.

4. Tension and Brace Bands: Pressed steel (PVC coated).
5. Tension Bars: PVC Coated Steel, length not less than 2 inches shorter than full height of chain-link fabric. Provide tension bar at all connections.

6. Tie Wires and Hog rings: PVC Coated 9 gauge.

   a. PVC Coated tie wires 9 gauge aluminum.

7. Finish:

   a. PVC Coated : Finished to match PVC fence.

2.7 CAST-IN-PLACE CONCRETE

1. Materials: Portland cement complying with ASTM C 150, Type I aggregates complying with ASTM C 33, and potable water for ready-mixed concrete complying with ASTM C 94/C 94M.

   a. Concrete Mixes: Normal-weight concrete with not less than 3000-psi compressive strength (28 days), 3-inch slump, and 1-inch maximum size aggregate.

PART 3 - EXECUTION

3.1 EXAMINATION

1. Examine areas and conditions, with Installer present, for compliance with requirements for a verified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance.

    a. Do not begin installation before final grading is completed, unless otherwise permitted by Architect.
    b. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

1. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION, GENERAL

1. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.

    a. Install fencing on established boundary lines inside property line (6” inside property lines and otherwise as shown on plans).

3.4 CHAIN-LINK FENCE INSTALLATION

1. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.
2. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.

    a. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
    b. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
        1) Exposed Concrete: Extend 2 inches above grade; domed to shed water.
3. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 30 degrees or more.
4. Line Posts: Space line posts uniformly and not to exceed 10’ o.c. or as required for wind loading.
5. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts.

a. Locate horizontal braces at midheight of nominal fence if over 6 feet of height, on fence with top rail and at 2/3 fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

6. Tension Wire: Install according to ASTM F 567, maintaining alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c. Install tension wire in locations indicated before stretching fabric.

   a. Tension Wire: Install tension wire within 6 inches of bottom and top of fabric and tie to each post with not less than same diameter and type of wire.

7. Top Rail: Not a part of the standard fence section. However, where possibly applicable install according to ASTM F 567, maintaining consistent alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to post fittings designed and fabricated to receive rail at terminal posts. Provide vinyl clad connectors to join top rail continuation.
8. Chain-Link Fabric: Install fence in accordance with ASTM Practice 567 and applying fabric to outside of enclosure / framework. Leave a maximum of 2 inches between finish grade or surface and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

9. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches o.c.

10. Fasteners: 5/16” x 1 ¼” carriage bolts and PVC coated nuts on the secure side of the fence. Peen ends of bolts or score threads to prevent removal of nuts.

3.5 GATE INSTALLATION

1. Install gates in a level and plumb position securing full opening. Attach fabric hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage with hardware adjusted for smooth operation.

3.6 ADJUSTING

1. Gate: Adjust gate to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

2. Lubricate hardware, gate operator, and other moving parts.

3.7 DEMONSTRATION

1. Engage a factory-authorized service representative to train Owner's personnel to adjust, operate, and maintain gates.

END OF SECTION 323113

SECTION 330500 - COMMON WORK RESULTS FOR UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Piping joining materials.
2. Dielectric fittings.
3. Sleeves.
4. Identification devices.
5. Grout.
6. Piping system common requirements.
7. Equipment installation common requirements.
8. Concrete bases.
9. Metal supports and anchorages.

1.2 DEFINITIONS

A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.

B. Concealed 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.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Dielectric fittings.
2. Identification devices.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Steel Piping Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

PART 2 - PRODUCTS

PIPING JOINING MATERIALS (Foremost , all materials must meet and comply with current Clay County Utility Authority / Camp Blanding Utilities specifications)

A. 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 (3.2-mm) maximum thickness, unless otherwise 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 (3.2 mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

G. Solvent Cements for Joining Plastic Piping:

1. ABS Piping: ASTM D 2235.
2. CPVC Piping: ASTM F 493.
3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
4. PVC to ABS Piping Transition: ASTM D 3138.

H. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.2 DIELECTRIC FITTINGS

A. Dielectric Fittings, General: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:

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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Epco Sales, Inc.
d. Hart Industries, International, Inc.
e. Watts Water Technologies, Inc.
f. Zurn Plumbing Products Group; Wilkins Div.

3. Description: Factory fabricated, union, NPS 2 (DN 50) and smaller.

a. Pressure Rating: 150 psig (1035 kPa) minimum, 250 psig (1725 kPa) at 180 deg F (82 deg C).
b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded ferrous.

C. Dielectric Flanges:

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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Epco Sales, Inc.
d. Watts Water Technologies, Inc.

3. Description: Factory-fabricated, bolted, companion-flange assembly, NPS 2-1/2 to NPS 4 (DN 65 to DN 100) and larger.

a. Pressure Rating: 150 psig (1035 kPa) minimum, 175 psig (1200 kPa) minimum, 300 psig (2070 kPa).
b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric Couplings:

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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Calpico, Inc.
b. Lochinvar Corporation.

3. Description: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining, NPS 3 (DN 80) and smaller.

a. Pressure Rating: 300 psig (2070 kPa) at 225 deg F (107 deg C).
b. End Connections: Threaded.

E. Dielectric Nipples:

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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Perfection Corporation.
b. Precision Plumbing Products, Inc.
c. Victaulic Company.

3. Description: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining.

a. Pressure Rating: 300 psig (2070 kPa) at 225 deg F (107 deg C).
b. End Connections: Threaded or grooved.

2.3 SLEEVES

A. Mechanical sleeve seals for pipe penetrations are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

B. Galvanized-Steel Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

C. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized, plain ends.

D. Cast-Iron Sleeves: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

E. Molded PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe Sleeves: ASTM D 1785, Schedule 40.

G. Molded PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.4 IDENTIFICATION DEVICES

A. Equipment Nameplates: Metal permanently fastened to equipment with data engraved or stamped.

1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and essential data.
2. Location: Accessible and visible.

B. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap-on type. Include color-coding according to ASME A13.1, unless otherwise indicated.

C. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, color-coded, pressure-sensitive-vinyl type with permanent adhesive.

D. Pipes with OD, Including Insulation, Less Than 6 Inches (150 mm): Full-band pipe markers, extending 360 degrees around pipe at each location.

E. Pipes with OD, Including Insulation, 6 Inches (150 mm) and Larger: Either full-band or strip-type pipe markers, at least three times letter height and of length required for label.

F. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.

1. Arrows: Either integrally with piping system service lettering to accommodate both directions of flow, or as separate unit on each pipe marker to indicate direction of flow.

G. Plastic Tape: Manufacturer's standard color-coded, pressure-sensitive, self-adhesive vinyl tape, at least 3 mils (0.08 mm) thick.

1. Width: 1-1/2 inches (40 mm) on pipes with OD, including insulation, less than 6 inches (150 mm); 2-1/2 inches (65 mm) for larger pipes.
2. Color: Comply with ASME A13.1, unless otherwise indicated.

H. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping system abbreviation and 1/2-inch (13-mm) sequenced numbers. Include 5/32-inch (4-mm) hole for fastener.

1. Material: 0.032-inch- (0.8-mm-) thick, polished brass or aluminum.
2. Material: 0.0375-inch- (1-mm-) thick stainless steel.
3. Material: 3/32-inch- (2.4-mm-) thick plastic laminate with 2 black surfaces and a white inner layer.
4. Material: Valve manufacturer's standard solid plastic.
5. Size: 1-1/2 inches (40 mm) in diameter, unless otherwise indicated.
6. Shape: As indicated for each piping system.

I. Valve Tag Fasteners: Brass, wire-link or beaded chain; or brass S-hooks.

J. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.

1. Engraving: Engraver's standard letter style, of sizes and with terms to match equipment identification.
2. Thickness: 1/16 inch (1.6 mm), 1/8 inch (3 mm), unless otherwise indicated.

3. Thickness: 1/16 inch (1.6 mm), for units up to 20 sq. in. (130 sq. cm) or 8 inches (200 mm) in length, and 1/8 inch (3 mm) for larger units.
4. Fasteners: Self-tapping, stainless-steel screws or contact-type permanent adhesive.

K. Plastic Equipment Markers: Manufacturer's standard laminated plastic, in the following color codes:

1. Green: Cooling equipment and components.
2. Yellow: Heating equipment and components.
3. Brown: Energy reclamation equipment and components.
4. Blue: Equipment and components that do not meet criteria above.
5. Hazardous Equipment: Use colors and designs recommended by ASME A13.1.
6. Terminology: Match schedules as closely as possible. Include the following:

   a. Name and plan number.
   b. Equipment service.
   c. Design capacity.
   d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.

7. Size: 2-1/2 by 4 inches (65 by 100 mm) for control devices, dampers, and valves; 4-1/2 by 6 inches (115 by 150 mm) for equipment.

2.5 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 (34.5-MPa), 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 DIELECTRIC FITTING APPLICATIONS

A. Dry Piping Systems: Connect piping of dissimilar metals with the following:

1. NPS 2 (DN 50) and Smaller: Dielectric unions.
2. NPS 2-1/2 (DN 65) and Larger: Dielectric flanges.

B. Wet Piping Systems: Connect piping of dissimilar metals with the following:

1. NPS 2 (DN 50) and Smaller: Dielectric couplings or dielectric nipples.
2. NPS 2-1/2 (DN 65) and Larger: Dielectric nipples.

3.2 PIPING INSTALLATION

A. Install piping according to the following requirements and utilities Sections specifying piping systems.

B. Drawing plans, 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 the Coordination Drawings.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping to permit valve servicing.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Select system components with pressure rating equal to or greater than system operating pressure.

I. Sleeves are not required for core-drilled holes.

J. Permanent sleeves are not required for holes formed by removable PE sleeves.

K. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

    a. Exception: Extend sleeves installed in floors of equipment areas or other wet areas 2 inches (50 mm) above finished floor level.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

    a. PVC or Steel Pipe Sleeves: For pipes smaller than NPS 6 (DN 150).
    b. Steel Sheet Sleeves: For pipes NPS 6 (DN 150) and larger, penetrating gypsum-board partitions.

L. Verify final equipment locations for roughing-in.

M. Refer to equipment specifications in other Sections for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and utilities Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. 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.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

G. Grooved Joints: Assemble joints with grooved-end pipe coupling with coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

H. 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 (0.20 percent maximum lead content) complying with ASTM B 32.

I. 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.

J. Pressure-Sealed Joints: Assemble joints for plain-end copper tube and mechanical pressure seal fitting with proprietary crimping tool to according to fitting manufacturer's written instructions.

K. Plastic Piping Solvent-Cemented 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. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.
3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
4. 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.
5. PVC Nonpressure Piping: Join according to ASTM D 2855.
6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.

L. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

M. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

N. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End PE Pipe and Fittings: Use butt fusion.
2. Plain-End PE Pipe and Socket Fittings: Use socket fusion.

O. Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Install dielectric fittings at connections of dissimilar metal pipes.

3.5 EQUIPMENT INSTALLATION

A. Install equipment level and plumb, unless otherwise indicated.

B. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.

C. Install equipment to allow right of way to piping systems installed at required slope.

3.6 IDENTIFICATION

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.

1. Plastic markers, with application systems. Install on insulation segment if required for hot non-insulated piping.
2. Locate pipe markers on exposed piping according to the following:

a. Near each valve and control device.
b. Near each branch, excluding short takeoffs for equipment and terminal units. Mark each pipe at branch if flow pattern is not obvious.
c. Near locations where pipes pass through walls or floors or enter inaccessible enclosures.
d. At manholes and similar access points that permit view of concealed piping.
e. Near major equipment items and other points of origination and termination.

B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of equipment.

1. Lettering Size: Minimum 1/4 inch (6.4 mm) high for name of unit if viewing distance is less than 24 inches (610 mm), 1/2 inch (13 mm) high for distances up to 72 inches (1800 mm), and

proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.

2. Text of Signs: Provide name of identified unit. Include text to distinguish among multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

C. Adjusting: Relocate identifying devices that become visually blocked by work of this or other Divisions.

3.7 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
2. 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 base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 4000-psi, 28-day compressive-strength concrete and reinforcement as specified in Section 033000 "Cast-in-Place Concrete." Section 033053 "Miscellaneous Cast-in-Place Concrete."

3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor piped utility materials and equipment.

B. Field Welding: Comply with AWS D1.1/D1.1M.

3.9 GROUTING

A. Mix and install grout for 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.

END OF SECTION 330500

SECTION 334100 - STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Channel drainage systems.
3. Encasement for piping.
4. Manholes.
5. Cleanouts.
6. Non-pressure transition couplings.
7. Expansion joints.
8. Catch basins.
9. Stormwater inlets.
10. Pipe outlets.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Manholes: Include plans, elevations, sections, details, frames, and covers.
2. Catch basins and stormwater inlets. Include plans, elevations, sections, details, frames, covers, and grates.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

B. Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 50 feet (1:500) and vertical scale of not less than 1 inch equals 5 feet (1:50). Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.

C. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.

D. Field quality-control reports.

1.4 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify the Architect, Engineer or Construction Manager no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Architect's, Engineer's or Construction Manager's written permission.

PART 2 - PRODUCTS

2.1 PE PIPE AND FITTINGS

A. Corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10 (DN 80 to DN 250): AASHTO M 252M, Type S, with smooth waterway for coupling joints.

1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.
2. Soiltight Couplings: AASHTO M 252M, corrugated, matching tube and fittings.

B. Corrugated PE Pipe and Fittings NPS 12 to NPS 60 (DN 300 to DN 1500): AASHTO M 294M, Type S, with smooth waterway for coupling joints.

1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.
2. Soiltight Couplings: AASHTO M 294M, corrugated, matching pipe and fittings.

2.2 PVC PIPE AND FITTINGS

A. PVC Corrugated Sewer Piping:

1. Pipe: ASTM F 949, PVC, corrugated pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM F 949, PVC molded or fabricated, socket type.
3. Gaskets: ASTM F 477, elastomeric seals.

2.3 CONCRETE PIPE AND FITTINGS

A. Non-reinforced-Concrete Sewer Pipe and Fittings: ASTM C 14 (ASTM C 14M), Class 3, with bell-and-spigot ends and gasketed joints with ASTM C 443 (ASTM C 443M), rubber gaskets, sealant joints with ASTM C 990 (ASTM C 990M), bitumen or butyl-rubber sealant.

B. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76 (ASTM C 76M).

1. Bell-and-spigot ends and gasketed joints with ASTM C 443 (ASTM C 443M), rubber gaskets sealant joints with ASTM C 990 (ASTM C 990M), bitumen or butyl-rubber sealant. Retain one of four subparagraphs below for NPS 12 to NPS 144 (DN 300 to DN 3600).
2. Class III.

2.4 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground non-pressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Concrete Pipes: ASTM C 443 (ASTM C 443M), rubber.
2. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
3. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings:

1. Description: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Shielded, Flexible Couplings:

1. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

E. Ring-Type, Flexible Couplings:

1. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.5 EXPANSION JOINTS

A. Ductile-Iron Flexible Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. EBAA Iron Sales, Inc.
    b. Romac Industries, Inc.
    c. Star Pipe Products.

3. Description: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections, rated for 250-psig (1725-kPa) minimum working pressure and for offset and expansion indicated.

2.6 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
2. Top-Loading Classification(s): Heavy Duty.
3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

B. Plastic Cleanouts:

1. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.7 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105.

B. Material: Linear low-density polyethylene film of 0.008-inch (0.20-mm) or high-density, cross-laminated polyethylene film of 0.004-inch (0.10-mm) minimum thickness.

C. Form: Sheet or tube, as noted in the plans.

D. Color: Black or natural.

2.8 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478 (ASTM C 478M), precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches (1200 mm) minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
4. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 4-inch (102-mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
5. Riser Sections: 4-inch (102-mm) minimum thickness, and lengths to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.

7. Joint Sealant: ASTM C 990 (ASTM C 990M), bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C 923 (ASTM C 923M), cast or fitted into manhole walls, for each pipe connection.
9. Steps: Individual FRP steps or FRP ladder, Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP, ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches (1500 mm).
10. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch- (102-mm-) minimum width flange and 26-inch- (660-mm-) diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
2. Material: ASTM A 536, Grade 60-40-18 ductile, ASTM A 48/A 48M, Class 35 gray iron unless otherwise indicated.

2.9 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350/350R (ACI 350M/350RM), and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

a. Invert Slope: 2 percent through manhole.

2. Benches: Concrete, sloped to drain into channel.

a. Slope: 4 -8 percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

2.10 POLYMER-CONCRETE, CHANNEL DRAINAGE SYSTEMS

A. General Requirements for Polymer-Concrete, Channel Drainage Systems: Modular system of precast, polymer-concrete channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling. Include quantity of units required to form total lengths indicated.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. ABT, Inc.
2. ACO USA.
3. Innovative Plastic, Inc.; a subsidiary of T-H Marine Supplies, Inc.
4. Mea-Josam Div.; Josam Company.
5. Poly-Cast.

D. Sloped-Invert, Polymer-Concrete Systems:

1. Channel Sections:

a. Interlocking-joint, precast, modular units with end caps.
b. 4-inch (102-mm) inside width and deep, rounded bottom, with built-in invert slope of 0.6 percent and with outlets in quantities, sizes, and locations indicated.
c. Extension sections necessary for required depth.
d. Frame: Include gray-iron or steel frame for grate.

2. Grates:

a. Manufacturer's designation "Heavy Duty," with slots or perforations that fit recesses in channels.
b. Material: Gray iron or as otherwise noted in the plans.

3. Covers: Solid gray iron if indicated.
4. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.

E. Narrow-Width, Level-Invert, Polymer-Concrete Systems:

1. Channel Sections:

a. Interlocking-joint, precast, modular units with end caps.
b. 5-inch (127-mm) inside width and 9-3/4-inch- (248-mm-) deep, rounded bottom, with level invert and with NPS 4 (DN 100) outlets in quantities, sizes, and locations indicated.

2. Grates:

a. Slots or perforations that fit recesses in channels.
b. Material: Gray iron or as otherwise noted in the plans.

3. Covers: Solid gray iron if indicated.
4. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.

F. Wide-Width, Level-Invert, Polymer-Concrete Systems:

1. Channel Sections:

a. Interlocking-joint, precast, modular units with end caps.
b. 8-inch (203-mm) inside width and 13-3/4-inch- (350-mm-) deep, rounded bottom, with level invert and with outlets in quantities, sizes, and locations indicated.

2. Grates:

a. Slots or other openings that fit recesses in channels.
b. Material: Gray iron or as otherwise indicated on the plans.

3. Covers: Solid gray iron if indicated.
4. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.

G. Drainage Specialties: Precast, polymer-concrete units.

1. Large Catch Basins:

a. 24-by-12-inch (610-by-305-mm) polymer-concrete body, with outlets in quantities and sizes indicated.
b. Gray-iron slotted grate.
c. Frame: Include gray-iron or steel frame for grate.

2. Small Catch Basins:

a. 19- to 24-inch by approximately 6-inch (483- to 610-mm by approximately 150-mm) polymer-concrete body, with outlets in quantities and sizes indicated.
b. Gray-iron slotted grate.
c. Frame: Include gray-iron or steel frame for grate.

3. Oil Interceptors:

a. Polymer-concrete body with interior baffle and four steel support channels and two 1/4-inch- (6.4-mm-) thick, steel-plate covers.
b. Steel-plate covers.
c. Capacity: as noted in the plans.
d. Inlet and Outlet: NPS 4 (DN 100).

4. Sediment Interceptors:

a. 27-inch- (686-mm-) square, polymer-concrete body, with outlets in quantities and sizes indicated.
b. 24-inch- (610-mm-) square, gray-iron frame and slotted grate.

H. Supports, Anchors, and Setting Devices: Manufacturer's standard unless otherwise indicated.

I. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

2.11 CATCH BASINS

A. Standard Precast Concrete Catch Basins:

1. Description: ASTM C 478 (ASTM C 478M), precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 4-inch (102-mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
3. Riser Sections: 4-inch (102-mm) minimum thickness, 48-inch (1200-mm) diameter, and lengths to provide depth indicated.
4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
5. Joint Sealant: ASTM C 990 (ASTM C 990M), bitumen or butyl rubber.
6. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 225-mm) total thickness, that match 24-inch- (610-mm-) diameter frame and grate.
8. Steps: Individual FRP steps or FRP ladder, Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP, ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60 inches (1500 mm).
9. Pipe Connectors: ASTM C 923 (ASTM C 923M), resilient, of size required, for each pipe connecting to base section.

B. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include flat grate with small square or short-slotted drainage openings.

1. Size: 24 by 24 inches (610 by 610 mm) minimum unless otherwise indicated.

2. Grate Free Area: Approximately 50 percent unless otherwise indicated.

C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch (102-mm) minimum width flange, and 26-inch- (660-mm-) diameter flat grate with small square or short-slotted drainage openings.

1. Grate Free Area: Approximately 50 percent unless otherwise indicated.

2.12 STORMWATER INLETS

A. Curb Inlets: Made with vertical curb opening, of materials and dimensions according to F.D.O.T. standards.

B. Gutter Inlets: Made with horizontal gutter openings, of materials and dimensions according to F.D.O.T. standards. Include heavy-duty frames and grates.

C. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to F.D.O.T. standards. Include heavy-duty frames and grates.

D. Frames and Grates: Heavy duty, according to F.D.O.T. standards.

2.13 PIPE OUTLETS

A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.

B. Riprap Basins: Broken, irregularly sized and shaped, graded stone according to NSSGA's "Quarried Stone for Erosion and Sediment Control."

1. Average Size: NSSGA No. R-3, screen opening 2 inches (51 mm).
2. Average Size: NSSGA No. R-4, screen opening 3 inches (76 mm).
3. Average Size: NSSGA No. R-5, screen opening 5 inches (127 mm).

C. Filter Stone: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. FS-2, No. 4 screen opening, average-size graded stone.

D. Energy Dissipaters: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. A-1, 3-ton (2721-kg) average weight armor stone, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

F. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow.
2. Install piping NPS 6 (DN 150) and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
3. Install piping with 36-inch (915-mm) minimum cover.
4. Install PE corrugated sewer piping according to ASTM D 2321.
5. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
6. Install nonreinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
7. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

G. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:

1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless cast-iron soil pipe and fittings.
3. Ductile-iron pipe and fittings.
4. Expansion joints.

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:
1. Join corrugated PE piping according to ASTM D 3212 for push-on joints.
2. Join PVC corrugated sewer piping according to ASTM D 2321 for elastomeric-seal joints.

3. Join nonreinforced-concrete sewer piping according to ASTM C 14 (ASTM C 14M) and ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
4. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
5. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.4 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
2. Use Medium-Duty (ADA rated), top-loading classification cleanouts in paved foot-traffic areas.
3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.

B. Set cleanout frames and covers in earth in cast-in-place concrete block, 24 by 24 by 18 inches deep. Set with tops 1 inch (25 mm) above surrounding earth grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.5 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches (76 mm) above finished surface elsewhere unless otherwise indicated.

3.6 CATCH BASIN INSTALLATION

A. Set frames and grates to elevations indicated.

3.7 STORMWATER INLET, AND OUTLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

B. Construct riprap of broken stone, as indicated.

C. Install outlets that spill onto grade, anchored with concrete, where indicated.

D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

E. Construct energy dissipaters at outlets, as indicated.

3.8 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.9 CHANNEL DRAINAGE SYSTEM INSTALLATION

A. Install with top surfaces of components, except piping, flush with finished surface.

B. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.

C. Embed channel sections and drainage specialties in 4-inch (102-mm) minimum concrete around bottom and sides.

D. Fasten grates to channel sections if indicated.

E. Assemble channel sections with flanged or interlocking joints.

F. Embed channel sections in 4-inch (102-mm) minimum concrete around bottom and sides.

3.10 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Section 221413 "Facility Storm Drainage Piping."

B. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch (150-mm) overlap, with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
2. Make branch connections from side into existing piping, NPS 4 to NPS 20 (DN 100 to DN 500). Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
3. Make branch connections from side into existing piping, NPS 21 (DN 525) or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches (76 mm) of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches (150 mm) of concrete for minimum length of 12 inches (300 mm) to provide additional support of collar from connection to undisturbed ground.

    a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi (20.7 MPa) unless otherwise indicated.

b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

C. Pipe couplings and expansion joints with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.

a. Unshielded or Shielded flexible couplings for same or minor difference OD pipes.
b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.11 IDENTIFICATION

A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.12 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (610 mm) of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visible between structures.
b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.

2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

    a. Exception: Piping with soil tight joints unless required by authorities having jurisdiction.
    b. Option: Test plastic piping according to ASTM F 1417.
    c. Option: Test concrete piping according to ASTM C 924 (ASTM C 924M).

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION 334100

SECTION 33 71 02.00 10 - UNDERGROUND ELECTRICAL DISTRIBUTION

PART 1 GENERAL

1.1 REFERENCES

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

ASSOCIATION OF EDISON ILLUMINATING COMPANIES (AEIC)

AEIC CS8	(2000) Extruded Dielectric Shielded Power Cables Rated 5 Through 46 kV

ASTM INTERNATIONAL (ASTM)

ASTM B 1	(2001; R 2007) Standard Specification for Hard-Drawn Copper Wire
ASTM B 3	(2001; R 2007) Standard Specification for Soft or Annealed Copper Wire
ASTM B 8	(2004) Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM F 512	(2006) Smooth-Wall Poly (Vinyl Chloride) (PVC) Conduit and Fittings for Underground Installation

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 100	(2000; Archived) The Authoritative Dictionary of IEEE Standards Terms
IEEE 400.2	(2004; R 2005) Guide for Field Testing of Shielded Power Cable Systems Using Very Low Frequency (VLF)
IEEE 81	(1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
IEEE C2	(2007; TIA 2007-1; TIA 2007-2; TIA 2007-3; TIA 2007-4; TIA 2007-5; Errata 2006-1; Errata 2007-2; Errata 2009-3) National Electrical Safety Code

INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)

ICEA S-94-649	(2004) Standard for Concentric Neutral Cables Rated 5 Through 46 KV

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

NETA ATS	(2009) Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI C119.1	(2006) Electric Connectors - Sealed Insulated Underground Connector Systems Rated 600 Volts
ANSI/NEMA WC 71/ICEA S-96-659	(1999) Standard for Nonshielded Cables Rated 2001-5000 Volts for use in the Distribution of Electric Energy
NEMA TC 2	(2003) Standard for Electrical Polyvinyl Chloride (PVC) Conduit
NEMA TC 6 & 8	(2003) Standard for Polyvinyl Chloride (PVC) Plastic Utilities Duct for Underground Installations
NEMA TC 9	(2004) Standard for Fittings for Polyvinyl Chloride (PVC) Plastic Utilities Duct for Underground Installation

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2011) National Electrical Code

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA-758-A	(2004) Customer-Owned Outside Plant Telecommunications Infrastructure Standard

U.S. DEPARTMENT OF AGRICULTURE (USDA)

RUS Bull 1751F-644	(2002) Underground Plant Construction

UNDERWRITERS LABORATORIES (UL)

UL 44	(2005; R 2005) Thermoset-Insulated Wires and Cables
UL 467	(2007) Grounding and Bonding Equipment
UL 486A-486B	(2003; R 2004 - R 2010) Wire Connectors
UL 514B	(2004; R 2006; R 2007; R 2009) Conduit, Tubing and Cable Fittings
UL 6	(2007) Electrical Rigid Metal Conduit-Steel
UL 651	(2005; R thru 2010) Standard for Schedule 40 and 80 Rigid PVC Conduit and Fittings

UL 651A	(2000; R thru 2007) Type EB and A Rigid PVC Conduit and HDPE Conduit
UL 83	(2008) Thermoplastic-Insulated Wires and Cables
UL 854	(2004; R 2007) Standard for Service-Entrance Cables

1.2 DEFINITIONS

a. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE 100.

b. In the text of this section, the words conduit and duct are used interchangeably and have the same meaning.

c. In the text of this section, "medium voltage cable splices," and "medium voltage cable joints" are used interchangeably and have the same meaning.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Medium voltage cable; G

Medium voltage cable joints; G

Medium voltage cable terminations; G

SD-06 Test Reports

Medium voltage cable qualification and production tests; G

Field Acceptance Checks and Tests; G

SD-07 Certificates

Cable splicer/terminator; G

Cable Installer Qualifications; G

1.4 QUALITY ASSURANCE

1.4.1 Certificate of Competency for Cable Splicer/Terminator

Certification of the qualification of the cable splicer/terminator shall be submitted, for approval, 30 days before splices or terminations are to be made in medium voltage (5 kV to 35 kV) cables. The certification shall include the training, and experience of the individual on the specific type and classification of cable to be provided under this contract. The certification shall indicate that the individual has had three or more years recent experience splicing and terminating medium voltage cables. The certification shall also list a minimum of three splices/terminations that have been in operation for more than one year. In addition, the individual may be required to perform a dummy or practice splice/termination in the presence of the Contracting Officer, before being approved as a qualified cable splicer. If that additional requirement is imposed, the Contractor shall provide short sections of the approved types of cables along with the approved type of splice/termination kit, and detailed manufacturer's instructions for the cable to be spliced. The Contracting Officer reserves the right to require additional proof of competency or to reject the individual and call for certification of an alternate cable splicer.

1.4.2 Cable Installer Qualifications

Provide at least one onsite person in a supervisory position with a documentable level of competency and experience to supervise all cable pulling operations. Provide a resume showing the cable installers' experience in the last three years, including a list of references complete with points of contact, addresses and telephone numbers.

1.4.3 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.4.4 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

1.4.4.1 Alternative Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

1.4.4.2 Material and Equipment Manufacturing Date

Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

PART 2 PRODUCTS

2.1 CONDUIT, DUCTS, AND FITTINGS

2.1.1 Rigid Galvanzied Conduit

UL 6.

2.1.2 Plastic Conduit for Direct Burial

UL 651,Schedule 40 of Schedule 80 as indicated. NEMA TC 2.

2.1.3 Plastic Duct for Concrete Encasement

NEMA TC 6 & 8 and ASTM F 512, UL 651A Type EPC-20-PVC.

2.1.4 Conduit Sealing Compound

Compounds for sealing ducts and conduit shall have a putty-like consistency workable with the hands at temperatures as low as 35 degrees F, shall neither slump at a temperature of 300 degrees F, nor harden materially when exposed to the air. Compounds shall adhere to clean surfaces of fiber or plastic ducts; metallic conduits or conduit coatings; concrete, masonry, or lead; any cable sheaths, jackets, covers, or insulation materials; and the common metals. Compounds shall form a seal without dissolving, noticeably changing characteristics, or removing any of the ingredients. Compounds shall have no injurious effect upon the hands of workmen or upon materials. Inflatable bladders may be used as an option.

2.1.5 Fittings

2.1.5.1 PVC Conduit Fittings

UL 514B, UL 651.

2.1.5.2 PVC Duct Fittings

NEMA TC 9.

2.2 LOW VOLTAGE INSULATED CONDUCTORS AND CABLES

Insulated conductors shall be rated 600 volts and conform to the requirements of NFPA 70, including listing requirements. Wires and cables manufactured more than 24 months prior to date of delivery to the site shall not be accepted. Service entrance conductors shall conform to UL 854, type USE.

2.2.1 Conductor Types

Cable and duct sizes indicated are for copper conductors unless otherwise noted. With the exception of conductors connected to the generator, conductors No. 10 AWG and smaller shall be solid copper. Conductors No. 8 AWG and larger and all conductors connected to the generator shall be stranded copper. All conductors shall be copper.

2.2.2 Conductor Material

Unless specified or indicated otherwise or required by NFPA 70, wires in conduit, other than service entrance, shall be 600-volt, Type THWN/THHN conforming to UL 83 or Type XHHW conforming to UL 44. Copper conductors shall be annealed copper complying with ASTM B 3 and ASTM B 8.

2.2.3 Cable Marking

Insulated conductors shall have the date of manufacture and other identification imprinted on the outer surface of each cable at regular intervals throughout the cable length.

Each cable shall be identified by means of a fiber, laminated plastic, or non-ferrous metal tags, or approved equal, in each manhole, handhole, junction box, and each terminal. Each tag shall contain the following information; cable type, conductor size, circuit number, circuit voltage, cable destination and phase identification.

Conductors shall be color coded. Conductor identification shall be provided within each enclosure where a tap, splice, or termination is made. Conductor identification shall be by color-coded insulated conductors, plastic-coated self-sticking printed markers, colored nylon cable ties and plates, heat shrink type sleeves,or colored electrical tape. Control circuit terminations shall be properly identified. Color shall be green for grounding conductors and white for neutrals; except where neutrals of more than one system are installed in same raceway or box, other neutrals shall be white with a different colored (not green) stripe for each. Color of ungrounded conductors in different voltage systems shall be as follows

a. 208/120 volt, three-phase

(1) Phase A - black

(2) Phase B - red

(3) Phase C - blue

b. 480/277 volt, three-phase

(1) Phase A - brown

(2) Phase B - orange

(3) Phase C - yellow

c. 120/240 volt, single phase: Black and red

2.3 LOW VOLTAGE WIRE CONNECTORS AND TERMINALS

Provide a uniform compression over the entire conductor contact surface. Use solderless terminal lugs on stranded conductors.

a. For use with copper conductors: UL 486A-486B.

2.4 LOW VOLTAGE SPLICES

Provide splices in conductors with a compression connector on the conductor and by insulating and waterproofing using one of the following methods which are suitable for continuous submersion in water and comply ANSI C119.1.

2.4.1 Heat Shrinkable Splice

Provide heat shrinkable splice insulation by means of a thermoplastic adhesive sealant material which shall be applied in accordance with the manufacturer's written instructions.

2.4.2 Cold Shrink Rubber Splice

Provide a cold-shrink rubber splice which consists of EPDM rubber tube which has been factory stretched onto a spiraled core which is removed during splice installation. The installation shall not require heat or flame, or any additional materials such as covering or adhesive. It shall be designed for use with inline compression type connectors, or indoor, outdoor, direct-burial or submerged locations.

2.5 MEDIUM VOLTAGE CABLE

Cable (conductor) sizes are designated by American Wire Gauge (AWG) and Thousand Circular Mils (Kcmil). Conductor and conduit sizes indicated are for copper conductors unless otherwise noted. Insulated conductors shall have the date of manufacture and other identification imprinted on the outer surface of each cable at regular intervals throughout cable length. Wires and cables manufactured more than 12 months prior to date of delivery to the site shall not be accepted. Provide single conductor type cables unless otherwise indicated.

2.5.1 Cable Configuration

Provide concentric neutral underground distribution cable conforming to ICEA S-94-649. Cable shall be rated 25 kV with 133 percent insulation level.

2.5.2 Insulation

Provide ethylene-propylene-rubber (EPR) insulation conforming to the requirements of ANSI/NEMA WC 71/ICEA S-96-659.

2.5.3 Shielding

Not Applicable.

2.5.4 Neutrals

Concentric neutrals conductors shall be copper, having a ampacity equal to the phase conductor ampacity rating.

2.5.5 Jackets

Cables shall be provided with a PVC jacket.

2.6 MEDIUM VOLTAGE CABLE JOINTS

Not Applicable.

2.7 PULL ROPE

Shall be plastic or flat pull line (bull line) having a minimum tensile strength of 200 pounds.

2.8 GROUNDING AND BONDING

2.8.1 Driven Ground Rods

Provide copper-clad steel ground rods conforming to UL 467 not less than 3/4 inch in diameter by 10 feet in length. Sectional type rods may be used for rods 20 feet or longer.

2.8.2 Grounding Conductors

Stranded-bare copper conductors shall conform to ASTM B 8, Class B, soft-drawn unless otherwise indicated. Solid-bare copper conductors shall conform to ASTM B 1 for sizes No. 8 and smaller. Insulated conductors shall be of the same material as phase conductors and green color-coded, except that conductors shall be rated no more than 600 volts. Aluminum is not acceptable.

2. 9 PRIMARY JUNCTION BOXES (PJB)

ANSI C57.12.28. The enclosure shall be of a compact, low profile, clamshell design with an easily removable, pad-lockable, flip-top door. All seams shall be continuous welded and shall be ground smooth. Each enclosure shall be furnished with a backplate for mounting and support of the load-break junction(s), parking stand(s) and ground lug(s). All mounting hardware and hinges shall be stainless steel. Enclosure nominal dimensions shall be as indicated. Paint color finish coat shall be Munsell-7GY 3.29/1.5 pad-mount green. The paint thickness shall be a minimum of 2.5 mils. Coordinate final dimensions of the PJB, junctions, and elbows, to insure adequate clearance.

2.9.1 Sleeves for Primary Junction Box

Provide an 18-inch minimum height fiberglass ground sleeve for direct burial below each PJB to facilitate cable training. The ground sleeve shall be a standard offering of the PJB manufacture. The upper flange of the ground sleeve shall mechanically interlock with the lower flange of the PJB for positive bolt hole alignment. The bottom flange of the ground sleeve shall turn outward to provide maximum bearing surface.

2.9.2 Primary Junction Box Labels

Provide florescent self-adhesive labels to identify the Primary Junction Boxes. Each label shall consist of a minimum of (5) 3” high characters to identify PJB-1, PJB-2, and PJB-3. Install labels on left side of cover facing the road.

2.9.3 Load Break Junctions

IEEE 386, 200 AMP, 25 kV class. Maximum voltage rating of 15.2 kV line to ground / 26.3 kV line to line. Provide 4-point junctions. When mated with elbow connector, the installation shall be a fully shielded, submersible, separable, insulated assembly designed for energized operations. All junctions shall include a minimum of (2) stainless steel u-brackets and stainless steel hardware for mounting the junction on the backplate of the Primary Junction Box.

2.9.4 Insulated Parking Bushings

IEEE 386, 200 AMP, 15.2/26.3 voltage rating, 25 kV class. Provide a set of (3) parking bushings and turn over to the base utility group at completion of the project.

2.9.5 Insulated Protective Caps

IEEE 386, 200 AMP, 15.2/26.3 voltage rating, 25 kV class. Provide insulated protective caps for all unused junction points.

2. 10 LOAD BREAK ELBOWS

IEEE 386, 200 AMP, 15.2/26.3 voltage rating, 25 kV class with Test Point.

2,10.1 Elbow Surge Arresters

ANSI C62.11, rated 15.3 kV MCOV, fully shielded, dead-front metal-oxide-varister with separable connections.

2.11 CABLE TAGS

Provide laminated cable tags on each cable at transformers and Primary Junction Boxes. Mount cable tags immediately below separable connectors (elbows). Cable tags shall be 0.125 inch thick melamine plastic with matte finish, black with white core, square corners, and shall be inscribed with normal block style lettering that is a minimum of 3/4 inch high. Length and height of the cable tags shall be as required for the information to be displayed. Cable tags for small cables (4/0 and below) shall be single line with multiple line cable tags acceptable for larger cables. Provide a one piece nylon, self-locking tie with a minimum tensile strength of 50 pounds at each end of the cable tag. Information on the tags shall be; Phase identification (A, B, or C) the Ø symbol, the cable size (1/0 AL) and the cable far end termination point (TO TRAN T-101).

2.12 CAST-IN-PLACE CONCRETE

Provide concrete in accordance with Section 03 30 00 CAST-IN-PLACE CONCRETE. In addition, provide concrete for encasement of underground ducts with 3000 psi minimum 28-day compressive strength. Concrete associated with electrical work for other than encasement of underground ducts shall be 4000 psi minimum 28-day compressive strength unless specified otherwise.

2.13 SOURCE QUALITY CONTROL

2.13.1 Medium Voltage Cable Qualification and Production Tests

Results of AEIC CS8 qualification and production tests as applicable for each type of medium voltage cable.

PART 3 EXECUTION

3.1 INSTALLATION

Install equipment and devices in accordance with the manufacturer's published instructions and with the requirements and recommendations of NFPA 70 and IEEE C2 as applicable. In addition to these requirements, install telecommunications in accordance with TIA-758-A and RUS Bull 1751F-644.

3.2 CABLE INSPECTION

Prior to installation, each cable reel shall be inspected for correct storage positions, signs of physical damage, and broken end seals. If end seal is broken, moisture shall be removed from cable prior to installation in accordance with the cable manufacturer's recommendations.

3.3 CABLE INSTALLATION PLAN AND PROCEDURE

The Contractor shall obtain from the manufacturer an installation manual or set of instructions which addresses such aspects as cable construction, insulation type, cable diameter, bending radius, cable temperature limits for installation, lubricants, coefficient of friction, conduit cleaning, storage procedures, moisture seals, testing for and purging moisture, maximum allowable pulling tension, and maximum allowable sidewall bearing pressure. Cable shall be installed strictly in accordance with the cable manufacturer's recommendations.

3.4 UNDERGROUND CONDUIT AND DUCT SYSTEMS

3.4.1 Requirements

Depths to top of the conduit shall be in accordance with NFPA 70 and design drawings (use the most stringent number). Run conduit in straight lines except where a change of direction is necessary. Numbers and sizes of ducts shall be as indicated. Ducts shall have a continuous slope downward toward underground structures and away from buildings, laid with a minimum slope of 4 inches per 100 feet. Depending on the contour of the finished grade, the high-point may be at a terminal, a manhole, a handhole, or between manholes or handholes. Short-radius manufactured 90-degree duct bends may be used only for pole or equipment risers, unless specifically indicated as acceptable. The minimum manufactured bend radius shall be 18 inches for ducts of less than 3 inch diameter, and 36 inches for ducts 3 inches or greater in diameter. Otherwise, long sweep bends having a minimum radius of 25 feet shall be used for a change of direction of more than 5 degrees, either horizontally or vertically. Both curved and straight sections may be used to form long sweep bends, but the maximum curve used shall be 30 degrees and manufactured bends shall be used. Ducts shall be provided with end bells whenever duct lines terminate in structures.

3.4.2 Treatment

Ducts shall be kept clean of concrete, dirt, or foreign substances during construction. Field cuts requiring tapers shall be made with proper tools and match factory tapers. A coupling recommended by the duct manufacturer shall be used whenever an existing duct is connected to a duct of different material or shape. Ducts shall be stored to avoid warping and deterioration with ends sufficiently plugged to prevent entry of any water or solid substances. Ducts shall be thoroughly cleaned before being laid. Plastic ducts shall be stored on a flat surface and protected from the direct rays of the sun.

3.4.3 Conduit Cleaning

As each conduit run is completed, for conduit sizes 3 inches and larger, draw a flexible testing mandrel approximately 12 inches long with a diameter less than the inside diameter of the conduit through the conduit. After which, draw a stiff bristle brush through until conduit is clear of particles of earth, sand and gravel; then immediately install conduit plugs. For conduit sizes less than 3 inches, draw a stiff bristle brush through until conduit is clear of particles of earth, sand and gravel; then immediately install conduit plugs.

3.4.4 Multiple Conduits

Separate multiple conduits by a minimum distance of 2 1/2 inches, except that light and power conduits shall be separated from control, signal, and telephone conduits by a minimum distance of 12 inches. Stagger the joints of the conduits by rows (horizontally) and layers (vertically) to strengthen the conduit assembly. Provide plastic duct spacers that interlock vertically and horizontally. Spacer assembly shall consist of base spacers, intermediate spacers, ties, and locking device on top to provide a completely enclosed and locked-in conduit assembly. Install spacers per manufacturer's instructions, but provide a minimum of two spacer assemblies per 10 feet of conduit assembly.

3.4.5 Conduit Plugs and Pull Rope

New conduit indicated as being unused or empty shall be provided with plugs on each end. Plugs shall contain a weephole or screen to allow water drainage. Provide a plastic pull rope having 3 feet of slack at each end of unused or empty conduits.

3.4.6 Conduit and Duct Without Concrete Encasement

Provide not less than 3 inches clearance from the conduit to each side of the trench. Grade bottom of trench smooth; where rock, soft spots, or sharp-edged materials are encountered, excavate the bottom for an additional 3 inches, fill and tamp level with original bottom with sand or earth free from particles, that would be retained on a 1/4 inch sieve. The first 6 inch layer of backfill cover shall be sand compacted as previously specified. The rest of the excavation shall be backfilled and compacted in3 to 6 inch layers.

3.4.7 Duct Encased in Concrete

Construct underground duct lines of individual conduits encased in concrete. Do not mix different kinds of conduit in any one duct bank. Concrete encasement surrounding the bank shall be rectangular in cross-section and shall provide at least 3 inches of concrete cover for ducts. Separate conduits by a minimum concrete thickness of 3 inches, except separate light and power conduits from control, signal, and telecommunications conduits by a minimum concrete thickness of 3 inches. Before pouring concrete, anchor duct bank assemblies to prevent the assemblies from floating during concrete pouring. Anchoring shall be done by driving reinforcing rods adjacent to duct spacer assemblies and attaching the rods to the spacer assembly.

3.5 CONDUCTORS INSTALLED IN PARALLEL

Conductors shall be grouped such that each conduit of a parallel run contains 1 Phase A conductor, 1 Phase B conductor, 1 Phase C conductor, and 1 neutral conductor.

3.6 LOW VOLTAGE CABLE SPLICING AND TERMINATING

Make terminations and splices with materials and methods as indicated or specified herein and as designated by the written instructions of the manufacturer. Do not allow the cables to be moved until after the splicing material has completely set. Make splices in underground distribution systems only in accessible locations such as manholes,handholes, or aboveground termination cabinets.

3.7 MEDIUM VOLTAGE CABLE TERMINATIONS

Make terminations in accordance with the written instruction of the termination kit manufacturer.

3.8 MEDIUM VOLTAGE CABLE JOINTS

Not Applicable.

3.9 CABLE END CAPS

Cable ends shall be sealed at all times with coated heat shrinkable end caps. Cables ends shall be sealed when the cable is delivered to the job site, while the cable is stored and during installation of the cable. The caps shall remain in place until the cable is spliced or terminated. Sealing compounds and tape are not acceptable substitutes for heat shrinkable end caps. Cable which is not sealed in the specified manner at all times will be rejected.

3.10 LIVE END CAPS

Provide live end caps for single conductor medium voltage cables where appropriate.

3.11 GROUNDING SYSTEMS

Provide grounding system as indicated, in accordance with NFPA 70 and IEEE C2, and as specified herein.

Noncurrent-carrying metallic parts associated with electrical equipment shall have a maximum resistance to solid earth ground not exceeding the following values:

Pad-mounted transformers without protective fences	5 ohms
Grounding other metal enclosures of primary voltage electrical and electrically-operated equipment	5 ohms

3.11.1 Grounding Electrodes

Provide cone pointed driven ground rods driven full depth plus 6 inches, installed to provide an earth ground of the appropriate value for the particular equipment being grounded. If the specified ground resistance is not met, an additional ground rod shall be provided in accordance with the requirements of NFPA 70 (placed not less than 6

feet from the first rod). Should the resultant (combined) resistance exceed the specified resistance, measured not less than 48 hours after rainfall, the Contracting Officer shall be notified immediately.

3.11.2 Grounding Connections

Make grounding connections which are buried or otherwise normally inaccessible, by exothermic weld or compression connector.

a. Make exothermic welds strictly in accordance with the weld manufacturer's written recommendations. Welds which are "puffed up" or which show convex surfaces indicating improper cleaning are not acceptable. Mechanical connectors are not required at exothermic welds.

b. Make compression connections using a hydraulic compression tool to provide the correct circumferential pressure. Tools and dies shall be as recommended by the manufacturer. An embossing die code or other standard method shall provide visible indication that a connector has been adequately compressed on the ground wire.

3.11.3 Fence Grounding

Any fences shall be grounded with a ground rod at each fixed gate post and at each corner post. Drive ground rods until the top is 12 inches below grade. Attach a No. 4 AWG copper conductor, by exothermic weld to the ground rods and extend underground to the immediate vicinity of fence post. Lace the conductor vertically into 12 inches of fence mesh and fasten by two approved bronze compression fittings, one to bond wire to post and the other to bond wire to fence. Each gate section shall be bonded to its gatepost by a 1/8 by one inch flexible braided copper strap and ground post clamps. Clamps shall be of the anti-electrolysis type.

3.12 EXCAVATING, BACKFILLING, AND COMPACTING

Provide in accordance with NFPA 70 and Section 31 00 00 EARTHWORK.

3.13 FIELD QUALITY CONTROL

3.13.1 Performance of Field Acceptance Checks and Tests

Perform in accordance with the manufacturer's recommendations, and include the following visual and mechanical inspections and electrical tests, performed in accordance with NETA ATS.

3.13.1.1 Medium Voltage Cables

Perform tests after installation of cable, splices, and terminators and before terminating to equipment or splicing to existing circuits.

a. Visual and Mechanical Inspection

(1) Inspect exposed cable sections for physical damage.

(2) Verify that cable is supplied and connected in accordance with contract plans and specifications.

(3) Inspect for proper shield grounding, cable support, and cable termination.

(4) Verify that cable bends are not less than ICEA or manufacturer's minimum allowable bending radius.

(5) Inspect for proper fireproofing.

(6) Visually inspect jacket and insulation condition.

(7) Inspect for proper phase identification and arrangement.

b. Electrical Tests

(1) Perform a shield continuity test on each power cable by ohmmeter method. Record ohmic value, resistance values in excess of 10 ohms per 1000 feet of cable must be investigated and justified.

(2) Perform acceptance test on new cables before the new cables are connected to existing cables and placed into service, including terminations and joints. Perform maintenance test on complete cable system after the new cables are connected to existing cables and placed into service, including existing cable, terminations, and joints. Tests shall be very low frequency (VLF) alternating voltage withstand tests in accordance with IEEE 400.2. VLF test frequency shall be 0.05 Hz minimum for a duration of 60 minutes using a sinusoidal waveform. Test voltages shall be as follows:

CABLE RATING AC TEST VOLTAGE for ACCEPTANCE TESTING
5 kV 10kV rms(peak)
8 kV 13kV rms(peak)
15 kV 20kV rms(peak)
25 kV 31kV rms(peak)
35 kV 44kV rms(peak)

CABLE RATING AC TEST VOLTAGE for MAINTENANCE TESTING
5 kV 7kV rms(peak)
8 kV 10kV rms(peak)
15 kV 16kV rms(peak)
25 kV 23kV rms(peak)
35 kV 33kV rms(peak)

3.13.1.2 Grounding System

a. Visual and mechanical inspection

Inspect ground system for compliance with contract plans and specifications

b. Electrical tests

Perform ground-impedance measurements utilizing the fall-of-potential method in accordance with IEEE 81. On systems consisting of interconnected ground rods, perform tests after interconnections are complete. On systems consisting of a single ground rod perform tests before any wire is connected.

Take measurements in normally dry weather, not less than 48 hours after rainfall. Use a portable megohmmeter tester in accordance with manufacturer's instructions to test each ground or group of grounds. The instrument shall be equipped with a meter reading directly in ohms or fractions thereof to indicate the ground value of the ground rod or grounding systems under test.

3.13.2 Follow-Up Verification

Upon completion of acceptance checks and tests, the Contractor shall show by demonstration in service that circuits and devices are in good operating condition and properly performing the intended function. As an exception to requirements stated elsewhere in the contract, the Contracting Officer shall be given 5 working days advance notice of the dates and times of checking and testing.

-- End of Section --