**PROJECT MANUAL**

**FOR**

**SAU Ozmer House**

**Southern Arkansas University**

100 University Avenue

Magnolia, Arkansas 71753

(870) 235-4065

May 22, 2017

Architect

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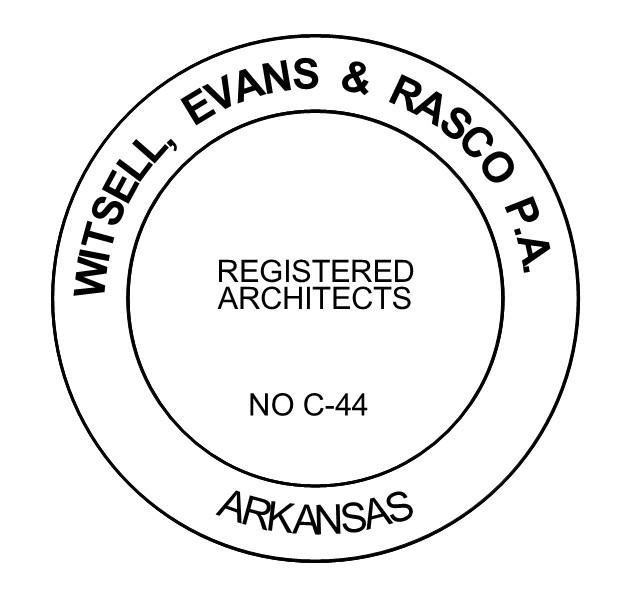
ARCHITECT’S PROJECT NUMBER SAUOES14.05

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# ARCHITECT

**SECTION 00 0105 CERTIFICATIONS PAGE**

**I HEREBY CERTIFY THAT THIS PROJECT MANUAL WAS PREPARED BY ME, OR UNDER MY DIRECT SUPERVISION, AND THAT I AM A DULY LICENSED ARCHITECT UNDER THE LAWS OF THE STATE OF ARKANSAS.**



**NAME:** **DATE** **REG NO: C-44**

**END OF CERTIFICATIONS PAGE**

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# SECTION 00 1130 INVITATION TO BID

**Sealed Bids for the construction and completion of the SAU Ozmer House, SAU Campus, Magnolia, Arkansas will be received in the Physical Plant Conference Room, until 2:00 p.m. local time on Tuesday, March 5, 2019. At that time bids will be publically opened.**

**BIDS WILL BE BASED ON A LUMP SUM CONTRACT.**

Bidding Documents may be examined at SAU physical plant.

Prime Bidders will be furnished 1 set of bidding documents at SAU, by depositing a check in the amount of $100.00 per set, payable to Southern Arkansas University. Deposits will be refunded to all prime bidders who return bidding documents in good condition within 10 days after the opening of bids.

Bid Security in the form of a Bid Bond (AIA document A310), or other acceptable bidder's bond, or a cashier's check, in an amount equal to 5% of the contract sum, and payable to SAU will be required of bidders.

Arkansas Statutory Performance And Payment Bond Form, equal to the amount of the contract, and issued by a surety approved by the Owner and authorized to do business in the State of Arkansas, will be required of the bidder awarded the contract.

Bidder must comply with the regulatory and licensing requirements of the State of Arkansas, and other applicable statutes.

Bidders are hereby notified that state wage rates will **not** apply for work under this contract.

# No bid may be withdrawn for a period of 45 days after the opening of bids.

The Owner reserves the right to reject any or all bids and to waive any informality or irregularity in any bid.

Southern Arkansas University encourages all small, minority, and women business enterprises to submit bids for capital improvements.

The Owner will conduct a Pre-Bid Conference at Physical Plant Conference Room, and then visit the Project Site at 10:00 A.M. on February 19, 2019. Alternate location due to weather will be a meeting only at the Physical Plant Conference Room, SAU, Magnolia, AR.

# END OF SECTION

# SECTION 00 2000 INSTRUCTIONS TO BIDDERS

* 1. **BIDDING DOCUMENTS.**
     1. **Bidders may obtain complete sets of Contract Documents from issuing office designated in the Invitation to Bid. Complete sets of Contract Documents must be used in preparing bids; neither Owner nor Design Professional assume responsibility for errors or misinterpretations resulting from the use of incomplete sets of Contract Documents. Obtaining Contract documents through any source other than the Design Professional or Representative listed in the Invitation to Bid is not advisable due to the risks of receiving incomplete or inaccurate information, and the bidder runs the risk of basing bidder's proposal on such information. The documents obtained through the Design Professional or his representative(s) or SAU are considered the official version and take precedence if any discrepancies occur. The fact that documents used for bidding purposes are named “contract documents" does not diminish in any way the right of the Owner to reject any and all bids and to waive any formality.**
  2. **EXAMINATION OF DRAWINGS, SPECIFICATIONS AND SITE OF WORK.**
     1. **Bidder shall examine the Contract Documents and visit the project site of work. Bidder shall become familiar with all existing conditions and limitations under which the Work is to be performed, and shall base bid on items necessary to perform the Work as set forth in the Contract Documents. No allowance will be made to Bidder because of lack of such examination or knowledge. The submission of a Bid shall be construed as conclusive evidence that the Bidder has made such examination.**
  3. **INTERPRETATION OF CONTRACT DOCUMENTS DURING BIDDING.**
     1. All references to the Owner shall be interpreted to mean Southern Arkansas University at Magnolia under the governance of the Board of Trustees of the Southern Arkansas University.
     2. If any person contemplating submitting a Bid is in doubt as to the true meaning of any part of the Contract Documents or finds discrepancies in or omissions from any part of the Contract Documents, he may submit to the Owner a written request for an interpretation or correction thereof not later than five (5) calendar days before Bid opening.
     3. Address all communications regarding the Contract Documents to the Owner: Southern Arkansas University, 100 East University Magnolia Arkansas, 71753 attn: Office of Purchasing.
     4. Interpretation or correction of the Contract Documents will be made only by Addendum and will be mailed, faxed or delivered to each Bidder of record by the Owner. The Owner will be responsible for oral explanations or interpretation of the Contract Documents.
     5. Addenda issued during the bidding period will be incorporated into the Contract Documents.

# SUBSTITUTIONS.

* + 1. Materials, products, and equipment described in the Contract Documents establish a standard of required function and a minimum desired quality or performance level, or other minimum dimensions and capacities, to be met by any proposed substitution. Acceptability of substitutions will not be considered during bidding period.
    2. In some cases, prior approval of material or equipment, or both shall be obtained from Owner in order to obtain the desired color, size, visual appearance, and other features specified.

# TYPE OF BID.

* + 1. The Work under this Contract will be awarded under a stipulated sum contract to the lowest responsible base bid amount. No segregated bids or assignments will be considered.
    2. The estimate of quantities is approximate only and shall be the basis for receiving unit price bids for each item, but shall not be considered by the Bidder as the actual quantities that may be required for the completion of the proposed work. Bidder shall state a unit price for every item

of work named in the Proposal. Bidder shall include, in the unit prices, furnishing of labor, materials, tools, equipment, and apparatus of every description to construct, erect, and finish the Work. The unit price bid for the items shall be stated in figures and in the appropriate spaces provided on the Bid Form. Such figures shall be clear and distinctly legible so that no question can arise as to their intent or meaning. Unit price bids and totals shown in the Bid Form shall not include costs of engineering, advertising, printing and appraising.

# PREPARATION OF BID.

* + 1. Bid shall be made on an unaltered Bid Form identical to the form included with the Contract Documents. Fill in all blank spaces and submit one original. Bids shall be signed with name typed below the signature. Where Bidder is a corporation, bids shall be signed with the legal name of the corporation followed by the name of the state of incorporation, contractor's license number, and the signature of an authorized officer of the corporation.

# BID GUARANTEE AND BONDS.

* + 1. Each bid proposal shall include a bid security in the amount of five percent of the total bid offered, if the bid is in excess of $20,000.00. The bidder will be required to submit a bidder's deposit, which includes enclosing a cashier’s check payable to the order of the OWNER drawn upon a bank or trust company doing business in Arkansas or by a corporate bid bond in an amount equal to five (5) percent of the bid. The bidder shall include in the bid the bid bond amount so that the bid represents the total cost to the Owner of all work included in the contract.
    2. The bid bond shall indemnify the Owner against failure of the Contractor to execute and deliver the contract and necessary bond (Performance and Payment Bond) for faithful performance of the contract. The bid bond shall provide that the contractor or surety must pay the damage, loss, cost and expense subject to the amount of the bid security directly arising out of the Contractor's default in failing to execute and deliver the contract and bonds.
    3. Owner will have the right to retain the bid security of bidders to whom an award is being considered until the Contract has been executed and bonds if required, have been furnished, or until specified time has elapsed so that bids may be withdrawn, or all bids have been rejected.
    4. Should Bidder fail to enter into a contract and furnish the required bonds and insurance certificates within 10 days after receipt of Intent to Award, the bid guarantee will be forfeited to the Owner as liquidated damages.

# PERFORMANCE AND PAYMENT BOND.

* + 1. Performance and Payment Bonds are not required for bids $20,000.00 or under, except for roofing projects. For work exceeding $20,000.00, the bidder shall furnish a Performance and Payment Bond in the amount equal to 100 percent of contract price, on a form identical to the Arkansas Statutory Performance and Payment Bond Form included with the Contract Documents as security for faithful performance of the Contract and payment of all obligations arising thereunder within ten days after receipt of the Intent to Award. The bond shall be written by a surety company qualified and authorized to do business in the State of Arkansas. The bond shall be executed by a resident local agent licensed by the State Insurance Commissioner to represent the surety company. The bond shall be written in favor of the Owner. Bidder shall file the bond with the Circuit Clerk in the county where the Work is to be performed. Failure to deliver said bonds, as specified, shall be considered as having abandoned the Contract and the bid security will be retained as liquidated damages. The bidder shall include in the bid the Performance and Payment bond amount so that the bid represents the total cost to the Owner of all work included in the contract. Bond must be amended and refiled for every Change Order issued during construction.

# SUBCONTRACTORS.

* + 1. Name of principal subcontractors shall be listed where indicated on the Bid Form in accordance with Ark. Code Ann. § 22-9-204 and the contract documents. All prime contractors, as a condition to perform construction work for and in the State of Arkansas, shall use no other subcontractors when the subcontractor's portion of the project is $20,000.00 or more, except

those qualified and licensed by the Contractors Licensing Board in Mechanical (HVAC), Plumbing, Electrical and Roofing.

* + 1. A bidder should request clarification from the Design Professional, if the bidder determines a type of work (mechanical -indicative of HVAC; electrical - indicative of wiring and illuminating fixtures; plumbing; roofing and sheetmetal work - indicative of roofing application) is a component of the project, but space has not been provided on the bid form for the listing of such or if the bid form lists a type of work that is not a component of the project.
    2. For those bids where the listed subcontract work is $20,000.00 or more, the prime contractor must make a decision as to which subcontractor he intends to use. The prime contractor shall place the names of each subcontractor and indicate whether the amount of the listed work is

$20,000.00 or more in the space provided on the Bid Form. The prime contractor may use his own forces to do the listed work, however, if the listed work is $20,000.00 or more, the prime contractor must be qualified and licensed by the Arkansas Contractors Licensing Board to perform the listed work. Once the prime contractor determines his own forces will be used, he shall place his name, and indicate in the space provided on the Bid Form whether the amount of the listed work is $20,000.00 or more. Failure to complete the form correctly shall cause the bid to be declared non-responsive, and the bid will not receive consideration.

* + 1. In the event the amount of the listed subcontract work is below $20,000.00, the Prime Contractor shall place the names of the person or firm performing the work and indicate in the space provided on the Bid Form whether the listed work is under $20,000.00.
    2. It shall be mandatory that any subcontractors listed in (A) - (D) on the Bid Form by the Prime Contractor is awarded a contract under Ark. Code Ann. § 22-9-204. Prime Contractors who submit a bid listing unlicensed subcontractors or use unlicensed subcontractors on a state project or any subcontractor not licensed by the Contractors Licensing Board who perform work having a value of $20,000.00 or more on a state project are subject to a civil penalty, after notice and hearing, of not less than $250.00 nor more than $500.00 and may be suspended from bidding on state projects. In the event that one (1) or more of the subcontractors named by the prime contractor in his successful bid thereafter refuse to perform his contract or offered contract, the prime contractor may substitute another subcontractor, after having obtained prior approval from the design professional, the owner, and SAU Facilities Office.

# ELECTRICAL LICENSE REQUIREMENT.

* + 1. No person shall perform electrical work on the contract without possessing an Arkansas State Master or Journeyman License from the Arkansas State Electrical Examiners Board. All electrical work and apprentice electricians shall be supervised by a Master or Journeyman Electrician on a one to one ratio.
    2. All electricians shall have a copy of their license with them and shall be required to show it to an appropriate inspector upon request.
    3. Pursuant to Ark. Code Ann. § 22-9- 404, the Bidder may require listed subcontractors (mechanical, plumbing, electrical and roofing/sheet metal) whose bid to the Contractor exceeds

$50,000.00 to provide a Performance and Payment Bond to the Bidder.

# SUBMITTAL.

* + 1. **Submit bid on the Bid Form in an opaque, sealed envelope. Identify the envelope with: project name and number, name of Bidder, and Arkansas Contractors License number; only one bid shall be submitted per State Contractors license number. Submit bids in accordance with the Invitation to Bid. All blanks on the form shall be filled out in ink or be typewritten. Erroneous entries, alterations, and erasures shall be lined out, initialed by the Bidder, and the corrected entry inserted on the Bid Form.**
  1. **MODIFICATION AND WITHDRAWAL.**
     1. **Bidder may withdraw bid at any time before bid opening and may resubmit up to the date and time designated for receipt of bids. No bid may be withdrawn or modified after time has been called for the bid opening. Oral modifications to bids will not be considered. Bidder may submit written modifications to bid in writing, by telegraph, or by facsimile at**

**any time prior to the expiration of the bidding time and date and shall so word the modification(s) as to not reveal the amount of the original bid. Telegraph or facsimile modifications shall require written confirmation over the Bidder's signature within 24 hours after bid opening.**

* 1. **DISQUALIFICATION OF BIDDERS.**
     1. **The Owner shall have the right to disqualify bids (before or after opening), which includes but is not limited to, evidence of collusion with intent to defraud or other illegal practices upon the part of the Bidder, to reject a bid not accompanied by the required bid security or by other data required by the Contract Documents, or to reject a Bid which is in any way incomplete or irregular.**
  2. **APPLICABLE LAWS.**
     1. Labor: Contractors employed upon the work will be required to conform to the labor laws of the State of Arkansas and the various acts amendatory and supplementary thereto, and to all the laws, regulations, and legal requirements applicable thereto.
     2. Discrimination: Bidder shall not discriminate against any employee, applicant for employment, or subcontractor as provided by law. Bidder shall be responsible for ensuring that all subcontractors comply with federal and state laws and regulations related to nondiscrimination. Upon a final determination by a court or administrative body having proper jurisdiction that the Bidder has violated state or federal laws or regulations, the Owner or SAU Systems, or both may impose a range for appropriate remedies up to and including termination of the Contract.
     3. Taxes: Bidder shall include in the bid all state sales tax, social security taxes, state unemployment insurance, and all other items of like nature. It is the intent that the bid shall represent the total cost to the Owner of all work included in the contract. There are no provisions for a contractor to avoid taxes by using the tax exempt number of a state agency, board, commission or institutions. Said taxes shall be included in the bid price.
     4. State Licensing Laws for Contractors:
        1. Disclosure: Potential Bidders are hereby notified that any bidder who desires to enter into a contract not exempted from the disclosure requirements, that disclosure is a condition of the Contract and that the Owner cannot enter into any such contract, nor can UA Systems approve any such contract, for which disclosures are not made and the verbiage of paragraphs a, b, and c below will be included in the body of any contract awarded.
        2. Potential Bidders are hereby notified that:
        3. Disclosure is required to be a condition of any present or future subcontract for which the total consideration is greater than twenty-five thousand dollars ($25,000.00).
           1. The Contractor shall require any present or future subcontractor, for which the subcontract amount is greater than $25,000.00, to complete and sign the Contract and Disclosure and Certification. The contractor shall ensure that any agreement, current or future between the contractor and a subcontractor for which the total consideration is greater than $25,000.00 shall contain the following:
           2. Failure to make any disclosure required by Governor Executive Order 98-04, or any violation of any rule, regulation or adopted pursuant to that Order, shall be material breach of the term of this subcontract. The party who fails to make the required disclosure or who violates the rule, regulation, or policy shall be subject to all legal remedies available to the contractor.
        4. The Contractor shall transmit a copy of the subcontractor's disclosure form to the agency and a statement containing the dollar amount of the subcontract within ten (10) days upon receipt of subcontractor's disclosure.
           1. Note: A copy of the “Contract and Grant Disclosure and Certification Form” is included at the end of this division.
     5. Minority Participation: Pursuant to Ark. Code Ann. § 22-9-203, the State encourages all small, minority, and women business enterprises to submit bids for capital improvements. Encouragement is also made to all general contractors that in the event they subcontract portions of their work, consideration is given to the identified groups.
     6. The bidding, award and administration of the contract shall be made pursuant to Ark. Code Ann.

§14-4-1401 et seq., Ark. Code Ann. § 22-9-101 et seq., Ark. Code Ann. § 22-2-101 et seq. and the Owner's established procedures.

# LIQUIDATED DAMAGES.

* + 1. **The amount of liquidated damages to be assessed shall be in accordance with the amount indicated in the Contract. Bidder understands and agrees that under the terms of the Contract to be awarded, if the Contractor fails to complete the work within the time limit specified in the Contract, the Contractor shall pay the Owner as Liquidated Damages, and not in the nature of a penalty the sum specified in the Bid Form for each day completion is delayed. It is further understood and agreed by bidder that the said sum fixed as Liquidated Damages is a reasonable sum considering the damages that Owner will sustain in the event of any delay in completion of the Work, and said sum is herein agreed upon and fixed as Liquidated Damages because of difficulty in ascertaining the exact amount of damages that may be sustained by such delay.**
  1. **PRE-BID CONFERENCE:**
     1. **There will be a pre-bid conference held on 10:00 A.M. on February 19, 2019 at the Physical Plant Conference Room. All prospective bidders are required to attend. The Owner reserves the right to reschedule pre-bid conference or to schedule additional conferences. Refer to the Invitation to Bid for meeting location.**
  2. **OPENING.**
     1. **Bids will be opened as identified in the Invitation to Bid.**
  3. **EVALUATION AND CONSIDERATION OF BIDS.**

**It is the intent of the Owner to award a Contract to the lowest responsive qualified Bidder provided the bid has been submitted in accordance with the requirements of the Contract Documents and does not exceed the funds appropriated for the project by more than 25%. The Owner shall have the right to waive any formalities in a bid received and to accept the bid which, in the State's judgment, is in its best interests. The Owner shall have the right to accept bids for a period not to exceed 30 days.**

* + 1. Tie Bids. If two or more sealed bids are equal in amount, meet Bidding Document requirements, and are the lowest received by the time of the bid opening, then the apparent low bidder will be determined by lot (placing the name of the tie bidders into a container and drawing one name). The drawing will be conducted by SAU personnel and another person so designated by SAU in the presence of a witness and the tie bidders or representatives. The witness shall be an employee of the Owner. Documentation of the drawing shall be included on the bid tabulation and be signed by those present. Nothing in the above and foregoing will diminish the Owner reserved right to reject any and all bids and to waive any formalities.

# EXECUTION OF CONTRACT.

* + 1. The apparent low Bidder shall be prepared, if so required by the Owner, to present evidence of experience, qualifications, and financial ability to carry out the terms of the Contract.
    2. The successful Bidder will be required to execute an Agreement with the Owner on a form identical to the Agreement Form included with the Contract Documents and the Performance and Payment Bond and Certification of Insurance within ten days after receipt of the Intent to Award. Failure of the Bidder to do so may result in the Bidder being rejected and could result in disqualification and forfeiture of bid bond.
    3. The successful Bidder will be required to furnish Owner with proof of insurance, as prescribed by the General Conditions and Supplementary General Conditions.

# SCOPE OF WORK

* + 1. Provide all labor, methods, materials and equipment necessary to construct and complete the SAU Ozmer House, Southern Arkansas University at Magnolia, Arkansas.

# END OF SECTION

# SECTION 00 2114 SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

**THE MODIFICATIONS (ADDITIONS, DELETIONS AND SUBSTITUTIONS) TO THE AMERICAN INSTITUTE OF ARCHITECTS “INSTRUCTIONS TO BIDDERS” (AIA DOCUMENT A701-97), LISTED BELOW ARE PART OF THE BIDDING DOCUMENTS. WHERE ANY PART OF THIS DOCUMENT IS MODIFIED BY THIS SECTION, THE UNALTERED PROVISIONS SHALL REMAIN IN EFFECT.**

1. **Article 3.3.1 after “SUBSTITUTIONS”, add “And must comply with requirements of Section 01 3000.**
2. **Article 4.2.1, delete last sentence.**
3. **Article 5.3.1:**
   1. In line 3 after “does not exceed” insert “25%”.
   2. Delete 2nd sentence in its entirety and insert “The Owner reserves the right to reject any or all bids and to waive all formalities.

# Article 5.3.2, delete in its entirety.

1. **Article 7.1.2, delete 2nd sentence.**
2. **Article 7.1.3, delete in its entirety.**
3. **Article 7.1.4, add new paragraph as follows:**
   1. 7.1.4 Arkansas Code Annotated § 22-9-404 requires listed subcontractors (mechanical, plumbing, electrical, and roofing/sheet metal) whose bid to prime contractor exceeds

$50,000 to provide a 100% performance and payment bond to prime contractor IF REQUIRED BY THE PRIME CONTRACTOR”.

# Article 7.2.1, delete paragraph in its entirety and insert “The bidder shall deliver required bonds to Owner within 10 days of receipt of Intent to Award notice. Failure to furnish required bonds may cause forfeiture of bid guarantee to Owner as liquidated damages”.

1. **Article 7.2.2, delete 1st sentence and insert “Bond shall be written on enclosed Arkansas Statutory Performance and Payment Bond Form”.**
2. **Article 7.2.3, in line 1, delete “or after the” and insert “same date as”.**
3. **BID OPENING:** The bid opening will be conducted at the time and place as stated in the Advertisement for Bids.
4. **BONDS:** Bonds will be required as stated in the Advertisement for Bids.
5. **LICENSING REQUIREMENTS:** Comply with licensing requirements as stated in the Advertisement for Bids.
6. **TIME:** Time will be of the essence of the Contract; the Contractor must agree to complete the work within the time period as set forth in the Bid Form.
7. **LIQUIDATED DAMAGES:** Liquidated damages will be required as stated in the BID FORM.
8. **RETAINAGE:** In accordance with Arkansas Code Annotated § 22-9-601, retainage will be withheld from progress payments. Refer to General and Supplementary General Conditions for retainage amounts.
9. **SEPARATE PAY ITEM FOR TRENCHING AND EXCAVATION SAFETY SYSTEMS:** Refer to Supplementary General Conditions for Arkansas Code Annotated § 22-9-212 requirements for inclusion of trenching and excavation safety systems inclusion in base bid and requirement for separate pay item listing on bid form.
10. **NAMING OF SUBCONTRACTORS ON BID FORM:** Arkansas Code Annotated § 22-9-204.
    1. Prime contractors, as a condition to perform work for and in the State of Arkansas shall use no other subcontractors, when the subcontractors portion of the project is $20,000 or more, except those licensed by the State Contractor's Licensing Board and qualified in: (a) mechanical (indicative of heating, air conditioning and ventilating), (b) plumbing, (c)

electrical (indicative of wiring and illuminating fixtures), and (d) roofing and sheet metal work (indicative of roofing application). In the event the prime contractor is qualified and licensed by the “Arkansas State Contractor's Licensing Board, he may use (must name) his own forces to perform those tasks listed herein as subcontractors in one or more of the trades listed. (Emphasis added)

* 1. The prime contractor shall make a definite decision regarding the subcontractors he intends to use, and he shall place the names of each subcontractor in a blank space to be provided on the Form of Proposal of his bid. It shall be mandatory that the (a) mechanical,

(b) plumbing, (c) electrical, and (d) roofing and sheet metal subcontractors named on the Form of Proposal by the prime contractor awarded a contract under the provisions of this code be given contracts by the prime contractor in keeping with their proposals to perform the items for which they were named. It shall be a violation of this code for any prime contractor to submit a bid listing unlicensed contractors or to use unlicensed contractors on a public works project. Any subcontractor not licensed by the Contractor's Licensing Board shall also be in violation of this section if they perform work on a public works project.

# WAGE RATES:

* 1. In accordance with Arkansas Code Annotated § 22-9-301 et seq., Arkansas Prevailing Wage Rate, as determined by Department of Labor, WILL NOT be required under this contract.

1. **TIE BIDS:** If two or more sealed bids are equal in amount, meet project manual requirements, and are the lowest received at the bid opening then the apparent low bidder will be determined by lot (placing the name of tie bidders into a container and drawing one name). The drawing will be done by Owner's personnel or another person so designated by the Owner in the presence of a witness and tie bidders. The witness shall be an employee of the Owner. Documentation of the drawing must be included on the bid tabulation and be signed by those present. Nothing in the above and foregoing will diminish the owner's reserved right to reject any and all bids and waive formalities.
2. **SMALL, MINORITY, AND WOMEN BUSINESS ENTERPRISES:** Pursuant to Arkansas Code Annotated § 22-9-203, SAU encourages all small, minority, and women business enterprises to submit bids for capital improvements. Encouragement is also made to all general contractors, that in the event they subcontract portions of their work, consideration is given to the identified groups.
3. **CONDENSATION OF CLAUSES:** The specifications are condensed in the interests of brevity and clarity. Incomplete sentences have been used; words such as “a”, “the”, “all”, and the phrases, “the contractor shall”, “shall be”, “as indicated on the drawings”, have been intentionally omitted. “Provide” means “furnish and install”. “Including” means “including, but not limited to”. Refer any questions of interpretation to the Owner immediately.

# END OF SECTION

# PART 1 GENERAL

* 1. **EXISTING CONDITIONS**

**SECTION 00 3100 AVAILABLE PROJECT INFORMATION**

* + 1. Certain information relating to existing surface and subsurface conditions and structures is available to bidders but will not be part of the Contract Documents, as follows:
    2. Site & Boundary Survey: Entitled Boundry/Topographic Survey , dated 02/20/15: by Global Surveying Consultants, Inc., 6511 Heilman Court, North Little Rock, Arkansas 72118.
       1. Original copy is available for inspection at SAU Offices during normal business hours. Document is also available to download via electronic document.
       2. This survey identifies grade elevations prepared primarily for the use of WER Architects in establishing new grades and identifying natural water shed.

# PART 2 PRODUCTS (NOT USED) PART 3 EXECUTION (NOT USED)

**END OF SECTION**

# BID TIME: 2:00 P.M.

**BID DATE: March 5, 2019**

**SECTION 00 4100 BID FORM**

**LOCATION: PHYSICAL PLANT CONFERENCE ROOM PHYSICAL PLANT OFFICE, 100 MILITARY DRIVE MAGNOLIA, AR**

**BID FROM:**

**BID TO: SAU BOARD OF TRUSTEES PROJECT: SAU OZMER HOUSE**

Historic Ozmer House Magnolia, Arkansas

# GENTLEMEN:

**HAVING CAREFULLY EXAMINED THE CONTRACT DOCUMENTS FOR THIS PROJECT, AS WELL AS THE PREMISES AND ALL CONDITIONS AFFECTING THE PROPOSED CONSTRUCTION, THE UNDERSIGNED PROPOSES TO PROVIDE ALL LABOR, MATERIALS, SERVICES, AND EQUIPMENT NECESSARY FOR, OR INCIDENTAL TO, THE CONSTRUCTION OF THE PROJECT IN ACCORDANCE WITH THE CONTRACT DOCUMENTS WITHIN THE TIME SET FORTH, FOR THE LUMP SUM BASE BID OF:**

**$** **DOLLAR AMOUNT IS TO BE SHOWN NUMERICALLY**

**ALLOWANCES**

1. Allowance #1: $5,000.00 for materials and labor for interior signs as specified in Section 10 1400.
2. Allowance #2: $10,000.00 for materials and labor for exterior signs as specified in Section 10 1400.
3. Allowance #3: $8,000.00 for materials and labor for door and window hardware as specified in Section 08 7100 and required for the complete installation.

# COMPLETION DATE: BIDDER AGREES THAT THE WORK WILL BE SUBSTANTIALLY COMPLETE AND READY FOR FINAL PAYMENT IN ACCORDANCE WITH THE CONTRACT DOCUMENTS BY 120 CALENDAR DAYS FROM NOTICE TO PROCEED.

**THE UNDERSIGNED, IN COMPLIANCE WITH THE CONTRACT DOCUMENTS FOR THE CONSTRUCTION OF THE ABOVE NAMED PROJECT, DOES HEREBY DECLARE:**

That the undersigned understands that the State reserves the right to reject any and all bids and to waive any formality.

That if awarded the Contract, the undersigned will enter into an Agreement, on a form identical to the form included in the Contract Documents and execute required performance and payment bonds and proof of insurance within 14 days after receipt of the Intent to Award, will commence work within 21 days after the date of the Notice to Proceed, and will complete the Contract fully by Completion Date indicated. Should the undersigned fail to fully complete the work within the above stated time, he shall pay the Owner as fixed, agreed completion penalty, the sum of Two Hundred Fifty Dollars ($250.00) for each calendar day of delay until the work is completed or accepted.

The undersigned further agrees that the bid security payable to Owner and accompanying this proposal shall become the property of the Owner if the undersigned fails to execute the Contract or to deliver the required bonds to the Owner within 10 days from receipt of the Intent to Award as these acts constitute a breach of the Contractor's duties.

That this bid may not be withdrawn for a period of 45 days after the bid opening.

The undersigned understands that the Owner's intent is to construct all facilities proposed within the limits established by the funds appropriated for the project.

The names of subcontractors and the nature of the work to be performed by each one have been included on the Bid Form.

Bids submitted by a “Joint Venture” shall be signed by representatives of each component part of the Joint Venture. The licenses of each component part of the Joint Venture shall also be listed in the bid submittal. Therefore, joint venture bidders shall indicate at least two (2) signatures and two (2) licenses numbers on the Bid Form. Exception: Joint Ventures who have been properly licensed with the Arkansas Contractors Licensing Board as a “Joint Venture” need only to indicate the joint venture license number on the Bid Form. Joint Venture Bidders shall indicate at least two (2) signatures on the bid form even if they are licensed as a joint venture.

The following documents are attached to and made a condition of this Bid.

Bid security.

Listing of Mechanical, Plumbing, Electrical and Roofing Subcontractors, if required. The undersigned acknowledges receipt of and inclusion as a part of the Contract Documents the following addenda:

Dated: Dated: Dated: Dated:

# LISTING OF MECHANICAL, PLUMBING, ELECTRICAL AND ROOFING SUBCONTRACTORS

ALL MECHANICAL, PLUMBING, ELECTRICAL AND ROOFING SUBCONTRACTORS SHALL BE LISTED REGARDLESS OF QUALIFICATIONS, LICENSURES OR WORK AMOUNT. BIDDERS SHOULD CONSULT THE PROJECT MANUAL ON HOW TO FILL OUT THIS FORM. FAILURE TO NAME THE SUBCONTRACTOR IN THE SPACE PROVIDED SHALL CAUSE THE BID TO BE DECLARED NON-RESPONSIVE AND THE BID WILL NOT RECEIVE CONSIDERATION.

Indicate the Name(s) of each entity performing the listed work:

MECHANICAL: (Indicative of HVACR)

Is the amount of work $20,000.00 or over: Yes No

Arkansas License Number:

PLUMBING:

Is the amount of work $20,000.00 or over: Yes No

Arkansas License Number:

ELECTRICAL: (Indicative of wiring and illuminating fixtures)

Is the amount of work $20,000.00 or over: Yes No

Arkansas License Number:

ROOFING AND SHEETMETAL: (Indicative of roofing applications) Is the amount of work $20,000.00 or over: Yes No

Arkansas License Number:

Respectfully Submitted:

Name of Bidder (Typed or Printed)

Address

BY:

\_ (Signature and Title)

Contractor's License Number or Contractor's (Joint Venture) Telephone Number Fax Number Federal ID Number or SSN# Date of Bid:

# END OF SECTION

# PART 1 GENERAL

* 1. **FORM OF AGREEMENT**

**SECTION 00 5200 AGREEMENT FORM**

* 1. **THE AIA A101 - 2007 AGREEMENT WILL BE USED WITH THIS PROJECT. COPIES ARE AVAILABLE FROM THE OWNER, IF NECESSARY.**
  2. **RELATED REQUIREMENTS**
     1. Section 00 7200 - General Conditions.
     2. Section 00 7500 - Supplementary Conditions.

# PART 2 PRODUCTS (NOT USED) PART 3 EXECUTION (NOT USED)

**END OF AGREEMENT**

SAUOES14.05 00 5200 - 1 AGREEMENT FORM

# SECTION 00 6000 PERFORMANCE BOND AND PAYMENT BOND

1. We , hereinafter referred to as Principal and , hereinafter referred to as Surety, are held and firmly bound unto Board of Trustees of Southern Arkansas University, as obligee, hereinafter referred to as Owner, in the amount of

$ , said amount to be deemed a performance bond payable to Owner under the terms of this Performance and Payment Bond Agreement. The Principal and Surety state that the Surety is a solvent corporate surety company authorized to do business in the State of Arkansas.

Principal has by written agreement dated entered into a Contract (the Contract) with the Owner for:

. The above referenced Contract is incorporated

herein by reference.

Under this performance and payment bond agreement, the principal and surety shall be responsible for the following:

* 1. The principal shall faithfully perform the above reference contract, which is incorporated herein by reference and shall pay all indebtedness for labor and materials furnished or performed under the contract.
  2. In the event that the principal fails to perform the contract, the principal and the surety, jointly and severally, shall indemnify and save harmless the owner from all cost and damage which the owner may suffer by reason of principal's failure to perform the contract. Said indemnification shall include, but not be limited to, full reimbursement and repayment to the owner for all outlays and expenses which the owner may incur in making good any such default or failure to perform the contract by the principal.
  3. Principal shall pay all persons all indebtedness for labor or material furnished or performed under the contract and in doing so this obligation shall be null and void. In the event that principal fails to pay for such indebtedness, such persons shall have a direct right of action against the principal and surety, jointly and severally, under this obligation, subject to the owner's priority.

This bond given in accordance with Arkansas laws and regulations (including Ark. Code Ann.

§18-44-503, §19-4-1405 and § 22-9-401 et seq.). The surety guarantees that the principal shall comply with Ark. Code Ann. § 22-9-308 (d) by payment and full compliance with all prevailing hourly wage contract provisions where the contract amount exceeds the amount provided in Ark. Code Ann. § 22-9-302(1).

Any alteration which may be made in the terms of the contract, or in the work to be done under it, or the giving by the owner of any extension of time for the performance of the contract, or any other forbearance on the part of either the owner or the principal to the other shall not in any way release the principal and the surety or sureties or either or any of them, their heirs, personal representatives, successors or assigns from their liability hereunder, notice to the surety or sureties of any such alteration, extension or forbearance being hereby waived. In no event shall the aggregate liability of the surety exceed the amount provided in the contract.

This Performance and Payment Bond Agreement is binding upon the above named parties, and their successors, heirs, assigns and personal representatives.

Executed by the parties who individually represent that each has the authority to enter into this agreement.

SAUOES14.05 00 6000 - 1 PERFORMANCE BOND AND PAYMENT BOND

BY: CONTRACTOR DATE

BY: AGENT/ATTORNEY-IN-FACT DATE

(IN ACCORDANCE WITH ARK. CODE ANN. §22-9-402(B))

AGENT DATE

Address

CITY COUNTY STATE ZIP CODE

Business Phone: Fax: Mail:

# THIS FORM IS THE ONLY PERFORMANCE AND PAYMENT BOND ACCEPTABLE TO THE OWNER.

**PERFORMANCE AND PAYMENT BOND AMENDMENT #**

We, hereinafter referred to as principal, and hereinafter referred to as surety, have entered into an agreement entitled "performance and payment bond", with Board of Trustees of Southern Arkansas University as obligee hereinafter after known as owner agency. Furthermore, we agree that said bond agreement, which was filed in the county of

on the day of , 20 and this amendment # is hereby incorporated into said bond agreement and any previous amendments(s) therein.

This amendment shall be upon the same terms and conditions as set forth in the bond agreement, including any amendments, except the agreement shall be amended and modified as follows:

* + 1. The total aggregate amount for the Bond Agreement shall be $ dollars. This amended amount reflects those costs, time for completion and other terms of the Contract associated with said bond agreement and Change Order(s) # for the project contract entered into between Principal and Owner Agency.
    2. This Performance and Payment Bond Agreement Amendment is binding upon the above named parties, and their successors, heirs, assigns and personal representatives. The Bond Agreement as hereby extended, amended and modified is hereby ratified and confirmed by the parties who individually represent that each has the authority to enter into this amended agreement.

BY: CONTRACTOR DATE

BY: ARKANSAS RESIDENT LOCAL AGENT/ATTORNEY-IN-FACT DATE

(IN ACCORDANCE WITH ARKANSAS CODE ANNOTATED §22-9-402(B)(1)(2))

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ADDRESS |  |  | BUSINESS PHONE/FAX # |  |
| CITY | COUNTY | STATE | ZIP CODE |  |

ARKANSAS STATUTORY PERFORMANCE AND PAYMENT BOND AMENDMENT IS THE ONLY BOND AMENDMENT FORM THE OWNER WILL ACCEPT.

# END OF PERFORMANCE AND PAYMENT BOND

# SECTION 00 6110 CONSENT OF SURETY

COMES THE UNDERSIGNED, WHO DOES HEREBY SWEAR AND AFFIRM THAT:

1. My name is and I am an authorized representative of

, a surety company.

1. With regards to the Project: SAU Ozmer House, Southern Arkansas University, Magnolia, AR.;

**Contract date** **:**

# Contractor; and Board of Trustees of Southern Arkansas University, Magnolia, AR. Owner; I hereby approve the final payment to the contractor. I agree that the final payment to the contractor shall not relieve the Surety Company of any of its obligations as set forth in the contract with the State of Arkansas and this contractor.

DATE

AFFIANT VERIFICATION

STATE OF ARKANSAS) COUNTY OF )

SUBSCRIBED AND SWORN TO before me this of , 20 .

NOTARY PUBLIC

MY COMMISSION EXPIRES:

# END OF SECTION

# SECTION 00 6400 RELEASE OF CLAIMS

1. COMES THE UNDERSIGNED, WHO DOES HEREBY SWEAR AND AFFIRM THAT:

# My name is ,

**and my address is ,**

**doing business as .**

* 1. **Pursuant to Contract Number** **,** SAU Ozmer House**, Board of Trustees of Southern Arkansas University, Magnolia, AR., and Contract Date**  **excepted as listed below in Paragraph 4, I have paid or otherwise satisfied all obligations for all materials and equipment furnished, for all work, labor, and services performed, and for all known claims against the Contractor arising in any manner in connection with the performance of the contract referenced above for which the Owner or his property might in any way be held responsible.**
  2. **To the best of my knowledge, information and belief, excepted as listed below in Paragraph 4, the Releases or Waivers of Claim, attached hereto and incorporated herein, include the Contract, all subcontractors, all suppliers of materials and equipment, and all performers of work, labor or services who have or may have claims against any property of the Owner arising in any manner out of the performance of the Contract referenced above.**
  3. **The Exceptions are: (if none, indicate "none." If required by the Owner, the Contractor shall furnish bond satisfactory to the Owner for each exception.)**

AFFIANT DATE

VERIFICATION

STATE OF ARKANSAS)

COUNTY OF)

SUBSCRIBED AND SWORN TO before me this of 2010.

NOTARY PUBLIC MY COMMISSION EXPIRES:

# END OF SECTION

# FORM OF GENERAL CONDITIONS

**SECTION 00 7200 GENERAL CONDITIONS**

**1.01 THE AIA A201-2007 GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION APPLICABLE TO THIS CONTRACT IS ATTACHED FOLLOWING THIS PAGE.**

**END OF DOCUMENT**

# PART 1 GENERAL

* 1. **SUMMARY**

**SECTION 00 7500 SUPPLEMENTARY GENERAL CONDITIONS**

* + 1. The terms used in these Supplementary Conditions that are defined in the General Conditions have the meanings assigned to them in the General Conditions.

# SUPPLEMENTARY GENERAL CONDITIONS: THE FOLLOWIMG SUPPLEMENTS MODIFY THE "GENERAL CONDITION OF THE CONTRACT FOR CONSTRUCTION", AIA DOCUMENT A201. WHERE A PORTION OF THE GENERAL CONDITIONS IS MODIFIED OR DELETED BY THESE SUPPLEMENTARY CONDITIONS, THE UNALTERED PORTIONS OF THE GENERAL CONDITIONS SHALL REMAIN IN EFFECT.

* + 1. 3.8.1 In line 1 after "Documents." add "Refer to Section 01 2100."
    2. 3.8.2.2 Add the following to end of clause, "except when installation is specified as part of the allowance. "Refer to Section 01 2100."
    3. 3.9.3 Add the following sentence at the end of the paragraph, "In event the approved superintendent must be changed for circumstances beyond the G.C.'s control, or at the direction of the Owner, the replacement superintendent must meet with the Owner's approval.
    4. 3.10 Add the following new subparagraph:

3.10.4 Submit construction schedules in accordance with Section 01 3216."

* + 1. 3.11 At end of paragraph, add "Submit in accordance with Section 01 7000."
    2. 3.12.5 At end of subparagraph, add "Submit in accordance with Section 01 3000."
    3. 7.3.7 Lines 4 through 5, delete "reasonable...profit." and insert "an allowance for overhead and profit in accordance with the schedule set forth in subparagraph 7.3.11.
    4. 7.3 Add new subparagraph as follows:

"7.3.11 In subparagraph 7.3.7, the allowance for overhead and profit included in the total cost to the Owner shall be based on the following schedule:

* + - 1. For the contractor, for work performed by the Contractor's own forces, 12 percent of the cost.
      2. For the contractor, for work performed by his subcontractor, 5 percent of the amount due the subcontractor.
      3. For each subcontractor or sub-subcontractor involved, for work performed by that subcontractor's or sub-subcontractor's own forces, 12 percent of the cost.
      4. For each subcontractor, for work performed by the subcontractor's sub-subcontractor, 5% of the amount due the sub-subcontractor.
      5. Cost to which overhead and profit is to be applied shall be determined in accordance with Subparagraph 7.3.7.
      6. In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials and subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major costs items are subcontracts, they shall be itemized also."
    1. 8.3 Add the following subparagraphs:

"8.3.4 The construction completion dates agreed on include an allowance for calendar days per month which may not be available for construction out-of-doors (normal inclement weather).

* + - 1. Contract time will not be extended due to normal inclement weather unless the Contractor can substantiate, to safisfaction of Owner, that greater-than-normal inclement weather occured, considering the full term of contract time, using averaged accumulated record mean values from climatological data compiled by National Weather Service for the

project locale, and that alleged greater-than-normal inclement weather actually delayed Work or portions of Work.

* + - * 1. The measure of extreme weather shall be the number of days in excess of those stated for each month, in which precipitation exceeded 0.10 inch, from area weather station for same period of time, which is same source of data used to determine normal weather losses.
        2. If total accumulated number of calendar days lost to weather exceeds total accumulated number expected for same period from inclement weather table, time for completion will be extended by number of calendar days needed to include excess number of calendar days lost.
      1. Contract time will not be extended due to weather occurring after building is enclosed. "Enclosed" is defined to mean when building is sufficiently sealed, either temporarily or permanently, to permit structure to be heated and roof completed in order to permit drywall trades to work. The Owner shall determine when structure is "enclosed", and shall issue a letter to Owner, with a copy to Contractor, stating date building became "enclosed".
      2. No change in contract sum will be authorized because of contract time due to weather."
    1. 9.2 At end of paragraph, add "Submit in accordance with Section 01 3000." K. 9.3.1:
       1. At end of subparagraph, add "Submit in accordance with Section 01 3000."
       2. Add new clause as follows:

"9.3.1.3 Until Substantial Completion of the Work, 5% of each progress payment will be retained. Refer to Article 9.8.3 for adjustment in retainage upon Substantial Completion of Work.

1. 9.10.2 At end of subparagraph, add "Submit affidavit of payment of debts and claims and affidavit of release of liens on AIA Forms G706 and G706A, respectively."
2. 11.1.1 Add the following new clauses:

"11.1.1.9 Liability Insurance shall include all major divisions of coverage and be on a comprehensive basis including:

* 1. Premises Operations (including X, C and U coverages as applicable).
  2. Independent Contractor's Protective.
  3. Products and Completed Operations.
  4. Personal Injury Liability with Employment Exclusion deleted.
  5. Contractural, including specified provision for Contractor's obligation under Paragraph 3.18.
  6. Owner, non-owned and hired motor vehicles.
  7. Broad Form Property Damage including Completed Operations."

1. 11.1.2 Add new clause as follows:

"11.1.2.1 The insurance required by Subparagraph 11.1.1 shall be written for not less than the following limits, or greater if required by law:

* 1. Worker's CompensationStatutory

Employer's Liability $100,000 per accident,

$500,000 Disease Policy Limit

$100,000 Disease, Each Employee

* 1. Commercial General Liability (including Premises-Operations, Independent Contractors' Protective, Products and Completed

Operations, Broad Form Property Damage)

* + 1. Bodily Injury & $1,000,000 each occurence Property Damage Combined $2,000,000 aggregate
    2. Products and Completed

Operations to be maintained for 2 year after final

Payment. $2,000,000 aggregate

* + 1. Property Damage Liability Insurance will provide X, C, or U Coverage.
    2. Broad Form Property Damage Coverage shall inslude Completed Operations.
  1. Contractual Liability
     1. Bodily Injury & $1,000,000 each occurrence Property Damage Combined $2,000,000 aggregate
  2. Personal Injury, with Employment Exclusion

deleted $2,000,000 aggregate

* 1. Business Auto Liability (including owned, non-owned and hired vehicles)
     1. Bodily Injury & $1,000,000 each occurrence Property Damage Combined $2,000,000 aggregate
  2. If the General Liability coverages are provided by a Commercial Liability policy, the:
     1. General Aggregate shall be not less than $2,000,000 and it shall apply, in total, to this Project only.
     2. Fire Damage Limit shall be not less than $50,000 on any one Fire.
     3. Medical Expense Limit shall be not less than $2,500 on any one person.
  3. Umbrella Excess Liability $1,000,000 over primary insurance

$10,000 retention for self-

insured hazards, each occurrence

1. 11.1.3 Add the following new clause as follows:

"11.1.3.1 The Contractor shall furnish 3 copies of each Certificate of Insurance herein required which shall specifically set forth evidence of all coveraage required. Use ACORD certificate, 25-S, completed and supplemented in accordance with AIA Document A715."

1. 11.2.1 In line 1 change "Owner" to "Contractor" and insert the following:

"The Contractor shall purchase and maintain insurance, in same amounts as specified in

11.1.2.1 above, covering the Owner's contingent liability for claims which may arise from operations under the Contract. The term "Owner", shall be deemed to include the Owner's employees, the Owner, and the Owner's employees and consultants."

1. 11.3.1 ADD the following sentences:

"The form of policy for this coverage shall be Completed Value. If the Owner is damaged by the failure of the Contractor to maintain such insurance, then the Contractor shall bear all reasonable costs properly attributable thereto."

1. 11.3.1.3 Delete in its entirety.
2. 11.3.4 Delete in its entirety.
3. 11.4.1 Delete in its entirety and substitute the following:

"11.4.1 Contractor shall bond covering faithful performance of the Contract and payment of obligations arising thereunder. Bonds must be issued by a Surety licensed to do work in Arkansas. Cost shall be included in the Contract Sum. The amount of bond shall be equal to 100 percent of the Contract Sum.

11.4.1.1 The Contractor shall deliver the required bonds to the Owner not less than three days following the date the Agreement is entered into, or if the work is to be commenced prior thereto in response to a letter of intent, the Contractor shall, prior to the commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished."

* + - 1. The Contractor shall require the attorney-in-fact who executes the required bond on behalf of the surety to affix thereto a certified and current copy of the power of attorney.
      2. File a copy of the bond with Circuit Clerk in the county in which project is located.

1. 12.2.2 Add the following to the subparagraph:

"12.2.2.1 Provide for and arrange a one year inspection of facilities before warranties expire, by Contractor, Owner. Inspection to occur before the end of the eleventh month from the date of substantial completion"

1. 14.2.1.1 After skilled workers, add "supervisors" to the listing in the sub-paragraph.

# PART 2 PRODUCTS - NOT USED PART 3 EXECUTION - NOT USED

**END OF SECTION**

**PART 1 GENERAL**

* 1. **PROJECT**

**SECTION 01 1000 SUMMARY**

* + 1. Project Name: SAU - Ozmer House.
    2. Owner's Name: Southern Arkansas University.
    3. Architect's Name: WER Architects.
    4. The project consists of the exterior restoration of the Ozmer House at SAU Campus, Columbia County, Arkansas. Work includes ~~new wood trusses for roof support, decking, asphalt shingles,~~ repairs to ~~siding~~ and doors / windows.

# CONTRACT DESCRIPTION

* + 1. Contract Type: A single prime contract based on a Stipulated Price as described in 00 5213 Agreement Form (DBA).

# DESCRIPTION OF ALTERATIONS WORK

* + 1. Scope of demolition and removal work is shown on drawings and specified in Section 02 4100.
    2. Scope of alterations work is shown on drawings.
    3. Plumbing: No work.
    4. HVAC: No work.
    5. Electrical Power and Lighting: No work.
    6. Fire Alarm: No work.
    7. Telephone: No work.
    8. Southern Arkansas University will remove the following items before start of work: 1. .
    9. Contractor shall remove and deliver the following to Southern Arkansas University prior to start of work:
       1. As shown on the drawings.
    10. Contractor shall remove and store the following prior to start of work, for later reinstallation by Contractor:
        1. As shown on the drawings.

# WORK BY OWNER

* + 1. Items noted NIC (Not in Contract) will be supplied and installed by Southern Arkansas University before Substantial Completion. Some items include:
       1. Movable cabinets.
       2. Furnishings.
       3. Small equipment.
       4. Rugs.
       5. Artwork.
    2. Southern Arkansas University will supply and install the following:
       1. None.
    3. Southern Arkansas University will supply the following for installation by Contractor:
       1. N/A.

# OWNER OCCUPANCY

* + 1. Southern Arkansas University intends to occupy the Project upon Substantial Completion.
    2. Cooperate with Southern Arkansas University to minimize conflict and to facilitate Southern Arkansas University's operations.
    3. Schedule the Work to accommodate Southern Arkansas University occupancy.

SAUOES14.05 01 1000 - 1 SUMMARY

SAU Ozmer House 11/07//2016

# CONTRACTOR USE OF SITE AND PREMISES

* + 1. Construction Operations: Limited to areas noted on Drawings.
    2. Arrange use of site and premises to allow:
       1. Southern Arkansas University occupancy.
    3. Provide access to and from site as required by law and by Southern Arkansas University:
       1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
       2. Do not obstruct roadways, sidewalks, or other public ways without permit.
    4. Existing building spaces may not be used for storage.
    5. Time Restrictions:
       1. Limit conduct of especially noisy exterior work to the hours of before 7:30 a.m. and after 9:00 p.m..
    6. Utility Outages and Shutdown:
       1. Limit disruption of utility services to hours the building is unoccupied.
       2. Prevent accidental disruption of utility services to other facilities.

# WORK SEQUENCE

* + 1. Coordinate construction schedule and operations with Southern Arkansas University.

# PART 2 PRODUCTS - NOT USED PART 3 EXECUTION - NOT USED

**END OF SECTION**

SAUOES14.05 01 1000 - 2 SUMMARY

SAU Ozmer House 11/07/2016

# PART 1: GENERAL

**SECTION 01 1210**

**ASBESTOS PRECAUTIONS AND PROCEDURES**

* 1. **SECTION INCLUDES:**
     1. Contractor's responsibilities concerning asbestos containing materials (ACM) in the existing building or system where work is to occur.
     2. Contractor's responsibilities concerning asbestos in materials, products, and equipment used in the construction project.

# DISCOVERY OF ASBESTOS CONTAINING MATERIALS (ACM):

* + 1. Unless indicated otherwise within the construction documents. There are no known ACM's present within the construction limits.
    2. During the construction project, the Contractor shall notify the Owner of any portion of the work which the Contractor knows or has reason to believe contains asbestos. The Contractor shall take necessary precautions to prevent damage and release of asbestos fibers to the air.
    3. Any asbestos abatement procedures shall be performed by the Owner under a separate contract.

# ASBESTOS CONTAINING MATERIALS AND PRODUCTS:

* + 1. All building construction materials, products, and equipment used in the project shall be asbestos free.
    2. The Contractor shall be responsible for verifying with suppliers and manufacturers that construction materials, products, and equipment used in completion of the project are asbestos free.
    3. The Contractor shall provide certification (typewritten, signed and dated) to the Owner indicating that asbestos free materials, products and equipment was used in completion of the work.

# PART 2: PRODUCTS NOT APPLICABLE. PART 3: EXECUTION NOT APPLICABLE.

**END OF SECTION**

SAUOES14.05 01 1210 - 1 ASBESTOS PRECAUTIONS AND PROCEDURES

# PART 1 GENERAL

* 1. **SECTION INCLUDES**

**SECTION 01 2000**

**PRICE AND PAYMENT PROCEDURES**

* + 1. Procedures for preparation and submittal of applications for progress payments.
    2. Change procedures.
    3. Procedures for preparation and submittal of application for final payment.

# RELATED REQUIREMENTS

* + 1. Document 00 5213 - Agreement Form: Contract Price, retainages, payment period, monetary values of unit prices.
    2. Document 00 7213 - General Conditions : Additional requirements for progress payments, final payment, changes in the Work.
    3. Section 01 2100 - Allowances: Payment procedures relating to allowances.

# SCHEDULE OF VALUES

* + 1. Schedule of Values Form to be provided by owner.
    2. Forms filled out by hand will not be accepted.
    3. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
    4. Include in each line item, the amount of Allowances specified in this section.
    5. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.
    6. Revise schedule to list approved Change Orders, with each Application For Payment.

# APPLICATIONS FOR PROGRESS PAYMENTS

* + 1. Payment Period: Submit at intervals stipulated in the Agreement.
    2. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Owner for approval.
    3. Forms filled out by hand will not be accepted.
    4. Execute certification by signature of authorized officer.
    5. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
    6. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of Work.
    7. Submit three copies of each Application for Payment.
    8. When Owner requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

# MODIFICATION PROCEDURES

* + 1. For minor changes not involving an adjustment to the Contract Price or Contract Time, the Owner will issue instructions directly to Contractor.
    2. For other required changes, the Owner will issue a signed document instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
       1. The document will describe the required changes and will designate method of determining any change in Contract Price or Contract Time.
       2. Promptly execute the change.

SAUOES14.05 01 2000 - 1 PRICE AND PAYMENT PROCEDURES

* + 1. For changes for which advance pricing is desired, SAU will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 10 days.
    2. Contractor may propose a change by submitting a request for change to the Owner, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Price and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors. Document any requested substitutions in accordance with Section 01 6000.
    3. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
       1. For change requested by the Owner for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
       2. For pre-determined unit prices and quantities, the amount will based on the fixed unit prices.
    4. Substantiation of Costs: Provide full information required for evaluation.
       1. Provide following data:
          1. Quantities of products, labor, and equipment.
          2. Taxes, insurance, and bonds.
          3. Overhead and profit.
          4. Justification for any change in Contract Time.
          5. Credit for deletions from Contract, similarly documented.
    5. Execution of Change Orders: The Owner will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
    6. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Price.

# APPLICATION FOR FINAL PAYMENT

* + 1. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Price, previous payments, and sum remaining due.
    2. Application for Final Payment will not be considered until the following have been accomplished:
       1. All closeout procedures specified in Section 01 7000.

# PART 2 PRODUCTS - NOT USED PART 3 EXECUTION - NOT USED

**END OF SECTION**

# PART 1 GENERAL

* 1. **SECTION INCLUDES**
     1. Cash allowances.

# RELATED REQUIREMENTS

**SECTION 01 2100 ALLOWANCES**

* + 1. Section 01 2000 - Price and Payment Procedures: Additional payment and modification procedures.

# CASH ALLOWANCES

* + 1. Costs Included in Cash Allowances: Cost of product to Contractor or subcontractor, less applicable trade discounts .
    2. Southern Arkansas University Responsibilities:
       1. Consult with Contractor for consideration and selection of products, suppliers, and installers.
       2. Select products and transmit decision to Contractor.
       3. Prepare Change Order.
    3. Contractor Responsibilities:
       1. Assist SAU in selection of products, suppliers, and installers.
       2. Obtain proposals from suppliers and installers and offer recommendations.
       3. On notification of which products have been selected, execute purchase agreement with designated supplier and installer.
       4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
       5. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.
    4. Differences in costs will be adjusted by Change Order.

# ALLOWANCES SCHEDULE

* + 1. Section 08 7100 - Door Hardware: Include the stipulated sum of $8,000.00 for misc refurbishment and repairs / replacement of door and window hardware.
    2. Section 10 1400 - Signage: Include the stipulated sum of $5,000.00 for purchase, delivery, and installation of interior signage for the project. Signage type and locations to be determined by Arkansas State Parks.
    3. Section 10 1400 - Signage: Include the stipulated sum of $10,000.00 for purchase, delivery, and installation of exterior signage for the project. Signage type and locations to be determined by Arkansas State Parks.

# PART 2 PRODUCTS - NOT USED PART 3 EXECUTION - NOT USED

**END OF SECTION**

# PART 1 GENERAL

* 1. **SECTION INCLUDES**

**SECTION 01 3000 ADMINISTRATIVE REQUIREMENTS**

* + 1. Electronic document submittals.
    2. Preconstruction meeting.
    3. Site mobilization meeting.
    4. Progress meetings.
    5. Construction progress schedule.
    6. Coordination drawings.
    7. Requests for Substitution
    8. Submittals for review, information, and project closeout.
    9. Progress Schedule
    10. Number of copies of submittals.
    11. Submittal procedures.

# RELATED REQUIREMENTS

* + 1. Document 00 7213 - General Conditions: Dates for applications for payment.
    2. Document 00 7213 - General Conditions: Duties of the Construction Manager.
    3. Section 01 1000 - Summary: Stages of the Work, Work covered by each contract, occupancy, .
    4. Section 01 3216 - Construction Progress Schedule: Form, content, and administration of schedules.
    5. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.
    6. Section 01 7800 - Closeout Submittals: Project record documents.

# PROJECT COORDINATION

* + 1. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for construction access, traffic, and parking facilities.
    2. During construction, coordinate use of site and facilities through the Project Coordinator.
    3. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
    4. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities.
    5. Coordinate field engineering and layout work under instructions of the Project Coordinator.
    6. Make the following types of submittals to Owner through the Project Coordinator:
       1. Requests for interpretation.
       2. Requests for substitution.
       3. Shop drawings, product data, and samples.
       4. Test and inspection reports.
       5. Manufacturer's instructions and field reports.
       6. Applications for payment and change order requests.
       7. Progress schedules.
       8. Coordination drawings.
       9. Closeout submittals.

# PART 2 PRODUCTS - NOT USED PART 3 EXECUTION

* 1. **ELECTRONIC DOCUMENT SUBMITTALS**
     1. Any documents transmitted for purposes of administration of the contract can be in electronic (PDF) file format and transmitted via an Internet-based e-mail service.
        1. In addition to submittals for review, information, and closeout, this procedure may apply to requests for information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, and any other document the Contractor & Owner wish to make part of the project electronic record.
        2. Contractor and Owner may use conventional e-mail for this service.
        3. It is Contractor's responsibility to submit documents in PDF format via file attachment to e-mail directed to SAU. Addressee will be determined at the pre-construction conference. Documents shall be reviewed and stamped by the contractor prior to submission. PDF documents without contractors stamp, signature and/or initials, & date will not be reviewed.
        4. Subcontractors, suppliers, and SAU's consultants may use the e-mail transmission of review documents, provided copies are directed to the Owner and Contractor.
        5. Users of the electronic document submission shall provide an email address and Internet access. PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, [www.adobe.com,](http://www.adobe.com/) or Bluebeam PDF Revu, www.bluebeam.com), is encouraged, unless scan to PDF file capability is provided by the document generator / provider.
        6. Paper documents & transmittals of electronic submissions will not be reviewed; emailed PDF documents without transmittal letters / forms from the contractor will not be reviewed.
        7. All other specified submittal and document transmission procedures apply, except that electronic document requirements to not apply to samples or color selection charts.
     2. Cost: Any cost of the electronic document submittal(s) is to be paid by Contractor; include the cost of the submittals in the contract sum.
     3. Project Closeout: Owner will determine which project electronic document files shall be archived. The contractor shall provide these documents on CD as part of the close out document submission.

# PRECONSTRUCTION MEETING

* + 1. Within ten (10) days after execution of agreement, the Owner will prepare an agenda and schedule a pre-construction meeting. Written notice of meeting date, time and place, and agenda items will be sent to the Owner and Contractor. The Contractor shall be responsible for notifying major subcontractors of meeting.
    2. SAU will schedule a meeting after Notice of Award.
    3. Attendance Required:
       1. Southern Arkansas University.
       2. Contractor.
       3. Major Sub contractors.
    4. Agenda:
       1. Issuance of Notice To Proceed.
       2. Distribution of Contract Documents.
       3. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
       4. Designation of personnel representing the parties to Contract, Arkansas State Parks.
       5. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
       6. Scheduling.

# SITE MOBILIZATION MEETING (MAY BE COMBINED WITH PRE-CONSTRUCTION)

* + 1. SAU will schedule a meeting at the Project site prior to Contractor occupancy.
    2. Attendance Required:
       1. Contractor.
       2. Southern Arkansas University.
       3. Contractor's Superintendent.
       4. Major Subcontractors.
    3. Agenda:
       1. Use of premises by Southern Arkansas University and Contractor.
       2. Southern Arkansas University's requirements and occupancy prior to completion.
       3. Construction facilities and controls provided by Southern Arkansas University.
       4. Temporary utilities provided by Southern Arkansas University.
       5. Survey and building layout.
       6. Security and housekeeping procedures.
       7. Schedules.
       8. Application for payment procedures.
       9. Procedures for testing.
       10. Procedures for maintaining record documents.
       11. Requirements for start-up of equipment.
       12. Inspection and acceptance of equipment put into service during construction period.

# PROGRESS MEETINGS

* + 1. The Contractor shall schedule and hold regular progress meetings to coordinate, expedite and schedule work of contract. Hold additional meetings as progress of work dictates or when requested by the Owner. Send written notice of meeting date, time and place, and agenda of meeting to the Owner, subcontractors and others as pertinent to agenda.
    2. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.
    3. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
    4. Attendance Required: Job superintendent, major Subcontractors and suppliers, Southern Arkansas University, as appropriate to agenda topics for each meeting.
    5. Agenda:
       1. Review minutes of previous meetings.
       2. Review of Work progress.
       3. Field observations, problems, and decisions.
       4. Identification of problems that impede, or will impede, planned progress.
       5. Review of submittals schedule and status of submittals.
       6. Maintenance of progress schedule.
       7. Corrective measures to regain projected schedules.
       8. Planned progress during succeeding work period.
       9. Maintenance of quality and work standards.
       10. Effect of proposed changes on progress schedule and coordination.
       11. Other business relating to Work.

# SCHEDULE OF VALUES

* + 1. Submit schedule of values on Owner provided form. Itemize separate line cost for each major item of work and each subcontracted item of work (use Sections under Division 2 through 28 in Table of Contents as a basis for listing).

# REQUESTS FOR SUBSTITUTION

* + 1. The naming of specified items on drawings or in specifications means that such named items are specifically desired by Owner. Substitution requests may be submitted.
    2. Complete data must be submitted on proposed substitutions. Include product and technical information with specific items and components identified, indicate differences between proposed item and specified item (materials, installation/erection/application, warranties, etc.), and samples for comparison and tests. Note: Incomplete data will not be reviewed.
    3. The Owner is the sole judge as to equality and acceptability of proposed substitutions. ONLY WRITTEN ACCEPTANCES WILL BE HELD VALID BY THE OWNER.
    4. Unless otherwise specified in individual sections, submit proposals for substitution within 7 days after award of contract. If required to submit prior to bid, submission must be received in SAU's office 10 days prior to date established for receipt of bids. Approved substitutions will be listed in Addenda. Submit substitution proposals on substitution form following this section.
    5. If substitution will affect a correlated function, adjacent construction, or work of other trades or contractors, necessary changes and modifications to affected work will be considered as part of the substitution, to be accomplished without additional cost to Owner, if and when accepted.
    6. Under no circumstances shall Owner acceptance of such substitution relieve Contractor from timely, full and proper performance of work.

# CONSTRUCTION PROGRESS SCHEDULE - SEE SECTION 01 3216

* + 1. Submit progress schedule on reproducible stock.
    2. Distribute progress schedule including all updates to Owner, subcontractors, suppliers, fabricators, and others with a need-to-know schedule compliance requirement. Post copy in field office.

# APPLICATION AND CERTIFICATE FOR PAYMENT

* + 1. Submit Application and Certificate for Payment on Owner provided form.

# PROGRESS PHOTOGRAPHS

* + 1. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
    2. Photography Type: Digital; electronic files.
    3. Provide photographs of site and construction throughout progress of Work produced by an experienced photographer, acceptable to the Owner.
    4. In addition to periodic, recurring views, take photographs of each of the following events:
    5. Views:
       1. Provide non-aerial photographs from four cardinal views at each specified time, until Date of Substantial Completion.
       2. Consult with Owner for instructions on views required.
       3. Provide factual presentation.
       4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
    6. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
       1. Delivery Medium: Via email.
       2. File Naming: Include project identification, date and time of view, and view identification.
       3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
       4. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

# COORDINATION DRAWINGS

* + 1. Provide information required by Project Coordinator for preparation of coordination drawings.

# SUBMITTALS FOR REVIEW

* + 1. When the following are specified in individual sections, submit them for review:
       1. Product data.
          1. Make all submissions affecting color selection within 30 days after signing contract.
          2. Submit 1 electronic copy of product data for Owner's review for items specified in the various specification sections (copies for mechanical and electrical data is specified in Divisions 23 and 26). Submit samples, where specified, along with product data.
          3. Mark data clearly to indicate exact items submitted, and note deviations from Contract Documents (if any). After reviewing the submittals, indicate approval by signing and dating on Contractor's stamp, and submit to Owner for review.
       2. Shop drawings.
          1. Submit required shop drawings drawn to a scale sufficiently large to show pertinent features of item and its method of connection to work. Submit related shop drawings together; partial submittals will not be accepted. Reproduction of contract documents in any form for use as shop drawings will not be permitted.
          2. Provide manufacturer's name and model number of prefabricated items and indicate methods of attachment and clearances required relative to other trades affecting all elements of work.
          3. Identify deviations from Contract Documents (if any), check dimensions, check that trades have been coordinated and that no conflict will develop in installation.
          4. After reviewing shop drawings, indicate Contractor's approval by signing and dating on Contractor's stamp. Failure to follow these procedures will result in rejection of submission and no additional contract time will be allowed for delay from this cause.
          5. Submit one electronic copy of Contractor's stamped and approved shop drawings for Owner's review. The Owner will review the copy and stamp it with indication of action as appropriate. The Owner will retain an electronic copy for his record, and will return an electronic copy to the Contractor. For electronic copies returned "Not Approved", "Not Accepted" or "Revise And Resubmit", correct the original drawings, make a new electronic file / copy, and resubmit. For reproducibles returned

"Approved", "Accepted", or "Accepted As Corrected", correct original drawings, make a new electronic file and provide such number of prints of the electronic file(s) as may be needed for field distribution.

* + - 1. Samples for selection.
      2. Samples for verification.
    1. Submit to Owner for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
    2. Samples will be reviewed only for aesthetic, color, or finish selection.
    3. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below .

# SUBMITTALS FOR INFORMATION

* + 1. When the following are specified in individual sections, submit them for information:
       1. Design data.
       2. Certificates.
       3. Test reports.
       4. Inspection reports.
    2. Submit for Owner knowledge as contract administrator or for Southern Arkansas University. No action will be taken.

# SUBMITTALS FOR PROJECT CLOSEOUT

* + 1. Upon completion of the work and prior to final payment, submit to the Owner a loose-leaf hard cover binder with the project name printed on it, containing indexed sections as follows:
       1. A listing of all subcontractors for the project, including portions of work done, address and telephone number of the firm, and contact at the firm familiar with the project.
       2. One fully executed copy of each guarantee and warranty specified.
       3. One fully executed copy of each certificate specified.
       4. One operating, service, and maintenance manual or instruction sheet for each item specified.
       5. List of As-Built Drawings, Record Drawings, Shop Drawings, Product Data, and Samples.
       6. List of spare parts, extra and overrun stock, maintenance tools and devices, keys and similar physical units submitted as specified.
       7. Project record documents.
       8. Operation and maintenance data.
       9. Warranties.
    2. Submit for Southern Arkansas University's benefit during and after project completion.

# NUMBER OF COPIES OF SUBMITTALS

* + 1. Documents for Review:
       1. Small Size Sheets, Not Larger Than 8-1/2 x 11 inches: Submit one electronic copy / file that will be retained by SAU. A copy of all comments will be returned for the Contractor to make all required prints for field distribution.
       2. Larger Sheets, Not Larger Than 36 x 48 inches: Submit one electronic copy / file that will be retained by Owners. All copies / prints of corrected / approved shop drawings for field use will be the responsibility of the contractor.
    2. Documents for Information: Submit one electronic copy / file.
    3. Documents for Project Closeout: Make one reproduction of submittal originally reviewed. Submit one extra of submittals for information.
    4. Samples: Submit the number specified in individual specification sections; one of which will be retained by SAU.
       1. After review, produce duplicates.
       2. Retained samples will not be returned to Contractor unless specifically so stated.

# SUBMITTAL PROCEDURES

* + 1. Transmit each submittal with approved form.
    2. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
    3. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
    4. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
    5. Deliver submittals to SAU at business address via e-mail or Information Exchange.
    6. Schedule submittals to expedite the Project, and coordinate submission of related items.
    7. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
    8. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.
    9. When revised for resubmission, identify all changes made since previous submission.
    10. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
    11. Submittals not requested will not be recognized or processed.

# SUBSTITUTION REQUEST FORM

MAIL TO:

SAU

100 East University

Magnolia, AR 71753

ATTN:

Telephone: (870) 235-4064 Fax: (870)235-4189

# SECTION PARAGRAPH SPECIFIED ITEM:

**PROPOSED SUBSTITUTE:**

**ATTACH COMPLETE DESCRIPTION, DESIGNATION, CATALOG OR MODEL NUMBER, SPEC DATA SHEET, AND OTHER TECHNICAL DATA, INCLUDING LABORATORY TESTS IF APPLICABLE.**

**FILL IN BLANKS BELOW:**

1. Will substitution affect dimensions indicated on drawings?
2. Will substitution affect wiring, piping, ductwork, etc., indicated on drawings?
3. What affect will substitution have on other trades?
4. Differences between proposed substitution and specified item?
5. If necessary, will the undersigned pay for Owner's cost, required to revise working drawings, caused by substitution?
6. Manufacturer’s warranties of specified items and proposed items are:

[ ] Same [ ] Different (explain)

# REVIEW COMMENTS [ ] APPROVED

**[ ] APPROVED AS NOTED (SEE ATTACHED COPY) [ ] NOT APPROVED**

**[ ] RECEIVED TOO LATE**

**REMARKS:**

Submitted By:

Firm:

Address:

Signature: Date: By: Date: Telephone: Fax:

# END OF SECTION

# PART 1 GENERAL

* 1. **SECTION INCLUDES**

**SECTION 01 3216 CONSTRUCTION PROGRESS SCHEDULE**

* + 1. Preliminary schedule.
    2. Construction progress schedule.

# RELATED SECTIONS

* + 1. Section 01 1000 - Summary: Work sequence.

# REFERENCES

* + 1. AGC (CPSM) - Construction Planning and Scheduling Manual; 2004.

# SUBMITTALS

* + 1. Within 10 days after date of Agreement, submit preliminary schedule defining planned operations for the first 30 days of Work, with a general outline for remainder of Work.
    2. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
    3. Within 10 days after joint review, submit complete schedule.
    4. Submit updated schedule with each Application for Payment.
    5. Submit one electronic reproduction / file.

# QUALITY ASSURANCE

* + 1. Contractor's Administrative Personnel: 3 years minimum experience in using and monitoring CPM schedules on comparable projects.

# SCHEDULE FORMAT

* + 1. Listings: In chronological order according to the start date for each activity.
    2. Sheet Size: Multiples of 8-1/2 x 11 inches.
    3. Scale and Spacing: To allow for notations and revisions.

# PART 2 PRODUCTS - NOT USED PART 3 EXECUTION

* 1. **PRELIMINARY SCHEDULE**
     1. Prepare preliminary schedule.

# CONTENT

1. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
2. Identify work of separate stages and other logically grouped activities.
3. Include conferences and meetings in schedule.
4. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
5. Indicate delivery dates for owner-furnished products.
6. Provide legend for symbols and abbreviations used.

# Bar Chart

* + 1. N/A

# REVIEW AND EVALUATION OF SCHEDULE

* + 1. ~~Participate in joint review and evaluation of schedule with WER Architects at each submittal.~~
    2. Evaluate project status to determine work behind schedule and work ahead of schedule.
    3. After review, revise as necessary as result of review, and resubmit within 10 days.

# UPDATING SCHEDULE

* + 1. Maintain schedules to record actual start and finish dates of completed activities.
    2. Indicate progress of each activity to date of revision, with projected completion date of each activity.
    3. Annotate diagrams to graphically depict current status of Work.
    4. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
    5. Indicate changes required to maintain Date of Substantial Completion.
    6. Submit reports required to support recommended changes.

# DISTRIBUTION OF SCHEDULE

* + 1. Distribute electronic copies of updated schedules to Contractor's project site file, to Subcontractors, suppliers, Southern Arkansas University, and other concerned parties.
    2. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

# END OF SECTION

**PART 1 GENERAL**

* 1. **SECTION INCLUDES**
     1. References and standards.
     2. Submittals.
     3. Mock-ups.
     4. Control of installation.

# SECTION 01 4000 QUALITY REQUIREMENTS

* + 1. Testing and inspection services.
    2. Mock-ups.

# RELATED REQUIREMENTS

* + 1. Document 00 3100 - Available Project Information: Soil investigation data.
    2. Section 01 3000 - Administrative Requirements: Submittal procedures.

# REFERENCE STANDARDS

* + 1. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2014.
    2. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.
    3. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing; 2014a.
    4. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2013.

# SUBMITTALS

* + 1. See Section 01 3000 - Administrative Requirements, for submittal procedures.
    2. ~~Testing Agency Qualifications:~~
       1. ~~Prior to start of Work, submit agency name, address, and telephone number, and names of full time specialist and responsible officer.~~
    3. ~~Test Reports: After each test/inspection, promptly submit two copies of report to WER Architects and to Contractor.~~
       1. ~~Include:~~
          1. ~~Date issued.~~
          2. ~~Project title and number.~~
          3. ~~Name of inspector.~~
          4. ~~Date and time of sampling or inspection.~~
          5. ~~Identification of product and specifications section.~~
          6. ~~Location in the Project.~~
          7. ~~Type of test/inspection.~~
          8. ~~Date of test/inspection.~~
          9. ~~Results of test/inspection.~~
          10. ~~Conformance with Contract Documents.~~
          11. ~~When requested by WER Architects, provide interpretation of results.~~
       2. Test report submittals are for SAU knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Southern Arkansas University's information.

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SAU Ozmer House 11/07//2016

# REFERENCES AND STANDARDS

* + 1. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
    2. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
    3. Obtain copies of standards where required by product specification sections.
    4. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
    5. Should specified reference standards conflict with Contract Documents, request clarification from SAU before proceeding.
    6. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of WER Architects shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

# TESTING AND INSPECTION AGENCIES

* + 1. N/A

# PART 2 PRODUCTS - NOT USED PART 3 EXECUTION

* 1. **CONTROL OF INSTALLATION**
     1. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
     2. Comply with manufacturers' instructions, including each step in sequence.
     3. Should manufacturers' instructions conflict with Contract Documents, request clarification from

Owners before proceeding.

* + 1. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
    2. Have Work performed by persons qualified to produce required and specified quality.
    3. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
    4. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

# MOCK-UPS

* + 1. Tests will be performed under provisions identified in this section and identified in the respective product specification sections.
    2. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
    3. Accepted mock-ups shall be a comparison standard for the remaining Work.
    4. Where mock-up has been accepted by Owners and is specified in product specification sections to be removed, remove mock-up and clear area when directed to do so.

# TESTING AND INSPECTION

* + 1. Testing Agency Duties:
       1. Provide qualified personnel at site. Cooperate with Owners and Contractor in performance of services.
       2. Perform specified sampling and testing of products in accordance with specified standards.
       3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
       4. Promptly notify Owners and Contractor of observed irregularities or non-conformance of Work or products.
       5. Perform additional tests and inspections required by Owners.
       6. Submit reports of all tests/inspections specified.
    2. Limits on Testing/Inspection Agency Authority:
       1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
       2. Agency may not approve or accept any portion of the Work.
       3. Agency may not assume any duties of Contractor.
       4. Agency has no authority to stop the Work.
    3. Contractor Responsibilities:
       1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
       2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
       3. Provide incidental labor and facilities:
          1. To provide access to Work to be tested/inspected.
          2. To obtain and handle samples at the site or at source of Products to be tested/inspected.
          3. To facilitate tests/inspections.
          4. To provide storage and curing of test samples.
       4. Notify Owners and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
       5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
       6. Arrange with Southern Arkansas University's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
    4. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Owners.
    5. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

# DEFECT ASSESSMENT

* + 1. Replace Work or portions of the Work not conforming to specified requirements.
    2. If, in the opinion of SAU, it is not practical to remove and replace the Work, SAU will direct an appropriate remedy or adjust payment.

# END OF SECTION

**PART 1 GENERAL**

* 1. **SECTION INCLUDES**
     1. Temporary utilities.

# SECTION 01 5000 TEMPORARY FACILITIES AND CONTROLS

* + 1. Temporary telecommunications services.
    2. Temporary sanitary facilities.
    3. Temporary Controls: Barriers, enclosures, and fencing.
    4. Security requirements.
    5. Vehicular access and parking.
    6. Waste removal facilities and services.
    7. Project identification sign.

# TEMPORARY UTILITIES

* + 1. General Contractor shall provide the following:
       1. Electrical power , consisting of connection to existing facilities. Provide for seperate metering as required.
       2. Water supply, consisting of connection to existing facilities. Provide for seperate metering as required.
    2. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.
    3. Existing facilities may be used.
    4. Use trigger-operated nozzles for water hoses, to avoid waste of water.

# TELECOMMUNICATIONS SERVICES

* + 1. Provide, maintain, and pay for telecommunications services to project site at time of project mobilization. Cell phone with designated contact number to project site superintendent will satisify this requirement.
    2. Telecommunications services shall include:(Home office for General Contractor)
       1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
       2. Telephone Land Lines: One line, minimum; one handset per line.
       3. Internet Connections: Minimum of one; DSL modem or faster.
       4. Email: Account/address reserved for project use.
       5. Facsimile Service: Minimum of one dedicated fax machine/printer, with dedicated phone line.

# TEMPORARY SANITARY FACILITIES

* + 1. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
    2. Maintain daily in clean and sanitary condition.

# BARRIERS

* + 1. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
    2. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
    3. Provide protection for plants designated to remain. Replace damaged plants.
    4. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

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# FENCING

* + 1. Construction: Minimum 4 foot high plastic fence to limit / restrict access to various designated areas.

# EXTERIOR ENCLOSURES

* + 1. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.
    2. Provide temporary plastic sheeting / tarps as required to facilitate work and protect any existing surfaces / vegitation repair / replacement operations.

# SECURITY

* + 1. Provide security and facilities to protect Work, existing facilities, and Southern Arkansas University's operations from unauthorized entry, vandalism, or theft.
    2. Coordinate with Southern Arkansas University's security program.

# VEHICULAR ACCESS AND PARKING

* + 1. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
    2. Coordinate access and haul routes with governing authorities and Southern Arkansas University.
    3. Provide and maintain access to fire hydrants, free of obstructions.
    4. Provide means of removing mud from vehicle wheels before entering streets.
    5. Designated existing on-site roads may be used for construction traffic.
    6. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

# WASTE REMOVAL

* + 1. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
    2. Provide containers with lids. Remove trash from site periodically.
    3. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

# PROJECT IDENTIFICATION

* + 1. ~~Provide project identification sign of design and construction as detailed by Architect.~~
    2. ~~Erect on site at location established by Architect.~~
    3. ~~Project Identification Signs:~~
       1. ~~One painted sign, 64 square feet area, bottom 3 feet above ground.~~
       2. ~~Content:~~
          1. ~~Project title, logo and name of Owner as indicated on Contract Documents.~~
          2. ~~Names and titles of authorities.~~
          3. ~~Names and titles of Architect/Engineer.~~
          4. ~~Name of Prime Contractor.~~
       3. ~~Graphic Design, Colors, Style of Lettering: Designated by Architect/Engineer.~~
    4. ~~Sign Materials:~~
       1. ~~Structure and Framing: New wood, structurally adequate.~~
       2. ~~Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4-inch thick, standard large sizes to minimize joints.~~
       3. ~~Paint and Primers: Exterior quality, two coats; sign background of color as selected.~~
       4. ~~Lettering: Exterior quality paint, contrasting colors as selected.~~
    5. ~~Installation:~~
       1. ~~Install project identification signs within 15 days after date fixed by Notice to Proceed.~~
       2. ~~Erect at location directed by the Architect.~~
       3. ~~Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.~~
       4. ~~Install signs surface plumb and level, with butt joints. Anchor securely.~~
       5. ~~Paint exposed surfaces of signs, supports, and framing.~~
    6. ~~Maintenance: Maintain signs and supports clean, repair deterioration and damage.~~
    7. ~~Removal: Remove signs, framing, supports, and foundations at completion of Project and restore the area.~~
    8. ~~No other signs are allowed without Southern Arkansas University permission except those required by law.~~

# FIELD OFFICES

* + 1. ~~Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rackand drawing display table.~~
    2. ~~Provide space for Project meetings, with table and chairs to accommodate 6 persons.~~
    3. ~~Locate offices a minimum distance of 30 feet from existing structures.~~

# REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

* + 1. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.
    2. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
    3. Clean and repair damage caused by installation or use of temporary work.
    4. Restore existing facilities used during construction to original condition.

# PART 2 PRODUCTS - NOT USED PART 3 EXECUTION - NOT USED

**END OF SECTION**

**PART 1 GENERAL**

* 1. **SECTION INCLUDES**

**SECTION 01 6000 PRODUCT REQUIREMENTS**

* + 1. Re-use of existing products.
    2. Transportation, handling, storage and protection.
    3. Product option requirements.
    4. Substitution limitations and procedures.

# RELATED REQUIREMENTS

* + 1. Section 01 1000 - Summary: Lists of products to be removed from existing building.
    2. Section 01 4000 - Quality Requirements: Product quality monitoring.

# SUBMITTALS

* + 1. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
    2. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
    3. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
       1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

# PART 2 PRODUCTS

* 1. **EXISTING PRODUCTS**
     1. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.
     2. Unforeseen historic items encountered remain the property of the Southern Arkansas University; notify Southern Arkansas University promptly upon discovery; protect, remove, handle, and store as directed by Southern Arkansas University.
     3. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Southern Arkansas University, or otherwise indicated as to remain the property of the Southern Arkansas University, become the property of the Contractor; remove from site.
     4. Reused Products: Reused products include materials and equipment previously used in this or other construction, salvaged and refurbished as specified.

# NEW PRODUCTS

* + 1. Provide new products unless specifically required or permitted by the Contract Documents.
    2. Where all other criteria are met, Contractor shall give preference to products that:
       1. Have a published GreenScreen Chemical Hazard Analysis.

# PRODUCT OPTIONS

* + 1. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
    2. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
    3. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

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# PART 3 EXECUTION

* 1. **SUBSTITUTION PROCEDURES**
     1. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
     2. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
     3. A request for substitution constitutes a representation that the submitter:
        1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
        2. Will provide the same warranty for the substitution as for the specified product.
        3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Southern Arkansas University.
        4. Waives claims for additional costs or time extension that may subsequently become apparent.
     4. Substitution Submittal Procedure:
        1. Submit one electronic copy of request for substitution for consideration. Limit each request to one proposed substitution.
        2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
        3. The Owner will notify Contractor in writing of decision to accept or reject request.

# TRANSPORTATION AND HANDLING

* + 1. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
    2. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
    3. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
    4. Transport and handle products in accordance with manufacturer's instructions.
    5. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
    6. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
    7. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.
    8. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

# STORAGE AND PROTECTION

* + 1. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
    2. Store and protect products in accordance with manufacturers' instructions.
    3. Store with seals and labels intact and legible.
    4. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
    5. For exterior storage of fabricated products, place on sloped supports above ground.
    6. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
    7. Comply with manufacturer's warranty conditions, if any.
    8. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
    9. Prevent contact with material that may cause corrosion, discoloration, or staining.
    10. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
    11. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

# SUBSTITUTION REQUEST FORM

**MAIL TO: Southern Arkansas University ATTN: Kyle Newton**

100 East University

Magnolia, Ar, 71753

Telephone: (870) 235-4064 Fax: (870) 235-4189

# 

**SECTION PARAGRAPH SPECIFIED ITEM:**

**PROPOSED SUBSTITUTE:**

**ATTACH COMPLETE DESCRIPTION, DESIGNATION, CATALOG OR MODEL NUMBER, SPEC DATA SHEET, AND OTHER TECHNICAL DATA, INCLUDING LABORATORY TESTS IF APPLICABLE.**

**FILL IN BLANKS BELOW:**

**WILL SUBSTITUTION AFFECT DIMENSIONS INDICATED ON DRAWINGS?**

**WILL SUBSTITUTION AFFECT WIRING, PIPING, DUCTWORK, ETC., INDICATED ON DRAWINGS?**

**WHAT AFFECT WILL SUBSTITUTION HAVE ON OTHER TRADES?**

**DIFFERENCES BETWEEN PROPOSED SUBSTITUTION AND SPECIFIED ITEM?**

**IF NECESSARY, WILL THE UNDERSIGNED PAY FOR OWNER’S COST, REQUIRED TO REVISE WORKING DRAWINGS, CAUSED BY SUBSTITUTION?**

**MANUFACTURER’S WARRANTIES OF SPECIFIED ITEMS AND PROPOSED ITEMS ARE:**

[ ] Same [ ] Different (explain)

# REVIEW COMMENTS [ ] APPROVED

**[ ] APPROVED AS NOTED (SEE ATTACHED COPY) [ ] NOT APPROVED**

**[ ] RECEIVED TOO LATE**

**REMARKS:**

.

Submitted By:

Firm:

Address:

Signature: Date: By: Date: Telephone: Fax:

# END OF SECTION

# PART 1 GENERAL

**SECTION 01 7000**

**EXECUTION AND CLOSEOUT REQUIREMENTS**

* 1. **SECTION INCLUDES**
     1. Examination, preparation, and general installation procedures.
     2. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.
     3. Cutting and patching.
     4. Surveying for laying out the work.
     5. Cleaning and protection.
     6. Closeout procedures, except payment procedures.
     7. General requirements for maintenance service.

# RELATED REQUIREMENTS

* + 1. Section 01 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
    2. Section 01 3000 - Administrative Requirements: Submittals procedures.

# SUBMITTALS

* + 1. See Section 01 3000 - Administrative Requirements, for submittal procedures.
    2. ~~Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.~~
       1. ~~On request, submit documentation verifying accuracy of survey work.~~
       2. ~~Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.~~
       3. ~~Submit surveys and survey logs for the project record.~~
    3. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
       1. Structural integrity of any element of Project.
       2. Integrity of weather exposed or moisture resistant element.
       3. Efficiency, maintenance, or safety of any operational element.
       4. Visual qualities of sight exposed elements.

# QUALIFICATIONS

* + 1. ~~For survey work, employ a land surveyor registered in State of Arkansas and acceptable to WER Architects. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.~~

# PROJECT CONDITIONS

* + 1. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
    2. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
       1. At All Times: Excessively noisy tools and operations will not be tolerated inside the building at any time of day; excessively noisy includes diesel engines on lifts and skytracks.
       2. Outdoors: Limit conduct of especially noisy exterior work to the hours of 6 pm to 7 am weekdays and weekends as scheduled by the Owner.
    3. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

# COORDINATION

* + 1. See Section 01 1000 for occupancy-related requirements.
    2. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
    3. Coordinate completion and clean-up of work of separate sections.
    4. After Southern Arkansas University occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Southern Arkansas University's activities.

# PART 2 PRODUCTS

* 1. **PATCHING MATERIALS**
     1. New Materials: As specified in product sections; match existing products and work for patching and extending work.
     2. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
     3. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000.

# PART 3 EXECUTION

* 1. **EXAMINATION**
     1. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
     2. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
     3. Examine and verify specific conditions described in individual specification sections.
     4. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
     5. Verify that utility services are available, of the correct characteristics, and in the correct locations.
     6. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

# PREPARATION

* + 1. Clean substrate surfaces prior to applying next material or substance.
    2. Seal cracks or openings of substrate prior to applying next material or substance.
    3. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

# LAYING OUT THE WORK

* + 1. ~~Verify locations of survey control points prior to starting work.~~
    2. ~~Promptly notify SAU of any discrepancies discovered.~~
    3. ~~Protect survey control points prior to starting site work; preserve permanent reference points during construction.~~
    4. ~~Promptly report to WER Architects the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.~~
    5. ~~Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to WER Architects.~~
    6. ~~Utilize recognized engineering survey practices.~~
    7. ~~Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:~~
       1. ~~Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations; and .~~
       2. ~~Grid or axis for structures.~~
       3. Building foundation, column locations, ground floor elevations, and .
    8. ~~Periodically verify layouts by same means.~~
    9. ~~Maintain a complete and accurate log of control and survey work as it progresses.~~

# GENERAL INSTALLATION REQUIREMENTS

* + 1. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
    2. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
    3. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
    4. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
    5. Make neat transitions between different surfaces, maintaining texture and appearance.

# ALTERATIONS

* + 1. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
       1. Report discrepancies to Owner before disturbing existing installation.
       2. Beginning of alterations work constitutes acceptance of existing conditions.
    2. Remove existing work as indicated and as required to accomplish new work.
       1. Remove items indicated on drawings.
       2. Relocate items indicated on drawings.
       3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
       4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
    3. Protect existing work to remain.
       1. Prevent movement of structure; provide shoring and bracing if necessary.
       2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
       3. Repair adjacent construction and finishes damaged during removal work.
    4. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
    5. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
    6. Refinish existing surfaces as indicated:
       1. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
    7. Clean existing systems and equipment.
    8. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
    9. Comply with all other applicable requirements of this section.

# CUTTING AND PATCHING

* + 1. Whenever possible, execute the work by methods that avoid cutting or patching.
    2. See Alterations article above for additional requirements.
    3. Perform whatever cutting and patching is necessary to:
       1. Complete the work.
       2. Fit products together to integrate with other work.
       3. Provide openings for penetration of mechanical, electrical, and other services.
       4. Match work that has been cut to adjacent work.
       5. Repair areas adjacent to cuts to required condition.
       6. Repair new work damaged by subsequent work.
       7. Remove samples of installed work for testing when requested.
       8. Remove and replace defective and non-conforming work.
    4. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
    5. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
    6. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
    7. Restore work with new products in accordance with requirements of Contract Documents.
    8. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
    9. Patching:
       1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
       2. Match color, texture, and appearance.
       3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

# PROGRESS CLEANING

* + 1. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
    2. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
    3. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
    4. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

# PROTECTION OF INSTALLED WORK

* + 1. Protect installed work from damage by construction operations.
    2. Provide special protection where specified in individual specification sections.
    3. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
    4. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
    5. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
    6. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
    7. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

# ADJUSTING

* + 1. Adjust operating products and equipment to ensure smooth and unhindered operation.

# FINAL CLEANING

* + 1. Use cleaning materials that are nonhazardous.
    2. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
    3. Clean debris from roofs, gutters, downspouts, and drainage systems.
    4. Clean site; sweep paved areas, rake clean landscaped surfaces.
    5. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

# CLOSEOUT PROCEDURES

* + 1. Make submittals that are required by governing or other authorities.
    2. Notify SAU when work is considered ready for Substantial Completion.
    3. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Owner's review.
    4. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Southern Arkansas University-occupied areas.
    5. Notify Owner's when work is considered finally complete.
    6. Complete items of work determined by Owner's final inspection.

# MAINTENANCE

* + 1. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
    2. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Southern Arkansas University.

# END OF SECTION

# PART 1 GENERAL

* 1. **SECTION INCLUDES**
     1. Project Record Documents.

# SECTION 01 7800 CLOSEOUT SUBMITTALS

* + 1. Operation and Maintenance Data.
    2. Warranties and bonds.

# RELATED REQUIREMENTS

* + 1. Section 00 7200 - General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.
    2. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
    3. Individual Product Sections: Specific requirements for operation and maintenance data.
    4. Individual Product Sections: Warranties required for specific products or Work.

# SUBMITTALS

* + 1. Project Record Documents: Submit documents to SAU with claim for final Application for Payment. Comply with ABA requirements for close out documents.
    2. Operation and Maintenance Data:
       1. For equipment, or component parts of equipment put into service during construction and operated by Southern Arkansas University, submit completed documents within ten days after acceptance.
       2. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Owner's comments. Revise content of all document sets as required prior to final submission.
       3. Submit two sets of revised final documents in final form within 10 days after final inspection.
    3. Warranties and Bonds:
       1. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
       2. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

# PART 2 PRODUCTS - NOT USED PART 3 EXECUTION

* 1. **PROJECT RECORD DOCUMENTS**
     1. Maintain on site one set of the following record documents; record actual revisions to the Work:
        1. Drawings.
        2. Addenda.
        3. Change Orders and other modifications to the Contract.
     2. Ensure entries are complete and accurate, enabling future reference by Southern Arkansas University.
     3. Store record documents separate from documents used for construction.
     4. Record information concurrent with construction progress.
     5. Record Drawings : Legibly mark each item to record actual construction including:
        1. Field changes of dimension and detail.
        2. Details not on original Contract drawings.

# MAINTENANCE DATA

* + 1. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
    2. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

# MAINTENANCE DATA FOR MATERIALS

* + 1. For Each Product, Applied Material, and Finish:
       1. Product data, with catalog number, size, composition, and color and texture designations.
       2. Information for re-ordering manufactured products.
    2. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

# WARRANTIES AND BONDS

* + 1. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Southern Arkansas University's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.
    2. Verify that documents are in proper form, contain full information, and are notarized.
    3. Co-execute submittals when required.
    4. Retain warranties and bonds until time specified for submittal.
    5. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.
    6. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
    7. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
    8. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

# END OF SECTION

**PART 1 GENERAL**

* 1. **SECTION INCLUDES**

**SECTION 02 4100 DEMOLITION**

* + 1. Selective demolition of building elements for alteration purposes.

# RELATED REQUIREMENTS

* + 1. Section 00 3100 - Available Project Information: Existing building survey conducted by Southern Arkansas University; information about known hazardous materials.
    2. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.
    3. Section 01 1000 - Summary: Sequencing and staging requirements.
    4. Section 01 1000 - Summary: Description of items to be salvaged or removed for re-use by Contractor.
    5. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
    6. Section 01 6000 - Product Requirements: Handling and storage of items removed for salvage and relocation.
    7. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.
    8. Section 07 0150.19 - Preparation for Re-Roofing: Removal of existing roofing, roof insulation, flashing, trim, and accessories.

# REFERENCE STANDARDS

* + 1. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.
    2. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

# SUBMITTALS

* + 1. See Section 01 3000 - Administrative Requirements, for submittal procedures.
    2. Site Plan: Showing:
       1. Areas for temporary construction and field offices.
    3. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
       1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
       2. Identify demolition firm and submit qualifications.
       3. Include a summary of safety procedures.
    4. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

# QUALITY ASSURANCE

* + 1. Demolition Firm Qualifications: Company specializing in the type of work required.

# PART 2 PRODUCTS -- NOT USED PART 3 EXECUTION

* 1. **SCOPE**
     1. Remove portions of existing building as noted on the demolition drawings.
        1. Salvage existing materials for reuse as noted.
     2. Remove other items indicated, for relocation, recycling, and disposal.

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# GENERAL PROCEDURES AND PROJECT CONDITIONS

* + 1. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
       1. Obtain required permits.
       2. Comply with applicable requirements of NFPA 241.
       3. Use of explosives is not permitted.
       4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
       5. Provide, erect, and maintain temporary barriers and security devices.
       6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
       7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
       8. Do not close or obstruct roadways or sidewalks without permit.
       9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
       10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
    2. Do not begin removal until receipt of notification to proceed from Southern Arkansas University.
    3. Do not begin removal until built elements to be salvaged or relocated have been removed.
    4. Do not begin removal until vegetation to be relocated has been removed and specified measures have been taken to protect vegetation to remain.
    5. Protect existing structures and other elements that are not to be removed.
       1. Provide bracing and shoring.
       2. Prevent movement or settlement of adjacent structures.
       3. Stop work immediately if adjacent structures appear to be in danger.
    6. If hazardous materials are discovered during removal operations, stop work and notify Southern Arkansas University; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.
    7. Perform demolition in a manner that maximizes salvage and recycling of materials.
       1. Dismantle existing construction and separate materials.
       2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

# SELECTIVE DEMOLITION FOR ALTERATIONS

* + 1. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
       1. Verify that construction and utility arrangements are as shown.
       2. Report discrepancies to SAU before disturbing existing installation.
       3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
    2. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
    3. Remove existing work as indicated and as required to accomplish new work.
       1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
       2. Remove items indicated on drawings.
    4. Protect existing work to remain.
       1. Prevent movement of structure; provide shoring and bracing if necessary.
       2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
       3. Repair adjacent construction and finishes damaged during removal work.
       4. Patch as specified for patching new work.

# DEBRIS AND WASTE REMOVAL

* + 1. Remove debris, junk, and trash from site.
    2. Remove from site all materials not to be reused on site; do not burn or bury.
    3. Leave site in clean condition, ready for subsequent work.
    4. Clean up spillage and wind-blown debris from public and private lands.

# END OF SECTION

**PART 1 GENERAL**

* 1. **SECTION INCLUDES**
     1. Shop fabricated steel items.

# REFERENCE STANDARDS

**SECTION 05 5000 METAL FABRICATIONS**

* + 1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
    2. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.
    3. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014.
    4. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2014.
    5. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.
    6. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.
    7. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).
    8. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).
    9. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).

# SUBMITTALS

* + 1. See Section 01 3000 - Administrative Requirements, for submittal procedures.
    2. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
    3. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

# PART 2 PRODUCTS

* 1. **MATERIALS - STEEL**
     1. Steel Sections: ASTM A36/A36M.
     2. Steel Tubing: ASTM A500/A500M, Grade B cold-formed structural tubing.
     3. Plates: ASTM A283.
     4. Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, plain.
     5. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
     6. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
     7. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

# FABRICATION

* + 1. Fit and shop assemble items in largest practical sections, for delivery to site.
    2. Fabricate items with joints tightly fitted and secured.
    3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

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* + 1. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

# FABRICATED ITEMS

* + 1. Joist Hangers: Strap anchors, fabricated with sheet steel, 18 gage, 0.0478 inch minimum base metal thickness; galvanized finish.
    2. Ledge Angles, Shelf Angles, and Plates Not Attached to Structural Framing: For support of masonry; prime paint finish.
    3. Lintels: As detailed; galvanized, prime paint finish.

# FINISHES - STEEL

* + 1. Prime paint all steel items.
    2. Prepare surfaces to be primed in accordance with SSPC-SP2.
    3. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
    4. Prime Painting: One coat.

# FABRICATION TOLERANCES

* + 1. Squareness: 1/8 inch maximum difference in diagonal measurements.
    2. Maximum Offset Between Faces: 1/16 inch.
    3. Maximum Misalignment of Adjacent Members: 1/16 inch.
    4. Maximum Bow: 1/8 inch in 48 inches.
    5. Maximum Deviation From Plane: 1/16 inch in 48 inches.

# PART 3 EXECUTION

* 1. **EXAMINATION**
     1. Verify that field conditions are acceptable and are ready to receive work.

# PREPARATION

* + 1. Clean and strip primed steel items to bare metal where site welding is required.
    2. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

# INSTALLATION

* + 1. Install items plumb and level, accurately fitted, free from distortion or defects.
    2. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
    3. Field weld components indicated .
    4. Perform field welding in accordance with AWS D1.1/D1.1M.
    5. Obtain approval prior to site cutting or making adjustments not scheduled.
    6. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

# END OF SECTION

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# PART 1 GENERAL

* 1. **SECTION INCLUDES**

**SECTION 06 1000 ROUGH CARPENTRY**

* + 1. Non-structural dimension lumber framing.
    2. Rough opening framing for doors, windows, and roof openings.
    3. Sheathing.
    4. Subflooring.
    5. Roofing nailers.
    6. Preservative treated wood materials.
    7. Concealed wood blocking, nailers, and supports.
    8. Miscellaneous wood nailers, furring, and grounds.
    9. ~~Roof sheathing with factory applied water-resistive barrier.~~

# RELATED REQUIREMENTS

* + 1. Section 05 5000 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.
    2. Section 06 1000 - Rough Carpentry
    3. ~~Section 07 6200 - Sheet Metal Flashing and Trim: Sill flashings.~~

# REFERENCE STANDARDS

* + 1. AFPA (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2012.
    2. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
    3. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
    4. AWPA U1 - Use Category System: User Specification for Treated Wood; 2012.
    5. PS 1 - Structural Plywood; 2009.
    6. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.
    7. PS 20 - American Softwood Lumber Standard; 2010.
    8. SPIB (GR) - Grading Rules; 2014.

# SUBMITTALS

* + 1. See Section 01 3000 - Administrative Requirements, for submittal procedures.
    2. Product Data: Provide technical data on wood preservative materials and application instructions.

# DELIVERY, STORAGE, AND HANDLING

* + 1. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

# WARRANTY

* + 1. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

# PART 2 PRODUCTS

* 1. **GENERAL REQUIREMENTS**
     1. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
        1. Species: Southern Pine, unless otherwise indicated.

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* + - 1. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
      2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
    1. Lumber fabricated from old growth timber is not permitted.

# DIMENSION LUMBER FOR CONCEALED APPLICATIONS

* + 1. Grading Agency: Southern Pine Inspection Bureau, Inc. (SPIB).
    2. Sizes: Nominal sizes as indicated on drawings, S4S.
    3. Moisture Content: S-dry or MC19.
    4. Stud Framing (2 by 2 through 2 by 6 ):
       1. Grade: No. 2.
    5. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16 ):
       1. Species: Southern Pine.
       2. Grade: No. 2.
    6. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
       1. Lumber: S4S, No. 2 or Standard Grade.
       2. Boards: Standard or No. 3.

# EXPOSED BOARDS

* + 1. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.
    2. Moisture Content: Kiln-dry (15 percent maximum).
    3. Surfacing: S4S.
    4. Species: Southern Pine.
    5. Grade: No. 2, 2 Common, or Construction.

# CONSTRUCTION PANELS

* + 1. Subfloor/Underlayment Combination: APA PRP-108, Rated Sturd-I-Floor.
       1. Exposure Class: Exterior.
       2. Span Rating: 16 inches.
       3. Thickness: 3/4 inches, nominal.
       4. Edges: Square.
    2. ~~Roof Sheathing: Oriented strand board structural wood panel, PS 2, with factory laminated roofing underlayment layer.~~
       1. ~~Sheathing Panel:~~
          1. ~~Grade: Structural 1 Sheathing.~~
          2. ~~Size: 4 feet wide by 8 feet long.~~
          3. ~~Performance Category: 5/8 PERF CAT.~~
          4. ~~Span Rating: 40/20.~~
          5. ~~Edge Profile: Square edge.~~
       2. ~~Integral Roofing Underlayment Layer: Medium density, phenolic impregnated kraft paper overlay.~~
       3. ~~Exposure Time: Sheathing undamaged and integral roofing underlayment layer intact after exposure to weather for up to 180 days.~~
       4. ~~Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches and 24 inches on center.~~
       5. ~~Seam Tape: Manufacturer's standard pressure-sensitive, self-adhering, cold-applied seam tape consisting of polyolefin film with acrylic adhesive.~~
       6. ~~Warranty: Manufacturer's standard 30 year limited system warranty of:~~
          1. ~~Performance: Panel and tape resistance to water penetration; tape adhesion.~~
          2. ~~Material: Free from manufacturing defects and panel delamination.~~
       7. ~~Manufacturers:~~
          1. ~~Huber Engineered Woods, LLC; ZIP System Roof/Wall Sheathing and ZIP System Seam Tape:~~ [~~www.huberwood.com.~~](http://www.huberwood.com/)
    3. Wall Sheathing: Oriented strand board wood structural panel; PS 2.
       1. Grade: Sheathing.
       2. Bond Classification: Exposure 1.
       3. Performance Category: 5/8 PERF CAT.
       4. Span Rating: 40/20.
       5. Edges: Square.
       6. Exposure Time: Sheathing will not delaminate or require sanding due to moisture absorption from exposure to weather for up to 500 days.
       7. Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches and 24 inches on center, respectively.
       8. Manufacturers:
          1. Huber Engineered Woods, LLC; Product: AdvanTech Sheathing: [www.huberwood.com.](http://www.huberwood.com/)
    4. Other Applications:
       1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
       2. Other Locations: PS 1, C-D Plugged or better.

# ACCESSORIES

* + 1. Fasteners and Anchors:
       1. Metal and Finish: Hot-dipped galvanized steel per ASTM A 153/A 153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
       2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.
       3. Anchors: Expansion shield and lag bolt type for anchorage to solid masonry or concrete.
    2. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
       1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing per ASTM A653/A653M.
    3. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
       1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing per ASTM A653/A653M.
    4. Sill Flashing: As specified in Section 07 6200.
    5. Subfloor Glue: Waterproof, water base, air cure type, cartridge dispensed.
    6. Termite Shield: Galvanized sheet steel, 0.0396 inch thick.

# FACTORY WOOD TREATMENT

* + 1. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
       1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.
    2. Preservative Treatment:
       1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.25 lb/cu ft retention.
          1. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
          2. Treat lumber in contact with roofing, flashing, or waterproofing.
          3. Treat lumber in contact with masonry or concrete.
          4. Treat lumber less than 18 inches above grade.
       2. Preservative Pressure Treatment of Lumber in Contact with Soil: AWPA U1, Use Category UC4A, Commodity Specification A using waterborne preservative to 0.4 lb/cu ft retention.
          1. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.

# PART 3 EXECUTION

* 1. **INSTALLATION - GENERAL**
     1. Select material sizes to minimize waste.
     2. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
     3. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

# FRAMING INSTALLATION

* + 1. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
    2. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
    3. Install structural members full length without splices unless otherwise specifically detailed.
    4. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AFPA Wood Frame Construction Manual.
    5. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.
    6. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
    7. Provide bridging at joists in excess of 8 feet span as detailed. Fit solid blocking at ends of members.
    8. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

# BLOCKING, NAILERS, AND SUPPORTS

* + 1. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
    2. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
    3. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
    4. Specifically, provide the following non-structural framing and blocking:
       1. Cabinets and shelf supports.
       2. Wall brackets.
       3. Handrails.
       4. Grab bars.
       5. Towel and bath accessories.
       6. Wall-mounted door stops.
       7. Chalkboards and marker boards.
       8. Wall paneling and trim.
       9. Joints of rigid wall coverings that occur between studs.

# ~~ROOF-RELATED CARPENTRY~~

* + 1. ~~Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation~~.
    2. ~~Provide wood curb at all roof openings except where specifically indicated otherwise. Form corners by alternating lapping side members.~~

# INSTALLATION OF CONSTRUCTION PANELS

* + 1. Subflooring/Underlayment Combination: Glue and nail to framing; staples are not permitted.
    2. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
       1. Nail panels to framing; staples are not permitted.

# SITE APPLIED WOOD TREATMENT

* + 1. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.
    2. Allow preservative to dry prior to erecting members.

# CLEANING

* + 1. Waste Disposal:
       1. Comply with applicable regulations.
       2. Do not burn scrap on project site.
       3. Do not burn scraps that have been pressure treated.
       4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.
    2. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
    3. Prevent sawdust and wood shavings from entering the storm drainage system.

# END OF SECTION

# PART 1 GENERAL

* 1. **SECTION INCLUDES**

**SECTION 06 2000 FINISH CARPENTRY**

* + 1. Interior & Exterior Finish Carpentry Items.

# RELATED REQUIREMENTS

* + 1. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.
    2. Section 09 9000 - Painting and Coating: Painting and finishing of finish carpentry items.

# REFERENCE STANDARDS

* + 1. ASTM C1036 - Standard Specification for Flat Glass; 2011.
    2. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
    3. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.
    4. NHLA G-101 - Rules for the Measurement & Inspection of Hardwood & Cypress; 2011.
    5. PS 1 - Structural Plywood; 2009.

# ADMINISTRATIVE REQUIREMENTS

* + 1. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

# SUBMITTALS

* + 1. See Section 01 3000 - Administrative Requirements for submittal procedures.
    2. Product Data:
       1. Provide instructions for attachment hardware and finish hardware.
    3. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
       1. Provide the information required by AWI/AWMAC/WI Architectural Woodwork Standards.
    4. Samples: Submit two samples of wood trim 10 inch long.

# QUALITY ASSURANCE

* + 1. Fabricator Qualifications: Company specializing in fabricating the products specified in this section.

# DELIVERY, STORAGE, AND HANDLING

* + 1. Protect work from moisture damage.

# PART 2 PRODUCTS

* 1. **FINISH CARPENTRY ITEMS**
     1. Quality Grade: Unless otherwise indicated provide products of quality specified by [AWI/AWMAC/WI (AWS) for Premium Grade.](http://www.awinet.org/)
     2. [Exterior Woodwork Items:](http://www.awinet.org/)
        1. [Misc. Trim.](http://www.awinet.org/)
     3. [Interior Woodwork Items:](http://www.awinet.org/)
        1. [Moldings,](http://www.awinet.org/) Bases, Casings, and Miscellaneous Trim: Clear white pine; prepare for paint [finish.](http://www.awinet.org/)
        2. [Wall boards, Batten strips, Baseboards & Misc. Trim in Exhibit Room; Prepare for Stain](http://www.awinet.org/) & [Clearcoat](http://www.awinet.org/) / Varnish finish.
        3. [Window Sills: Clear fir; prepare for opaque paint finish.](http://www.awinet.org/)

# [WOOD-BASED COMPONENTS](http://www.awinet.org/)

* + 1. [Wood fabricated from old growth timber is not permitted.](http://www.awinet.org/)

# [LUMBER MATERIALS](http://www.awinet.org/)

* + 1. [Softwood Lumber: Longleaf or Southern Yellow Pine species, plain sawn, maximum moisture](http://www.awinet.org/) [content of 15 percent; with vertical grain, . Clear or better grade for members in shutters & trim.](http://www.awinet.org/)
    2. [Hardwood Lumber: Popular or Birch species, quarter sawn, maximum moisture content of 6](http://www.awinet.org/) [percent; with vertical grain .](http://www.awinet.org/)

# [SHEET MATERIALS](http://www.awinet.org/)

* + 1. [Softwood Plywood Not Exposed to View: Any face species, veneer core; PS 1 Grade A-B; glue](http://www.awinet.org/) [type as recommended for application.](http://www.awinet.org/)
    2. [Softwood Plywood Exposed to View: Face species as selected, plain sawn, veneer core; PS 1](http://www.awinet.org/) [Grade A-B; glue type as recommended for application.](http://www.awinet.org/)
    3. [Hardwood Plywood: Face species Birch, plain sawn, , veneer core; glue type as recommended](http://www.awinet.org/) [for application.](http://www.awinet.org/)

# [FASTENINGS](http://www.awinet.org/)

* + 1. [Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not](http://www.awinet.org/) [containing formaldehyde or other volatile organic compounds.](http://www.awinet.org/)
    2. [Concealed Joint Fasteners: Threaded steel.](http://www.awinet.org/)

# [ACCESSORIES](http://www.awinet.org/)

* + 1. [Lumber for Shimming, Blocking, and concealed locations: Softwood lumber of southern yellow](http://www.awinet.org/) [pine species.](http://www.awinet.org/)
    2. [Plain Glass: ASTM C1036 annealed float glass, clear, 6 mm thick minimum.](http://www.awinet.org/)
    3. [Safety Glass: ASTM C1048, fully tempered; clear; 6 mm thick minimum.](http://www.awinet.org/)
    4. [Primer: Alkyd primer sealer.](http://www.awinet.org/)
    5. [Wood Filler: Solvent base, tinted to match surface finish color.](http://www.awinet.org/)

# [FABRICATION](http://www.awinet.org/)

* + 1. [Shop assemble work for delivery to site, permitting passage through building openings.](http://www.awinet.org/)
    2. [When necessary to cut and fit on site, provide materials with ample allowance for cutting.](http://www.awinet.org/) [Provide trim for scribing and site cutting.](http://www.awinet.org/)

# [SHOP FINISHING](http://www.awinet.org/)

* + 1. [Sand work smooth and set exposed nails and screws.](http://www.awinet.org/)
    2. [Apply wood filler in exposed nail and screw indentations.](http://www.awinet.org/)
    3. [On items to receive transparent finishes, use wood filler that matches surrounding surfaces and](http://www.awinet.org/) [is of type recommended for the applicable finish.](http://www.awinet.org/)
    4. [Finish work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards, Section 5](http://www.awinet.org/)

[- Finishing for Grade specified and as follows:](http://www.awinet.org/)

* + - 1. [Opaque:](http://www.awinet.org/)
         1. [System - 8, Acrylic Cross Linking, Water-based .](http://www.awinet.org/)
         2. [Color: As selected by SAU.](http://www.awinet.org/)
         3. [Sheen: Flat.](http://www.awinet.org/)
    1. [Prime paint surfaces in contact with cementitious materials.](http://www.awinet.org/)
    2. [Back prime woodwork items to be field finished, prior to installation.](http://www.awinet.org/)

# [PART 3 EXECUTION](http://www.awinet.org/)

* 1. [**EXAMINATION**](http://www.awinet.org/)
     1. [Verify adequacy of backing and support framing.](http://www.awinet.org/)
     2. [Verify mechanical, electrical, and building items affecting work of this section are placed and](http://www.awinet.org/) [ready to receive this work.](http://www.awinet.org/)

# [INSTALLATION](http://www.awinet.org/)

* + 1. [Install work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards](http://www.awinet.org/) [requirements for grade indicated.](http://www.awinet.org/)
    2. [Set and secure materials and components in place, plumb and level.](http://www.awinet.org/)
    3. [Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use](http://www.awinet.org/) [additional overlay trim to conceal larger gaps.](http://www.awinet.org/)

# [SITE APPLIED WOOD TREATMENT](http://www.awinet.org/)

* + 1. [Apply preservative treatment in accordance with manufacturer's instructions.](http://www.awinet.org/)
    2. [Brush apply one coats of preservative treatment on wood in contact with cementitious materials.](http://www.awinet.org/) [Treat site-sawn cuts.](http://www.awinet.org/)
    3. [Allow preservative to dry prior to erecting members.](http://www.awinet.org/)

# [PREPARATION FOR SITE FINISHING](http://www.awinet.org/)

* + 1. [Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.](http://www.awinet.org/)
    2. [Before installation, prime paint surfaces of items or assemblies to be in contact with](http://www.awinet.org/) [cementitious materials.](http://www.awinet.org/)

# [TOLERANCES](http://www.awinet.org/)

* + 1. [Maximum Variation from True Position: 1/16 inch.](http://www.awinet.org/)
    2. [Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.](http://www.awinet.org/)

# [END OF SECTION](http://www.awinet.org/)

**PART 1 GENERAL**

* 1. **~~SECTION INCLUDES~~**

**SECTION 07 0150.19 PREPARATION FOR RE-ROOFING**

* + 1. ~~Removal of portions of the existing roofing system in preparation for a new roof shingle system.~~

# ~~PRICE AND PAYMENT PROCEDURES~~

* + 1. ~~See Section 01 2100 - Allowances, for cash allowances affecting this section.~~

# ~~REFERENCE STANDARDS~~

* + 1. ~~ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board; 2012.~~

# ~~ADMINISTRATIVE REQUIREMENTS~~

* + 1. ~~Coordinate with affected mechanical and electrical work associated with roof penetrations.~~
    2. ~~Preinstallation Meeting: Convene one week before starting work of this section.~~

# ~~QUALITY ASSURANCE~~

* + 1. ~~Materials Removal Firm Qualifications: Company specializing in performing the work of this section.~~

# ~~FIELD CONDITIONS~~

* + 1. ~~Do not remove existing roofing membrane when weather conditions threaten the integrity of the building contents or intended continued occupancy.~~
    2. ~~Maintain continuous temporary protection prior to and during installation of new roofing system.~~

# ~~PART 2 PRODUCTS 2.01 MATERIALS~~

1. ~~Temporary Protection: Sheet polyethylene; provide weights to retain sheeting in position.~~
2. ~~Protection Board: ASTM C208 cellulose fiber board, one face finished with mineral fiber, asphalt and kraft paper.~~
   1. ~~Provide protection board with the following characteristics:~~
   2. ~~Board Size: 48 x 96 inches.~~
   3. ~~Board Thickness: 5/8 inch.~~
   4. ~~Board Edges: Square.~~ **PART 3 EXECUTION ~~3.01 EXAMINATION~~**

~~A.~~ ~~Verify that existing roof surface is clear and ready for work of this section.~~

# ~~PREPARATION~~

* + 1. ~~Sweep roof surface clean of loose matter.~~
    2. ~~Remove loose refuse and dispose off site.~~

# ~~MATERIAL REMOVAL~~

* + 1. ~~Remove only existing roofing materials that can be replaced with new materials the same day.~~
    2. ~~Remove metal counter flashings.~~
    3. ~~Remove roofing membrane & shingles, perimeter base flashings, flashings around roof protrusions, pitch pans and pockets.~~
    4. ~~Repair existing wood deck surface to provide smooth working surface for new roof system.~~

# ~~FIELD QUALITY CONTROL~~

* + 1. ~~The drawings identify the approximate limits to material removal.~~

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# ~~PROTECTION~~

* + 1. ~~Provide temporary protective sheeting over uncovered deck surfaces.~~
    2. ~~Turn sheeting up and over parapets and curbing. Retain sheeting in position with weights.~~
    3. ~~Provide for surface drainage from sheeting to existing drainage facilities.~~
    4. ~~Do not permit traffic over unprotected or repaired deck surface.~~

# END OF SECTION

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# PART 1 GENERAL

* 1. **SECTION INCLUDES**

**SECTION 07 2100 THERMAL INSULATION**

* + 1. Batt insulation in exterior wall and ceiling construction.
    2. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

# RELATED REQUIREMENTS

* + 1. Section 06 1000 - Rough Carpentry: Supporting construction for batt insulation.
    2. Section 06 1000 - Rough Carpentry: Installation requirements for board insulation over steep slope roof sheathing or roof structure.
    3. Section 07 2119 - Foamed-In-Place Insulation: Plastic foam insulation other than boards.

# REFERENCE STANDARDS

* + 1. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.
    2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
    3. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2012.

# SUBMITTALS

* + 1. See Section 01 3000 - Administrative Requirements, for submittal procedures.
    2. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
    3. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

# FIELD CONDITIONS

* + 1. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

# PART 2 PRODUCTS

* 1. **APPLICATIONS**
     1. Insulation in Wood Framed Walls: Batt insulation with no vapor retarder.
     2. Insulation in Wood Framed Ceiling Structure: Batt insulation with no vapor retarder.
     3. Insulation in Wood Framed Floor Structure: Batt insulation with no vapor retarder.

# BATT INSULATION MATERIALS

* + 1. Where batt insulation is indicated, either glass fiber or mineral fiber batt insulation may be used, at Contractor's option.
    2. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
       1. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
       2. Formaldehyde Content: Zero.
       3. Thermal Resistance: R of 13 or 19.
       4. Thickness: 3 1/2 & 6 inch.
       5. Facing: Unfaced.
       6. Manufacturers:
          1. CertainTeed Corporation: [www.certainteed.com.](http://www.certainteed.com/)

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* + - * 1. Johns Manville Corporation: [www.jm.com.](http://www.jm.com/)
        2. Owens Corning Corp: [www.owenscorning.com.](http://www.owenscorning.com/)
    1. Mineral Fiber Batt Insulation: Flexible or semi-rigid preformed batt or blanket, complying with [ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C665) [ASTM E84.](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)
       1. [Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)
       2. [Thermal Resistance: R of 13 or 19.](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)
       3. [Thickness: 3 1/2 & 6 inch.](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)
       4. [Manufacturers:](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)
          1. [Thermafiber, Inc: www.thermafiber.com.](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)
          2. [ROXUL, Inc; ComfortBatt: www.rspec.com.](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)

# [ACCESSORIES](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)

* + 1. [Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)
       1. [Length as required for thickness of insulation material and penetration of deck substrate, .](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)
    2. [Nails: Steel wire; galvanized; type and size to suit application.](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)
    3. [Wire Mesh: Galvanized steel, hexagonal wire mesh.](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)
    4. [Adhesive: Type recommended by insulation manufacturer for application.](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)
    5. [Netting: 1 x 2 Mesh Insulation Netting - to be used in crawl space.](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)

# [PART 3 EXECUTION](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)

* 1. [**EXAMINATION**](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)
     1. [Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84) [ready to receive insulation and adhesive.](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)
     2. [Verify substrate surfaces are flat, free of irregularities or materials or substances that may](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84) [impede adhesive bond.](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)

# [BATT INSTALLATION](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)

* + 1. [Install insulation in accordance with manufacturer's instructions.](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)
    2. [Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)
    3. [Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)
    4. [Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84) [within the plane of the insulation.](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)
    5. [Retain insulation batts in place with spindle fasteners at 12 inches on center.](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)

# [PROTECTION](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)

* + 1. [Do not permit installed insulation to be damaged or wet prior to its concealment.](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)

# [END OF SECTION](https://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20E84)

SAUOES14.05 07 2100 - 2 THERMAL INSULATION

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# PART 1 GENERAL

* 1. **SECTION INCLUDES**

**SECTION 07 2119 FOAMED-IN-PLACE INSULATION**

* + 1. Foamed-in-place insulation.
       1. Underside of Roof Decking between Rafters

# RELATED REQUIREMENTS

* + 1. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

# REFERENCE STANDARDS

* + 1. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.
    2. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2012.
    3. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
    4. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.
    5. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).
    6. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

# SUBMITTALS

* + 1. See Section 01 3000 - Administrative Requirements, for submittal procedures.
    2. Product Data: Provide product description, insulation properties, overcoat properties, and preparation requirements.
    3. Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.

# QUALITY ASSURANCE

* + 1. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.
    2. Applicator Qualifications: Company specializing in performing work of the type specified, with minimum three years documented experience.

# MOCK-UP

* + 1. Locate where directed.
    2. Mock-up may remain as part of the Work.

# FIELD CONDITIONS

* + 1. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.

# PART 2 PRODUCTS

* 1. **MANUFACTURERS**
     1. Foamed-In-Place Insulation:
        1. BASF Corporation; WALLTITE US Series Closed Cell: [www.spf.basf.com.](http://www.spf.basf.com/)
        2. Covestro, LLC; EcoBay CC: [www.covestro.com/sprayfoam.com.](http://www.covestro.com/sprayfoam.com)
        3. Demilec LLC; Product Heatlok Soy 200 Plus: [www.demilec.com/sle.](http://www.demilec.com/sle)
        4. Icynene Inc; Icynene ProSeal Eco MD-R-210: [www.icynene.com.](http://www.icynene.com/)
        5. Johns Manville; JM Corbond III Closed Cell Spray Polyurethane Foam: [www.jm.com/sle.](http://www.jm.com/sle)

SAUOES14.05 07 2119 - 1 FOAMED-IN-PLACE INSULATION

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# MATERIALS

* + 1. Foamed-In-Place Insulation: Medium-density, rigid or semi-rigid, closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
       1. Aged Thermal Resistance: R-value of 5 (deg F hr sq ft)/Btu, minimum, when tested at 1 inch thickness in accordance with ASTM C518 after aging for 180 days at 41 degrees F.
       2. Water Vapor Permeance: Vapor retarder; 2 perm, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
       3. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
       4. Air Permeance: 0.004 cfm/sq ft, maximum, when tested at intended thickness in accordance with ASTM E2178 or ASTM E283 at 1.5 psf.
       5. Closed Cell Content: At least 90 percent.
       6. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.

# ACCESSORIES

* + 1. Primer: As required by insulation manufacturer.

# PART 3 EXECUTION

* 1. **EXAMINATION**
     1. Verify work within construction spaces or crevices is complete prior to insulation application.
     2. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation or overcoat adhesion.

# PREPARATION

* + 1. Mask and protect adjacent surfaces from over spray or dusting.
    2. Apply primer in accordance with manufacturer's instructions.

# APPLICATION

* + 1. Apply insulation in accordance with manufacturer's instructions.
    2. Apply insulation by spray method, to a uniform monolithic density without voids.
    3. Patch damaged areas.
    4. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.
    5. Trim excess away for applied trim or remove as required for continuous sealant bead.

# PROTECTION

* + 1. Do not permit subsequent construction work to disturb applied insulation.

# END OF SECTION

SAUOES14.05 07 2119 - 2 FOAMED-IN-PLACE INSULATION

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# ~~PART 1: GENERAL 1.01 SCOPE:~~

**SECTION 07 3129 WOOD SHINGLES**

~~A.~~ ~~Furnish and install all wood shingles and ridge and hip boards as shown on the drawings and as~~ ~~specified herein, and as required to prevent penetration of water through the roof.~~

# ~~RELATED WORK SPECIFIED IN OTHER SECTIONS:~~

* + 1. ~~Mock-ups, Samples, Submittals & Substitutions~~ ~~Section 01 3000~~
    2. ~~Finish Carpentry~~ ~~Section 06 2000~~
    3. ~~Flashing and Sheet Metal~~ ~~Section 07 6150~~

# ~~QUALITY ASSURANCE:~~

* + 1. ~~Qualifications of Manufacturers: Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the Owner.~~
    2. ~~Qualifications of Installers: Use a skilled workman who is trained and experienced in the necessary craft and who is completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.~~

# ~~SUBMITTALS:~~

* + 1. ~~General: Comply with the pertinent provision of Section 01 3000.~~
    2. ~~Product Data: Provide complete manufacturer's specifications on the specified shingles and fire prevention treatment, and manufacturer's recommendations for installation of shingles.~~

# ~~PRODUCT HANDLING:~~

* + 1. ~~Protection of Building: Use all means necessary to protect the building during roof removal and roof installation.~~
    2. ~~Protection of Product: Use all means necessary to protect materials of this section before, during and after installation and to protect installed work and material of all other trades.~~

# ~~GUARANTEE:~~

* + 1. ~~The following guarantee shall be made:~~
       1. ~~The General Contractor and the roofing subcontractor (if other than the General Contractor) shall jointly and separately provide a written guarantee warranting the roof to be weather tight and free from defects in materials and workmanship for a period of two (2) years from the date of acceptance. All leaks and defects shall be corrected at no cost to the Owner for the guarantee period, and all repairs made promptly after notification of the existence of leaks or other defects.~~

# ~~PART 2: PRODUCTS 2.01 SHINGLES:~~

~~A.~~ ~~Section covers wood shingles and coordination with metal flashing.~~

# ~~MATERIALS:~~

* + 1. ~~Wood Shingles: to be #1 Western Red Cedar, 18" x 1/2" to 5/8" taper split, random width.~~
    2. ~~Shingles shall be blue label all edge, all-clear, labeled with “Certi” brand name, indicating the manufacturer to be a member of the Cedar Shake & Shingle Bureau (CSSB).~~
    3. ~~Provide necessary material of same type, grade and size indicated above as indicated on drawings for eaves, outercourses and undercourses.~~
    4. ~~Roofing shingles shall be laid with a weather exposure of 5-1/2”.~~
    5. ~~Nails for fastening wood shakes shall be hot dipped galvanized steel roofing nails for sufficient length to penetrate the wood deck at least 3/4"; minimum size 6d.~~

SAUOES14.05 07 3129 - 1 WOOD SHINGLES

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* + 1. ~~Flashing includes concealed ridge and hip flashing, drip edge flashing at roof edges, and miscellaneous flashings at chimneys and other areas. Refer to Section 07 6150.~~

# ~~SHEET MATERIALS:~~

* + 1. ~~Underlayment & Eave Protection Membrane (Ice & Water Shield): Self-adhering polymer-modified asphalt sheet complying with ASTM D1970; 40 mil total thickness; with strippable treated release paper and polyethylene sheet top surface.~~
    2. ~~Roof Ventilation Underlayment:~~
       1. ~~ASTM C 165-00: Standard Test Method for Measuring Compressive Properties of Thermal Insulations~~
       2. ~~ASTM D 4533: Standard Test Method for Trapezoidal Tear Strength of Geotextiles~~
       3. ~~ASTM D 4632: Standard Test Method for Grab-Breaking Load and Elongation of Textiles~~
       4. ~~ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials~~
       5. ~~Manufacturer: Benjamin Obdyke Incorporated.~~
          1. ~~Contact: 400 Babylon Road, Suite A, Horsham, PA 19044; Telephone: (800) 523-5261; Fax: (215) 672-3731; E-mail: info@benjaminobdyke.com; website:~~ [~~www.benjaminobdyke.com~~](http://www.benjaminobdyke.com/)
       6. ~~Cedar Breather®:~~
          1. ~~Description: Three-dimensional matrix in roll form.~~
          2. ~~Color: Black~~
          3. ~~Material: Nylon~~
          4. ~~Width: 39.37 inches.~~
          5. ~~Length: 46 1/2 feet .~~
          6. ~~Coverage Area: 200 ft2~~
          7. ~~Thickness: 0.277 inches .~~
          8. ~~Weight: 9.7 lbs/roll~~
          9. ~~Fire Rating: A~~ **~~PART 3: EXECUTION 3.01 INSTALLATION~~**

1. ~~Roofing subcontractor shall inspect the decking and temporary protection and conditions at the job site and shall not begin unless he is satisfied with the installation.~~
2. ~~Install eave protection membrane from eave edge to minimum 4 ft up-slope beyond interior face of exterior wall.~~
3. ~~Roof Ventilation Underlayment Installation: Comply with the instructions and recommendations of the underlayment manufacturer.~~
   1. ~~Install eave protection membrane extending 1/4" beyond edge of roof deck.~~
   2. ~~Tack down ventilation underlayment with 1 tack (or nail) approximately every 3 square feet.~~
   3. ~~Install ventilation underlayment with dimples down to present the flat side as the nailing surface.~~
   4. ~~Butt each course of ventilation underlayment against previous course. Do not lap layers of underlayment.~~
   5. ~~Work from fascia to ridge just ahead of shake and felt installation to avoid walking directly on the ventilation underlayment.~~
   6. ~~Install an 18” wide strip of 30lb roofing felt over the top portion of the shakes and extend onto the underlayment. Position the bottom edge of the felt above the butt of the shake at a distance equal to twice the weather exposure in compliance with manufacturer’s installation instructions. Use a nail of sufficient length to allow for 3/4" penetration into the sheathing.~~
4. ~~Shingles shall be nailed onto decking no less than three (3) shingles thick having an exposure of no more than 5 1/2". Each shingle shall be applied with two fasteners specified above, flush with surface of shingle.~~
5. ~~Installation shall conform to the requirements contained in the latest edition of the publication issued by the Cedar Shake & Shingle and Bureau (CSSB).~~
6. ~~The shingle roof shall be weather and water tight. The roof shall be guaranteed by the roofing subcontractor against leaks due to defects in materials or workmanship for a period of two years after acceptance. (See 1.06, A.)~~

# END OF SECTION

**PART 1 GENERAL**

* 1. **~~SECTION INCLUDES~~**

**SECTION 07 6200**

**SHEET METAL FLASHING AND TRIM**

* + 1. ~~Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, and termite shields.~~

# ~~REFERENCE STANDARDS~~

* + 1. ~~ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).~~
    2. ~~ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction; 2012.~~
    3. ~~ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.~~
    4. ~~ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2009.~~
    5. ~~ASTM D2178/D2178M - Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing; 2013a.~~
    6. ~~ASTM D4479/D4479M - Standard Specification for Asphalt Roof Coatings - Asbestos-Free; 2007 (Reapproved 2012).~~
    7. ~~ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2012).~~
    8. ~~SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.~~

# ~~ADMINISTRATIVE REQUIREMENTS~~

* + 1. ~~Preinstallation Meeting: Convene one week before starting work of this section.~~

# ~~SUBMITTALS~~

* + 1. ~~See Section 01 3000 - Administrative Requirements, for submittal procedures.~~
    2. ~~Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.~~

# ~~QUALITY ASSURANCE~~

* + 1. ~~Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.~~
    2. ~~Maintain one copy of each document on site.~~
    3. ~~Fabricator and Installer Qualifications: Company specializing in sheet metal work with documented experience.~~

# ~~DELIVERY, STORAGE, AND HANDLING~~

* + 1. ~~Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.~~
    2. ~~Prevent contact with materials that could cause discoloration or staining.~~

# ~~PART 2 PRODUCTS 2.01 SHEET MATERIALS~~

~~A.~~ ~~Copper: ASTM B370, cold rolled 20 oz/sq ft thick; natural finish.~~

# ~~FABRICATION~~

* + 1. ~~Form sections true to shape, accurate in size, square, and free from distortion or defects.~~
    2. ~~Form pieces in longest possible lengths.~~
    3. ~~Hem exposed edges on underside 1/2 inch; miter and seam corners.~~

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* + 1. ~~Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.~~
    2. ~~Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.~~
    3. ~~Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.~~
    4. ~~Fabricate flashings to allow toe to extend 2 inches over roofing membrane base flashings. Return and brake edges.~~

# ~~GUTTER AND DOWNSPOUT FABRICATION~~

* + 1. ~~Gutters: SMACNA (ASMM), Semi-circular profile.~~
    2. ~~Downspouts: Round profile.~~
    3. ~~Gutters and Downspouts: Size for rainfall intensity determined by a storm occurrence of 1 in 10 years in accordance with SMACNA (ASMM).~~
    4. ~~Accessories: Profiled to suit gutters and downspouts.~~
       1. ~~Anchorage Devices: In accordance with SMACNA (ASMM) requirements.~~
       2. ~~Gutter Supports: Brackets.~~
       3. ~~Downspout Supports: Brackets.~~
    5. ~~Seal metal joints.~~

# ~~ACCESSORIES~~

* + 1. ~~Fasteners: Galvanized steel, with soft neoprene washers.~~
    2. ~~Underlayment: ASTM D226/D226M, organic roofing felt, Type I (No. 15).~~
    3. ~~Underlayment: Polyethylene, 6 mils thick.~~
    4. ~~Primer: Zinc chromate type.~~
    5. ~~Protective Backing Paint: Asphaltic mastic, ASTM D4479 Type I.~~
    6. ~~Concealed Sealants: Non-curing butyl sealant.~~
    7. ~~Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.~~
    8. ~~Plastic Cement: ASTM D4586/D4586M, Type I.~~
    9. ~~Solder: ASTM B32; Sn50 (50/50) type.~~

# ~~PART 3 EXECUTION 3.01 EXAMINATION~~

1. ~~Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.~~
2. ~~Verify roofing termination and base flashings are in place, sealed, and secure.~~

# ~~PREPARATION~~

* + 1. ~~Install starter and edge strips, and cleats before starting installation.~~
    2. ~~Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.~~

# ~~INSTALLATION~~

* + 1. ~~Conform to drawing details and details as appropiate from the SMACNA Architectural Sheet Metal Manual/~~
    2. ~~Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.~~
    3. ~~Apply plastic cement compound between metal flashings and felt flashings.~~
    4. ~~Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.~~
    5. ~~Seal metal joints watertight.~~
    6. ~~Secure gutters and downspouts in place with concealed fasteners.~~
    7. ~~Slope gutters 1/4 inch per 10 feet, minimum.~~

# ~~FIELD QUALITY CONTROL~~

* + 1. ~~See Section 01 4000 - Quality Requirements, for field inspection requirements.~~
    2. ~~Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.~~

# END OF SECTION

**PART 1 GENERAL**

* 1. **SECTION INCLUDES**
     1. Sealants and joint backing.
     2. Precompressed foam sealers.

# REFERENCE STANDARDS

**SECTION 07 9005 JOINT SEALERS**

* + 1. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
    2. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.
    3. ASTM D1056 - Standard Specification for Flexible Cellular Materials--Sponge or Expanded Rubber; 2014.
    4. ASTM D1667 - Standard Specification for Flexible Cellular Materials--Poly(Vinyl Chloride) Foam (Closed-Cell); 2005 (Reapproved 2011).
    5. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.

# SUBMITTALS

* + 1. See Section 01 3000 - Administrative Requirements, for submittal procedures.
    2. Product Data: Provide data indicating sealant chemical characteristics.
    3. Manufacturer's Installation Instructions: Indicate special procedures.

# QUALITY ASSURANCE

* + 1. Maintain one copy of each referenced document covering installation requirements on site.
    2. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with experience.
    3. Applicator Qualifications: Company specializing in performing the work of this section, with experience, and approved by manufacturer.

# FIELD CONDITIONS

* + 1. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

# COORDINATION

* + 1. Coordinate the work with all sections referencing this section.

# WARRANTY

* + 1. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
    2. Correct defective work within a 10 (ten) year period after Date of Substantial Completion.
    3. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

# PART 2 PRODUCTS

* 1. **MANUFACTURERS**
     1. Polyurethane Sealants:
        1. Bostik Inc; Product Chem Calk 900: [www.bostik-us.com.](http://www.bostik-us.com/)
        2. Pecora Corporation; Product NR-200: [www.pecora.com.](http://www.pecora.com/)
        3. BASF Construction Chemicals-Building Systems; Product Sonolastic SL-1: [www.buildingsystems.basf.com.](http://www.buildingsystems.basf.com/)
        4. Substitutions: See Section 01 6000 - Product Requirements.
        5. Pecora Corporation: [www.pecora.com.](http://www.pecora.com/)
        6. BASF Construction Chemicals-Building Systems: [www.chemrex.com.](http://www.chemrex.com/)
        7. Substitutions: See Section 01 6000 - Product Requirements.

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* + 1. Butyl Sealants:
       1. Bostik Inc; Product Chem-Calk 300: [www.bostik-us.com.](http://www.bostik-us.com/)
       2. Pecora Corporation; Product BC-158: [www.pecora.com.](http://www.pecora.com/)
       3. Substitutions: See Section 01 6000 - Product Requirements.
       4. Bostik Inc; Product Chem Calk 600: [www.bostik-us.com.](http://www.bostik-us.com/)
       5. Pecora Corporation; Product AC-20: [www.pecora.com.](http://www.pecora.com/)
       6. BASF Construction Chemicals-Building Systems; Product Sonolac: [www.buildingsystems.basf.com.](http://www.buildingsystems.basf.com/)
       7. Tremco; Product Acrylic Latex Caulk.
       8. Substitutions: See Section 01 6000 - Product Requirements.
    2. Preformed Compressible Foam Sealers:
       1. EMSEAL Joint Systems, Ltd: [www.emseal.com.](http://www.emseal.com/)
       2. Sandell Manufacturing Company, Inc: [www.sandellmfg.com.](http://www.sandellmfg.com/)
       3. Dayton Superior Corporation: [www.daytonsuperior.com.](http://www.daytonsuperior.com/)

# SEALANTS

* + 1. ~~Type A - General Purpose Exterior Sealant: Polyurethane; ASTM C920, Grade NS, Class 25, Uses M, G, and A; single component.~~
       1. ~~Color: color as selected.~~
       2. ~~Applications: Use for:~~
          1. ~~Control, expansion, and soft joints in masonry.~~
          2. ~~Joints between concrete and other materials.~~
          3. ~~Joints between metal frames and other materials.~~
          4. ~~Other exterior joints for which no other sealant is indicated.~~
    2. ~~Type C - Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, nondrying, nonskinning, noncuring.~~
       1. ~~Applications: Use for:~~
          1. ~~Concealed sealant bead in sheet metal work.~~
          2. ~~Concealed sealant bead in siding overlaps.~~
    3. Type D - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.
       1. Applications: Use for:
          1. Interior wall and ceiling control joints.
          2. Joints between door and window frames and wall surfaces,
          3. (except joints in metal, aluminum, ceramic tile, and wet work).
          4. Other interior joints for which no other type of sealant is indicated.
       2. Products:
          1. Pecora Corporation; AC-20 + Silicone Acrylic Latex Caulking Compound: [www.pecora.com.](http://www.pecora.com/)
          2. Sherwin-Williams Company; 850A Acrylic Latex Caulk: [www.sherwin-williams.com.](http://www.sherwin-williams.com/)
          3. Tremco Global Sealants: [www.tremcosealants.com.](http://www.tremcosealants.com/)
    4. ~~Type H - Concrete Paving Joint Sealant: Polyurethane, self-leveling; ASTM C920, Class 25, Uses T, I, M and A; single component.~~
       1. ~~Color: Gray.~~
       2. ~~Applications: Use for:~~
          1. ~~Joints in sidewalks and vehicular paving.~~
    5. Type J - Butyl Sealant: ASTM C920, Grade NS, Class 12-1/2, Uses NT, M, A, G, O; single component, solvent release, non-skinning, non-sagging.
       1. Color: Standard colors matching finished surfaces.
       2. Service Temperature Range: -13 to 180 degrees F.
       3. Shore A Hardness Range: 10 to 30.
    6. Type K - Nonsag Polyurethane Sealant: ASTM C920, Grade NS, Class 25, Uses NT, M, A, G, O; single component, chemical curing, non-staining, non bleeding, non-sagging type.
       1. Color: Match adjacent finished surfaces.
       2. Movement Capability: Plus and minus 25 percent.
       3. Service Temperature Range: -40 to 180 degrees F.
       4. Shore A Hardness Range: 20 to 35.

# ACCESSORIES

* + 1. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
    2. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
    3. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.
    4. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

# PART 3 EXECUTION

* 1. **EXAMINATION**
     1. Verify that substrate surfaces are ready to receive work.
     2. Verify that joint backing and release tapes are compatible with sealant.

# PREPARATION

* + 1. Remove loose materials and foreign matter that could impair adhesion of sealant.
    2. Clean and prime joints in accordance with manufacturer's instructions.
    3. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
    4. Protect elements surrounding the work of this section from damage or disfigurement.

# INSTALLATION

* + 1. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
    2. Perform installation in accordance with ASTM C1193.
    3. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
       1. Width/depth ratio of 2:1.
       2. Neck dimension no greater than 1/3 of the joint width.
       3. Surface bond area on each side not less than 75 percent of joint width.
    4. Install bond breaker where joint backing is not used.
    5. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
    6. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
    7. Tool joints concave.
    8. Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch below adjoining surface.

# CLEANING

* + 1. Clean adjacent soiled surfaces.

# PROTECTION

* + 1. Protect sealants until cured.

# SCHEDULE

* + 1. ~~Exterior Joints for Which No Other Sealant Type is Indicated: Type A; colors as selected.~~
    2. ~~Control and Expansion Joints in Paving: Type H.~~
    3. ~~Lap Joints in Exterior Sheet Metal Work: Type C or Type J.~~
    4. ~~Butt Joints in Exterior Metal Work and Siding: Type A.~~

# END OF SECTION

# PART 1: GENERAL

* 1. **SUMMARY**

**SECTION 08 5500**

**WOOD WINDOW RESTORATION**

* + 1. This section includes but is not limited to the following:
       1. Restoration / Repair / Replacement of historic wood windows.
       2. Window Schedule
    2. Related Sections: the following sections contain requirements related to this Section:
       1. Allowances Section 01 2100
       2. Finish Carpentry Section 06 2000
       3. Sealants Section 07 9005
       4. Painting Section 09 9000

# SUBMITTALS

* + 1. General: Submit each item in this Article in accordance with the Conditions of the Contract and Division 1 Specification Sections:
       1. Manufacturer’s technical data for each product indicated. Include product description, application procedures, precautions, limitations in use of products, and test reports and certifications substantiating that products comply with requirements.
       2. Written Restoration Program for each phase of restoration process including protection of surrounding materials and site during operations. Describe in detail materials, methods and equipment to be used in each phase of restoration work.
          1. If alternative methods and materials to those indicated are proposed for any phase of the restoration work, provide written description, including evidence of successful use on other comparable projects, and program of testing to demonstrate effectiveness for use on this project.
       3. Shop drawings of existing window assemblies and new wood components, including location floor plans or exterior wall elevations showing all window openings. Provide full scale detail sections of typical members to be replicated, indicating profiles and dimensions. Show existing construction surrounding windows and proposed anchorages, where required.
       4. Samples, for verification purposes, prior to mock-up erection, of the following:
          1. For new wood components, where required, full size samples indicating actual profile and thickness.

# QUALITY ASSURANCE

* + 1. Field-constructed Mockup:
       1. Provide sample of the following:
          1. One (1) window, restored in accordance with these specifications, including priming, complete in operating condition.
          2. Sample window to be restored shall be selected by the Owner.
       2. Approved mockup shall be marked and remain as the standard for the project. Paint mock-up only when directed by the Owner.

# JOB CONDITIONS

* + 1. Existing Conditions: The Contractor shall determine all restraints imposed due to existing surfaces, spaces, clearances, and equipment.
    2. Environmental Conditions: Work during inclement weather may be performed only if “adequate protection” from the elements is provided such that the building interior and its contents are not exposed to the elements and subject to damage.
    3. Protection:
       1. “Adequate protection” is defined as protection which renders the building and the work watertight and secure against intrusion of the elements.
       2. Protect surrounding surfaces and finishes from damage during the execution of window restoration.
       3. Protect unfinished work at the end of each day’s work activities.

# DELIVERY, STORAGE AND HANDLING

* + 1. Store materials off the ground in clean, dry and restricted locations; protect from accidental opening and damage. Remove materials which are damaged or otherwise not suitable for use from the jobsite.
    2. Deliver materials to the jobsite in manufacturer’s original and unopened containers and packaging bearing labels as type of material, brand name and manufacturer. Employ specialized storage containers when directed by manufacturer. Delivered materials shall be identical to tested and approved materials.
    3. Protect adjacent and underlying surfaces from damage.
    4. Observe manufacturer's label precautions

# PART 2: PRODUCTS

* 1. **MATERIALS**
     1. Wood: Grade C or better, Longleaf Yellow Pine.
        1. Sills, Sashes, muntins etc. - Grade C or better Longleaf Yellow Pine

# ACCESSORIES

* + 1. Sealant: Polyurethane sealant, color to match window paint color.
    2. Glazing compound: polysulfide two-part elastomeric sealant, FS-TT-S-00227, Type II, Class A compounded by manufacturer especially for glazing. Products include:
       1. Dualthane and CM-60 two-part, by W.R. Meadows
       2. Sonoclastic two-part, by Sonneborn
    3. Paint Remover for Wood Windows: (Only As Noted On Plans)
       1. Paint Remover:
          1. Solvent-based methylene chloride stripper, specifically fomulated for removing paint, conforming to Federal Specification TT-R-241, Type II. Manufacturers include, but are not limited to:

Dad’s Easy Spray, professional strength paint & varnish remover, by Sansher Corporation-Fort Wayne, IN 46825

Klean Strip, KS-3 premium stripper, by W M Barr & Co., Inc, Memphis, TN 38101

Other strippers may be submitted for approval by the Owner.

# FABRICATION

* + 1. Repair / Restore / Replacement Frames and Sashes:
       1. Remove sashes from frames.
       2. Remove existing glazing and compound.
       3. Remove paint. (Only As Noted On Plans)
       4. Fabricate sections from wood of profile to match existing.
       5. Reinforce corners and intersections. Miter solid.
       6. Tenon side rails to top and bottom stiles.
       7. Finish exposed and contact surfaces flush with adjacent surfaces.
       8. Apply one coat primer and 2 coats finish paint.
       9. Reglaze window panes.
       10. Reinstall Sashes
       11. Install appropriate window hardware.

# PART 3: EXECUTION

* 1. **REPAIR AND RESTORATION OF EXISTING FRAME, SASH AND SILLS**
     1. PROTECTION: Protect surrounding surfaces during paint removal on windows.
     2. Remove all existing sealants and glazing compound by hand.
     3. Remove existing painted coatings by scraping, sanding and paint removal to bare wood. Sand windows smooth to prepare for priming and final painting.
     4. Repair all holes, depressions, cracks and other minor damage and deterioration with exterior wood filler per manufacturer’s instructions upon approval by COR. Finish all filled areas by sanding exposed filler smooth and flush with surrounding surface, after curing time has elapsed.
     5. All repairs shall be as inconspicuous as possible.
     6. Repair existing wood that exhibits moderate decay as opposed to replacing with new material with a 2 part epoxy consolidant and structural adhesive process. Follow manufacturers recommended application instructions.
        1. Liquid wood consolidant equal to LiquidWood as manufactured by Abatron Inc. Consolidant is to be applied to decayed areas as a primer to the structural adhesive.
        2. Structural adhesive putty and replacement compound equal to WoodEpox as manufactured by Abatron Inc. Structural putty is to fill and replace decayed wood of structural and non-structural members.
     7. Prepare all previously painted windows and frames by striping, scraping and sanding complete prior to priming.
     8. Prime all wood in preparation for finish painting in accordance with Section 09 9000 - Painting.

# REPLACEMENT OF WOOD WINDOW COMPONENTS

* + 1. Fabricate new components to match dimensions and profile of existing.
    2. Prepare new components by priming and painting all exposed surfaces prior to installation.
    3. Install components per drawings. Use blind anchoring to attach sill to frame.
    4. Apply specified finish coats of paint per Section 09 9000.

# PAINT REMOVAL ON WINDOWS

* + 1. Remove sashes from frames.
    2. Remove glass from sashes and protect until time for reinstallation.
    3. Protect surrounding surfaces prior to beginning.
    4. Apply liberal amount of chemical stripper to windows.
    5. Allow to sit for minimum 10 minutes. Do not allow stripper to dry during this time. Agitate if necessary.
    6. Remove stripper with plastic scrappers being very careful not to damage wood.
    7. Repeat steps B-D until paint has been removed. With the approval of the Owner, some paint will be allowed to remain provided it is well adhered to the substrate. This can be determined in the Mock-Up.

# END OF SECTION

**PART 1 GENERAL**

* 1. **SECTION INCLUDES**
     1. Hardware for wood doors.
     2. Thresholds.

# SECTION 08 7100 DOOR HARDWARE

* + 1. Weatherstripping, seals and door gaskets.
    2. Window Hardware

# RELATED REQUIREMENTS

* + 1. Section 08 1433 - Stile and Rail Wood Doors.

# PRICE AND PAYMENT PROCEDURES

* + 1. See Section 01 2100 - Allowances, for allowances affecting this section.

# REFERENCE STANDARDS

* 1. **ADMINISTRATIVE REQUIREMENTS**
     1. Coordinate the manufacture, fabrication, and installation of products onto which door hardware will be installed.
     2. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
     3. Convey Southern Arkansas University's keying requirements to manufacturers.

# SUBMITTALS

* + 1. See Section 01 3000 - Administrative Requirements, for submittal procedures.
    2. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project.
    3. Hardware Schedule: Detailed listing of each item of hardware to be installed on each door. Use door numbering scheme as included in the Contract Documents. Identify electrically operated items and include power requirements.
    4. Keying Schedule: Submit for approval of Southern Arkansas University.
    5. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
    6. Keys: Deliver with identifying tags to Southern Arkansas University by security shipment direct from hardware supplier.
    7. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Southern Arkansas University's name and registered with manufacturer.

# QUALITY ASSURANCE

* + 1. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with documented experience.
    2. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist in the work of this section.

# DELIVERY, STORAGE, AND HANDLING

* + 1. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

# WARRANTY

* + 1. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
    2. Provide five year warranty for door closers.

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# PART 2 PRODUCTS

* 1. **MANUFACTURERS**
  2. **DOOR HARDWARE - GENERAL**
     1. Provide all hardware specified or required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated.
     2. Provide all items of a single type of the same model by the same manufacturer.
     3. Provide products that comply with the following:
        1. Applicable provisions of federal, state, and local codes.

# PART 3 EXECUTION

* 1. **EXAMINATION**
     1. Verify that doors and frames are ready to receive work; labeled, fire-rated doors and frames are present and properly installed, and dimensions are as indicated on shop drawings.

# INSTALLATION

* + 1. Install hardware in accordance with manufacturer's instructions and applicable codes.
    2. Use templates provided by hardware item manufacturer.
    3. Mounting heights for hardware from finished floor to center line of hardware item: As listed in Schedule, unless otherwise noted:

# ADJUSTING

* + 1. Adjust work under provisions of Section 01 7000.
    2. Adjust hardware for smooth operation.

# CLEANING

* 1. **PROTECTION**
     1. Protect finished Work under provisions of Section 01 7000.
     2. Do not permit adjacent work to damage hardware or finish.

# END OF SECTION

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# PART 1 GENERAL

* 1. **SECTION INCLUDES**
     1. Gypsum wallboard.

# SECTION 09 2116 GYPSUM BOARD ASSEMBLIES

* + 1. Joint treatment and accessories.

# RELATED REQUIREMENTS

* + 1. Section 06 1000 - Rough Carpentry: Building framing and sheathing.
    2. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.
    3. Section 07 2100 - Thermal Insulation: Acoustic insulation.
    4. Section 07 9200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

# REFERENCE STANDARDS

* + 1. ANSI A108.11 - American National Standard for Interior Installation of Cementitious Backer Units; 2010 (Revised).
    2. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2010).
    3. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.
    4. ASTM C514 - Standard Specification for Nails for the Application of Gypsum Board; 2004 (Reapproved 2014).
    5. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2009).
    6. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2013.
    7. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2014.
    8. ASTM C1288 - Standard Specification for Discrete Non-Asbestos Fiber-Cement Interior Substrate Sheets; 2014.
    9. ASTM C1325 - Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units; 2014.
    10. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2014.
    11. GA-216 - Application and Finishing of Gypsum Board; 2013.

# SUBMITTALS

* + 1. See Section 01 3000 - Administrative Requirements, for submittal procedures.
    2. Shop Drawings: Indicate special details associated with acoustic seals.
    3. Product Data: Provide data on gypsum board, accessories, and joint finishing system.

# QUALITY ASSURANCE

* + 1. Installer Qualifications: Company specializing in performing gypsum board application and finishing and documented experience.

# PART 2 PRODUCTS

* 1. **GYPSUM BOARD ASSEMBLIES**
     1. Provide completed assemblies complying with ASTM C840 and GA-216.

# BOARD MATERIALS

* + 1. Manufacturers - Gypsum-Based Board:

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* + - 1. American Gypsum Company: [www.americangypsum.com.](http://www.americangypsum.com/)
      2. CertainTeed Corporation: [www.certainteed.com.](http://www.certainteed.com/)
      3. Georgia-Pacific Gypsum: [www.gpgypsum.com.](http://www.gpgypsum.com/)
      4. National Gypsum Company: [www.nationalgypsum.com.](http://www.nationalgypsum.com/)
      5. USG Corporation: [www.usg.com.](http://www.usg.com/)
    1. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
       1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
       2. Thickness:
          1. Vertical Surfaces: 1/2 & 5/8 inch.
          2. Ceilings: 1/2 inch.
          3. At other locations as indicated: 1/4 & 3/8 inch.
       3. Paper-Faced Products:
          1. American Gypsum Company; LightRoc Gypsum Wallboard.
          2. Georgia-Pacific Gypsum; ToughRock, ToughRock Fireguard, and ToughRock FireGuard C Gypsum Wallboard.
          3. National Gypsum Company; Gold Bond Brand Gypsum Wallboard.
          4. USG Corporation; Sheetrock Brand Gypsum Panels.
    2. Backing Board For Wet Areas: One of the following products:
       1. Application: Surfaces behind tile in wet areas including wainscots, walls, fixture walls.
       2. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or [ASTM C1325.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1325)
          1. [Thickness: 1/2 inch.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1325)
          2. [Products:](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1325)

[National Gypsum Company; PermaBase Brand Cement Board.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1325)

[USG Corporation; Durock Brand Cement Board.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1325)

* + - 1. [ASTM Cement-Based Board: Non-gypsum-based, cementitious board complying with](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1325) [ASTM C1288.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)
         1. [Thickness: 1/2 inch.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)
         2. [Products:](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)

[James Hardie Building Products, Inc; Hardibacker Cement Board.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)

# [ACCESSORIES](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)

* + 1. [Acoustic Insulation: As specified in Section 07 2100.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)
    2. [Acoustic Sealant: As specified in Section 07 9005.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)
    3. [Joint Materials: ASTM C475 and as recommended by gypsum board manufacturer for project](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288) [conditions.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)
       1. [Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288) [indicated.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)
       2. [Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288) [indicated.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)
    4. [Screws for Attachment to Steel Members Less Than 0.033 inch In Thickness, to Wood](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288) [Members, and to Gypsum Board: ASTM C1002; self-piercing tapping type; cadmium plated for](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288) [exterior locations.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)
    5. [Nails for Attachment to Wood Members: ASTM C514.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)
    6. [Adhesive for Attachment to Wood: ASTM C557.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)

# [PART 3 EXECUTION](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)

* 1. [**EXAMINATION**](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)
     1. [Verify that project conditions are appropriate for work of this section to commence.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)

# [BOARD INSTALLATION](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)

* + 1. [Comply with ASTM C 840, GA-216, and manufacturer's instructions. Install to minimize butt end](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288) [joints, especially in highly visible locations.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)
    2. [Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288) [edges occurring over firm bearing.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)
    3. [Double-Layer Non-Rated: Use gypsum board for first layer, placed parallel to framing or furring](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288) [members, with ends and edges occurring over firm bearing. Use glass mat faced gypsum board](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288) [at exterior walls and at other locations as indicated. Place second layer perpendicular to framing](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288) [or furring members. Offset joints of second layer from joints of first layer.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)
    4. [Cementitious Backing Board: Install over wood framing members and plywood substrate where](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288) [indicated, in accordance with ANSI A108.11 and manufacturer's instructions.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)
    5. [Installation on Wood Framing: For non-rated assemblies, install as follows:](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)
       1. [Single-Layer Applications: Adhesive application.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)
       2. [Double-Layer Application: Install base layer using screws or nails. Install face layer using](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288) [adhesive.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)

# [INSTALLATION OF TRIM AND ACCESSORIES](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)

* + 1. [Control Joints: Place control joints consistent with lines of building spaces and as indicated.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)
       1. [Not more than 30 feet apart on walls and ceilings over 50 feet long.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)
    2. [Corner Beads: Install at external corners, using longest practical lengths.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)
    3. [Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)

# [JOINT TREATMENT](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)

* + 1. [Finish gypsum board in accordance with levels defined in ASTM C840, as follows:](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)
       1. [Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288) [indicated.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)
       2. [Level 1: Wall areas above finished ceilings, whether or not accessible in the completed](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288) [construction.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)
    2. [Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288) [receive finishes.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)
       1. [Feather coats of joint compound so that camber is maximum 1/32 inch.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)
    3. [Fill and finish joints and corners of cementitious backing board as recommended by](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288) [manufacturer.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)

# [TOLERANCES](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)

* + 1. [Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288) [in any direction.](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)

# [END OF SECTION](http://global.ihs.com/doc_detail.cfm?rid=BSD&amp;document_name=ASTM%20C1288)

**PART 1 GENERAL**

* 1. **SECTION INCLUDES**
     1. Surface preparation.
     2. Field application of paints.

# SECTION 09 9113 EXTERIOR PAINTING

* + 1. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
       1. Exposed surfaces of steel lintels and ledge angles.
       2. Mechanical and Electrical:
          1. On the roof and outdoors, paint equipment that is exposed to weather or to view, including factory-finished materials.
    2. Do Not Paint or Finish the Following Items:
       1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
       2. Items indicated to receive other finishes.
       3. Items indicated to remain unfinished.
       4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
       5. Non-metallic roofing and flashing.
       6. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, zinc, and lead.
       7. Floors, unless specifically indicated.
       8. Ceramic and other types of tiles.
       9. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
       10. Exterior insulation and finish system (EIFS).
       11. Glass.
       12. Concealed pipes, ducts, and conduits.

# RELATED REQUIREMENTS

* + 1. Section 09 9123 - Interior Painting.

# DEFINITIONS

* + 1. Conform to ASTM D16 for interpretation of terms used in this section.

# REFERENCE STANDARDS

* + 1. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2014.
    2. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 2007.
    3. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, [www.paintinfo.com.](http://www.paintinfo.com/)

# SUBMITTALS

* + 1. See Section 01 3000 - Administrative Requirements, for submittal procedures.
    2. Product Data: Provide complete list of products to be used, with the following information for each:
       1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
       2. MPI product number (e.g. MPI #47).
       3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
       4. Manufacturer's installation instructions.

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* + 1. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
       1. Where sheen is specified, submit samples in only that sheen.
    2. Manufacturer's Instructions: Indicate special surface preparation procedures.
    3. Maintenance Materials: Furnish the following for Southern Arkansas University's use in maintenance of project.
       1. See Section 01 6000 - Product Requirements, for additional provisions.
       2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
       3. Label each container with color in addition to the manufacturer's label.

# QUALITY ASSURANCE

* + 1. Manufacturer Qualifications: Company specializing in manufacturing the products specified
    2. Applicator Qualifications: Company specializing in performing the type of work specified

# MOCK-UP

* + 1. See Section 01 4000 - Quality Requirements, for general requirements for mock- up.
    2. Locate where directed by Owner.
    3. Mock-up may remain as part of the work.

# DELIVERY, STORAGE, AND HANDLING

* + 1. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
    2. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
    3. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

# FIELD CONDITIONS

* + 1. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
    2. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
    3. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
    4. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

# PART 2 PRODUCTS

* 1. **MANUFACTURERS**
     1. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
     2. Paints:
        1. Base Manufacturer: Sherwin Williams.
        2. Benjamin Moore & Co: [www.benjaminmoore.com.](http://www.benjaminmoore.com/)
        3. PPG Paints: [www.ppgpaints.com.](http://www.ppgpaints.com/)

# PAINTS AND FINISHES - GENERAL

* + 1. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
       1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
       2. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
       3. Supply each paint material in quantity required to complete entire project's work from a single production run.
       4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
    2. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by SAU from the manufacturer's full line.
    3. Colors: As indicated in Color Schedule.
       1. Extend colors to surface edges; colors may change at any edge as directed by SAU.

# PAINT SYSTEMS - EXTERIOR

* + 1. Paint WE-OP-3L - Wood, Opaque, Latex, 3 Coat:
       1. One coat of latex primer sealer.
       2. Semi-gloss: Two coats of latex enamel; A-100 Exterior Latex Satin, A82 Series.
    2. Paint ME-OP-3A - Ferrous Metals, Unprimed, Acrylic, 3 Coat:
       1. One coat of acrylic primer. Sherwin Williams B66-310 Series
       2. Semi-gloss: Two coats of acrylic enamel; Sherwin Williams B66-650 Series.
    3. Paint ME-OP-2A - Ferrous Metals, Primed, Acrylic, 2 Coat:
       1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
       2. Semi-gloss: Two coats of acrylic enamel; Sherwin Williams B66-650 Series.
    4. Paint MgE-OP-3A - Galvanized Metals, Acrylic, 3 Coat:
       1. One coat galvanize primer.
       2. Semi-gloss: Two coats of acrylic enamel; Sherwin Williams B66-650 Series.
    5. Paint MgE-OP-3X - Exterior Metal Handrails & Door Frames, Acrylic, 3 Coat:
       1. One coat ProCryl Universal Primer B66-310 Series.
       2. Semi-gloss: Two coats of DTM acrylic enamel; Sherwin Williams B66-200 Series.

# ACCESSORY MATERIALS

* + 1. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
    2. Patching Material: Latex filler.
    3. Fastener Head Cover Material: Latex filler.

# PART 3 EXECUTION

* 1. **EXAMINATION**
     1. Do not begin application of paints and finishes until substrates have been properly prepared.
     2. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
     3. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
     4. Test shop-applied primer for compatibility with subsequent cover materials.
     5. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
        1. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.

# PREPARATION

* + 1. Clean surfaces thoroughly and correct defects prior to application.
    2. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
    3. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
    4. Seal surfaces that might cause bleed through or staining of topcoat.
    5. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
    6. Exterior Gypsum Board: Fill minor defects with exterior filler compound. Spot prime defects after repair.
    7. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.
    8. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

# APPLICATION

* + 1. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
    2. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.
    3. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
    4. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
    5. Apply each coat to uniform appearance.
    6. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.
    7. Sand wood and metal surfaces lightly between coats to achieve required finish.
    8. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
    9. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
    10. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

# CLEANING

* + 1. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

# PROTECTION

* + 1. Protect finishes until completion of project.
    2. Touch-up damaged finishes after Substantial Completion.

# PAINT SCHEDULE

* + 1. Wood Board & Batten Siding & Trim
    2. Porch Floor and Steps
    3. Handrails
    4. Windows & Doors

# END OF SECTION

**PART 1 GENERAL**

* 1. **SECTION INCLUDES**
     1. Surface preparation.

# SECTION 09 9123 INTERIOR PAINTING

* + 1. Field application of paints, stains, and varnishes.
    2. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
       1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
       2. Prime surfaces to receive wall coverings.
       3. Mechanical and Electrical:
          1. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
          2. In finished areas, paint shop-primed items.
          3. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
    3. Do Not Paint or Finish the Following Items:
       1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
       2. Items indicated to receive other finishes.
       3. Items indicated to remain unfinished.
       4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
       5. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, and lead items.
       6. Marble, granite, slate, and other natural stones.
       7. Floors, unless specifically indicated.
       8. Ceramic and other tiles.
       9. Glass.
       10. Concealed pipes, ducts, and conduits.

# RELATED REQUIREMENTS

* + 1. Section 09 9113 - Exterior Painting.
    2. Section 09 9125 - Refinishing Wood Floors

# DEFINITIONS

* + 1. Conform to ASTM D16 for interpretation of terms used in this section.

# REFERENCE STANDARDS

* + 1. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
    2. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2014.
    3. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 2007.
    4. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, [www.paintinfo.com.](http://www.paintinfo.com/)
    5. SSPC-SP 1 - Solvent Cleaning; 2015.
    6. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).
    7. SSPC-SP 3 - Power Tool Cleaning; 1982 (Ed. 2004).

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* + 1. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

# SUBMITTALS

* + 1. See Section 01 3000 - Administrative Requirements, for submittal procedures.
    2. Product Data: Provide complete list of products to be used, with the following information for each:
       1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
       2. MPI product number (e.g. MPI #47).
       3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
       4. Manufacturer's installation instructions.
    3. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
       1. Where sheen is specified, submit samples in only that sheen.
    4. Manufacturer's Instructions: Indicate special surface preparation procedures.
    5. Maintenance Materials: Furnish the following for Southern Arkansas University's use in maintenance of project.
       1. See Section 01 6000 - Product Requirements, for additional provisions.
       2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
       3. Label each container with color in addition to the manufacturer's label.

# QUALITY ASSURANCE

* + 1. Manufacturer Qualifications: Company specializing in manufacturing the products specified.

# MOCK-UP

* + 1. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.
    2. Provide panel, 3 feet long by 3 feet wide, illustrating each paint color, texture, and finish.
    3. Provide mock-up on-site of each accent paint colors selected by Owner, minimum 3 feet long by 3 feet wide, in location as directed by Owner. Accent colors to be reviewed by Owner for final approval PRIOR to accent painting starting. Proceeding with Accent painting without approval is done so at Contractor's own risk.
    4. Provide door and frame assembly illustrating paint color, texture, and finish.
    5. Locate where directed by Owner.
    6. Mock-up may remain as part of the work.

# DELIVERY, STORAGE, AND HANDLING

* + 1. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
    2. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
    3. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

# FIELD CONDITIONS

* + 1. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
    2. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
    3. Do not apply materials when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.
    4. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.
    5. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior, unless required otherwise by manufacturer's instructions.
    6. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

# PART 2 PRODUCTS

* 1. **MANUFACTURERS**
     1. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
     2. Paints:
        1. Base Manufacturer: Sherwin Williams Company.
        2. Benjamin Moore & Co: [www.benjaminmoore.com.](http://www.benjaminmoore.com/)
        3. PPG Paints: [www.ppgpaints.com.](http://www.ppgpaints.com/)
        4. Pratt & Lambert Paints: [www.prattandlambert.com.](http://www.prattandlambert.com/)
     3. Transparent Finishes:
        1. Sherwin-Williams Company: [www.sherwin-williams.com.](http://www.sherwin-williams.com/)
     4. Stains:
        1. Sherwin-Williams Company: [www.sherwin-williams.com.](http://www.sherwin-williams.com/)
     5. Primer Sealers: Same manufacturer as top coats.
     6. Block Fillers: Same manufacturer as top coats.

# PAINTS AND FINISHES - GENERAL

* + 1. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
       1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
       2. Supply each paint material in quantity required to complete entire project's work from a single production run.
       3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
    2. Colors: As indicated on drawings.
       1. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Southern Arkansas University.
       2. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

# PAINT SYSTEMS - INTERIOR

* + 1. Paint WI-OP-3A - Wood, Opaque, Alkyd, 3 Coat: Wood Trim
       1. One coat alkyd primer sealer.
       2. Semi-gloss: Two coats of alkyd enamel.
    2. Paint WI-OP-3L - Wood, Opaque, Latex, 3 Coat:
       1. One coat of latex primer sealer. PrepRite ProBlock Latex Primer Sealer B51 Series
       2. Semi-gloss: Two coats of latex enamel; Pro Industrial Acrylic Semi Gloss B66-650 Series.
    3. Paint WI-TR-VS - Wood, Transparent, Varnish, Stain: (Refer to 09 9125 for floors)
       1. One coat of stain; Wood Clasics 250 Stain A49-800 Series.
       2. One coat sealer.
       3. Satin: Two coats of varnish; Waterborne Polyurethane Satin A68 Series.
    4. Paint MI-OP-3L - Ferrous Metals, Unprimed, Latex, 3 Coat:
       1. One coat of acrylic primer. ProCryl Universal Primer B66-310 Series
       2. Semi-gloss: Two coats of acrylic enamel; Pro Industrial Semi-Gloss B66-650 Series.
    5. Paint MI-OP-2A - Ferrous Metals, Primed, Acrylic, 2 Coat:
       1. Touch-up with reccommended primer.
       2. Semi-gloss: Two coats of acrylic enamel; Pro Industrial Semi Gloss B66-650 Series.
    6. Paint MI-OP-2L - Ferrous Metals / Roof Deck / Exposed Interior Structure, Primed, Latex, 2 Coat:
       1. Touch-up with reccommended primer. Pro-Cryl B66-310 Series
       2. Semi-gloss: Two coats of water borne acrylic dryfall Pro Industrial Semi Gloss B42-80 Series. .
    7. Paint GI-OP-3L - Gypsum Board/Plaster, Latex, 3 Coat:
       1. One coat of alkyd primer sealer. ProMar 200 Primer B28W2600 Series
       2. Semi-gloss: Two coats of latex enamel.
       3. Eggshell: Two coats of latex enamel; ProMar 200 B20-2600 Series.
       4. Flat: Two coats of latex enamel; B30-2600 Series (ceilings).

# ACCESSORY MATERIALS

* + 1. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
    2. Patching Material: Latex filler.
    3. Fastener Head Cover Material: Latex filler.

# PART 3 EXECUTION

* 1. **EXAMINATION**
     1. Do not begin application of paints and finishes until substrates have been properly prepared.
     2. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
     3. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
     4. Test shop-applied primer for compatibility with subsequent cover materials.

# PREPARATION

* + 1. Clean surfaces thoroughly and correct defects prior to application.
    2. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
    3. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
    4. Seal surfaces that might cause bleed through or staining of topcoat.
    5. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
    6. Concrete:
       1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
    7. Galvanized Surfaces:
       1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
    8. Ferrous Metal:
       1. Solvent clean according to SSPC-SP 1.
       2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
       3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.
    9. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.
    10. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

# APPLICATION

* + 1. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
    2. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
    3. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
    4. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
    5. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
    6. Sand wood and metal surfaces lightly between coats to achieve required finish.
    7. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
    8. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

# CLEANING

* + 1. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

# PROTECTION

* + 1. Protect finishes until completion of project.
    2. Touch-up damaged finishes after Substantial Completion.

# SCHEDULE - INTERIOR PAINT SYSTEMS

* + 1. Gypsum Wall Board - Latex
    2. Wood Trim - Oil / Alkyd
    3. Wood Board & Batten - Stain & Varnish
    4. Wood Floors - Stain & Varnish

# END OF SECTION

# PART 1 GENERAL

* 1. **SUMMARY**

**SECTION 09 9125 REFINISHING WOOD FLOORS**

* + 1. This procedure includes guidance on removing an existing wood finish and refinishing with a stain, varnish or wax.

# SUBMITTALS

* + 1. See Section 01 3000 - Administrative Requirements, for submittal procedures.
    2. Samples:
       1. The Contractor shall refinish two (2) sample areas for approval by the Owner or designated representative. Locations of sample areas shall be as selected by the Owner or designated representative
       2. The Contractor shall obtain written approval from the Owner or designated representative of wood refinishing methods, materials, and sample panels before proceeding with the work of this section. Approved sample panels shall be marked and protected for the duration of the project. They shall be used as the standard for similar work throughout the project.
       3. In the case of rejection of the sample areas, these locations shall be re-stripped and refinished until approved by the Owner or designated representative.

# PROJECT CONDITIONS

* + 1. Environmental Requirements:
       1. No painting, glazing, varnishing or sizing shall be performed when surface and air temperatures are below 10 degrees C.
       2. Floor refinishing shall not be performed until all surfaces are suitably dry. Moisture content shall be determined by means of a moisture meter, and shall comply with the recommendations of the finish manufacturer.
       3. Provide adequate continuous ventilation and sufficient heating before, during and after application or as specified in manufacturer’s product instructions or recommendations. Provide means of exhaust so as to prevent fumes from affecting other areas of work or personnel. Protect all surfaces from dust and other particulate matter generated by this or other work.
    2. HISTORIC BUILDING: The project work involves the renovation of an historically significant building. The building shall be treated respectfully. Existing conditions are to be carefully treated. Materials and finishes adjoining the work specified herein are to be protected from damage as a result of this work. No material or element shall be removed or disfigured unless specifically indicated on the drawings, specified herein or directed by the Owner.
    3. Safety Precautions: The Contractor must comply with the following safety precautions during finishing and refinishing work:
       1. All work shall be performed in accordance with NFPA 30 Flammable and Combustible Liquids Code and OSHA 39 CFR, Prt 1910.
       2. The Contractor shall strictly adhere to the manufacturer’s instructions for safe applications of all cleaning, sealing, resurfacing and stripping materials.
       3. All rags and other debris shall be disposed of nightly and removed from the building.
       4. The amount of combustible liquids on the job site shall not exceed the maximum amount necessary for daily use. In addition, the quantity must not exceed that permitted by NFPA

30. All liquids must be kept in shipping containers or in U.L. listed devices.

* + - 1. The storage of product applicators (e.g., brushes, rags, towels, etc.) on site shall be in approved safety containers or containers with metal lids.
      2. Smoking materials, electrical devices, etc., are strictly prohibited during delivery, application, and drying phases of any liquid whose MSDS cautions against potential fire or ignition hazards.
      3. Adequate ventilation must be provided in each area that solvents, cleaners, strippers and varnishes are used, so that accumulations of volatile vapors is below flammable and/or explosive range.
      4. Work involving the use of combustible liquids shall not be performed during hours when the subject areas are occupied.
      5. All other elements of the building must be adequately protected from solvents, strippers, stains, washes, etc. This includes marble, metalwork, and all decorative details, etc. Sawdust or other absorbent compound should be used to absorb runoff of cleaning.
      6. A fully charged fire extinguisher suitable for Class B fires shall be kept in each area where varnishes are freshly applied.
      7. The Contractor shall make sure that adequate heat is maintained in each area where floor refinishes are freshly applied.
      8. The Contractor shall provide multiple fans with high CFM to move fumes out of the building and away from areas where work is being done.
      9. Compressor motors, heat lamps, etc., must be explosion-proof type.
      10. Workmen shall wear full-face respirators with cartridges or canisters bearing NIOSHapproval for protection against vapors.

# QUALITY ASSURANCE

* + 1. General Objective: The objectives of wood refinishing and cleaning are to give wood surfaces a smooth, uniform appearance consistent with the original design intent, and to preserve the inherent patina. Splotches, streaks,runs, or any other kind of spotty appearance shall not be accepted. Too aggressive cleaning or sanding shall not be accepted.
    2. Work Standards: Basic reference and standard for wood refinishing shall be "Wood Finishing and Refinishing Revised Edition," by S.W. Gibbia, New York: Van Nostrand Reinhold Co., 1971
    3. Contractor: A firm with experience in wood refinishing and restoration. The Owner or designated representative reserves the right to approve or disapprove the use of the Contractor contingent upon their experience.
    4. Refinish Standard: Sample areas shall be prepared which shall form a standard for wood refinishing.
    5. Refinishing is defined as all the process(es) necessary to restore woodwork. Stripping is defined as the process of removing existing coatings from woodwork without damage to the wood. Finishing is defined as the process of applying stain and protective coating and all related preparatory and follow-up tasks. Cleaning is defined as the removal of dirt embedded in the upper finish layers and does not include the removal of any finish layer.
    6. Single Source Responsibility: Provide compatible finish coating, thinner, sanding sealer, and wood filler that are produced by the same manufacturer.
    7. Regulatory Requirements: Comply with municipal and Federal regulations governing the refinishing operations, chemical waste disposal, and scaffolding.

# PART 2 PRODUCTS

* 1. **MANUFACTURERS**
     1. Bonakemi USA, Inc.

14805 East Moncrieff Place Aurora, CO 80011

800/872-5515 or 303/371-141

* + 1. Butcher Polish Company

120 Bartlett Street Marlborough, MA 617/481-5700

* + 1. 3M Consumer Products Group Box 33053

St. Paul, MN 55133-3053

612/737-6501 or 800/364-3577

* + 1. The Sherwin Williams Co.

101 Prospect Ave. NW Cleveland, OH 44101 216/566-2000.

* + 1. Specialty Environmental Technologies, Inc. 4520 Glenmeade Lane

Auburn Hills, MI 48326 810/340-0400

# MATERIALS

* + 1. Commercial Paint and Varnish Remover such as "Citristrip" (Specialties Environmental Technologies, Inc.), "Safest Stripper" (3M), or approved equal
    2. Mineral Spirits:
       1. A petroleum distillate that is used especially as paint or varnish thinner.
       2. Other chemical or common names include Benzine\* (not Benzene); Naphtha\*; Petroleum spirits\*; Solvent naphtha\*.
       3. Potential Hazards: TOXIC AND FLAMMABLE.
       4. Safety Precautions:
          1. AVOID REPEATED OR PROLONGED SKIN CONTACT.
          2. ALWAYS wear rubber gloves when handling mineral spirits.
          3. If any chemical is splashed onto the skin, wash immediately with soap and water.
       5. Available from construction specialties' distributor, hardware store, paint store, or printer's supply distributor.

# -OR-

Turpentine:

1. Typically used as a solvent and thinner.
2. Potential Hazards: TOXIC AND FLAMMABLE.
3. Safety Precautions:
   1. Work in a well ventilated area.
   2. Observe safety rules as turpentine is flammable, and the fumes can trip an ionization smoke detection system.
   3. Store soiled cloths in a metal safety container to guard against spontaneous combustion.
4. Available from hardware store or paint store.

# -OR-

Solvent Wax Remover such as "Woodline Renovator" (Bonakemi USA, Inc.), or approved equal.

* + 1. Wood filler in color to match original stain.

CAUTION: WOOD FILLERS CONTAINING A LINSEED OIL VEHICLE MAY CAUSE WHITE SPOTS TO DEVELOP IN THE LACQUER FINISH COAT.

* + 1. Oil stain or universal stain (Sherwin Williams), or approved equal.
    2. Alkyd or urethane-base satin varnish (Sherwin Williams), or approved equal.
    3. Paste wax (non-yellowing) such as "Butcher's Paste Wax" (Butcher Polish Company), or approved equal.

# EQUIPMENT

* + 1. 000 steel wool
    2. Steel or brass wire brushes
    3. Stiff fiber bristle brushes
    4. Putty knife or broad knife
    5. Clean, dry cloths (cheese cloth or gauze)
    6. Orbital Sander
    7. Electric floor polisher
    8. Nylon web scrubbing pads
    9. Lamb's wool buffing pads

# PART 3 EXECUTION

* 1. **EXAMINATION**
     1. Verify that project conditions are appropriate for work of this section to commence.

# INSTALLATION

* + 1. Remove Existing Coating:
       1. Work in areas approximately 4' by 4' at one time.

# NOTE: DO NOT USE WATER ON THE WOOD SURFACE.

* + - 1. Special Procedures for Varnished Wood Floors:
         1. Sand the floor with an orbital sander to remove stains, old finish and indentations in the wood. Sand in direction of wood grain.

# NOTE: DO NOT REMOVE MORE THAN 1/16" OF THE WOOD SURFACE.

* + - * 1. Remove dust from floor with vacuum and tack cloth.
      1. Special Procedures for Waxed Wood Floors:

NOTE: Some sophisticated modern waxes, formulate for long wear and for high production commercial use, require special strippers that most often are not appropriate for historic materials because the ingredients cannot be readily detected. Some silicon waxes can only be removed by abrasion.

NOTE: WORK IN A WELL-VENTILATED ROOM. OBSERVE SAFETY RULES AS BOTH THE TURPENTINE AND THE WAX ARE FLAMMABLE, AND THE FUMES CAN TRIP AN IONIZATION SMOKE DETECTION SYSTEM. STORE SOILED CLOTHS IN A METAL SAFETY CONTAINER TO GUARD AGAINST SPONTANEOUS COMBUSTION.

* + - * 1. Dampen small area of floor with turpentine or mineral spirits, or apply wax remover evenly over the floor following manufacturer's instructions.
        2. Using a 16" electric floor machine, scrub lightly with a piece of 000 steel wool or nylon web scrubbing pad. Change steel wool or pads as they become clogged with old wax.
        3. Wipe up solvent and wax with clean cloths.
        4. Continue cleaning in this manner until all of the old wax has been removed. Allow floor to dry, approximately 15-20 minutes after the last area has been cleaned.
        5. Apply wax and buff. Apply two or more thin coats rather than one thick coat. Buff after each coat.
    1. Fill scratches, gouges and dents with wood filler.
    2. Apply a high quality paste wood filler with a brush to all open grain wood species (i.e., Oak) before staining.
       1. Dampen a clean cloth with mineral spirits and wipe the paste off across the grain of the wood to enable the filler to remain in the grain depressions.
       2. Allow the filler to fully dry before applying the stain or varnish.
    3. Stain and Varnish the Wood:
       1. On a SAMPLE area 12 inches square, brush apply oil stain or universal stain.
       2. Allow the stain to penetrate the wood for at least 5-10 minutes.
       3. Remove excess stain with a clean, lint-free cloth. Rub the wood parallel to the grain.
       4. Allow the stain to dry at least 12 hours before applying varnish.
       5. Brush apply one coat of alkyd or urethane-base satin varnish. Varnish should be thin, but not watery.
       6. Allow to dry for at least 24 hours.
       7. When dry, buff the surface with 000 steel wool and dry-brush with a fiber bristle brush to remove any metal particles left behind from the steel wool. A tack rag may also be used to remove dust from the surface.
       8. Apply second coat of satin varnish (full-strength).
       9. Allow to fully dry.
       10. Buff the surface with 000 steel wool and dry-brushwith a fiber bristle brush to remove any metal particles left behind from the steel wool.
       11. If sample is approved by Owner, follow the same procedures for all remaining wood.
       12. For areas subject to wear (i.e., handrails, wainscot, etc.):
           1. After buffing the final coat of varnish, apply one coat of non-yellowing paste wax.

# END OF SECTION

# ~~PART 1 GENERAL 1.01 SECTION INCLUDES~~

1. ~~Cash allowance for signs.~~
2. ~~Room and door signs.~~
3. ~~Plaque.~~

# SECTION 10 1400 ~~SIGNAGE~~

* 1. **~~PRICE AND PAYMENT PROCEDURES~~**
     1. ~~See Section 01 2100 - Allowances, for cash allowances affecting this section.~~
     2. ~~Allowance amount covers purchase, delivery, and installation.~~

# ~~REFERENCE STANDARDS~~

* + 1. ~~36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.~~
    2. ~~ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.~~

# ~~FIELD CONDITIONS~~

* + 1. ~~Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.~~
    2. ~~Maintain this minimum temperature during and after installation of signs.~~

# ~~PART 2 PRODUCTS 2.01 MANUFACTURERS~~

1. ~~Flat Signs:~~
   1. ~~Best Sign Systems, Inc:~~ [~~www.bestsigns.com.~~](http://www.bestsigns.com/)
   2. ~~Cosco Industries (ADA signs); ADA Series 1:~~ [~~www.coscoarchitecturalsigns.com.~~](http://www.coscoarchitecturalsigns.com/)
   3. ~~InPro Corporation; Aspen produced in one piece photopolymer media:~~ [~~www.inprocorp.com.~~](http://www.inprocorp.com/)
   4. ~~Mohawk Sign Systems, Inc:~~ [~~www.mohawksign.com.~~](http://www.mohawksign.com/)
2. ~~Plaques:~~
   1. ~~Cosco Industries; Cast Aluminum:~~ [~~www.coscoarchitecturalsigns.com.~~](http://www.coscoarchitecturalsigns.com/)

# ~~SIGNAGE APPLICATIONS~~

* + 1. ~~Accessibility Compliance: All signs are required to comply with ADA Standards for Accessible Design and ANSI/ICC A 117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.~~
    2. ~~Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.~~
       1. ~~Sign Type: Flat signs with engraved panel media as specified.~~
       2. ~~Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.~~
       3. ~~Character Height: 1 inch.~~
       4. ~~Sign Height: 2 inches, unless otherwise indicated.~~
       5. ~~Office Doors: Identify with room numbers to be determined later, not the numbers shown on the drawings; in addition, provide "window" section for replaceable occupant name.~~
       6. ~~Conference and Meeting Rooms: Identify with room numbers to be determined later, not the numbers shown on the drawings; in addition, provide "window" section with sliding "In Use/Vacant" indicator.~~
       7. ~~Service Rooms: Identify with room names and numbers to be determined later, not those shown on the drawings.~~
       8. ~~Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.~~
    3. ~~Plaque: See Allowance for details.~~

# ~~SIGN TYPES~~

* + 1. ~~Flat Signs: Signage media without frame.~~
       1. ~~Edges: Square.~~
       2. ~~Corners: Square.~~
       3. ~~Wall Mounting of One-Sided Signs: Tape adhesive.~~
    2. ~~Color and Font: Unless otherwise indicated:~~
       1. ~~Character Font: Helvetica, Arial, or other sans serif font.~~
       2. ~~Character Case: Upper case only.~~
       3. ~~Background Color: Clear.~~
       4. ~~Character Color: Contrasting color.~~

# ~~TACTILE SIGNAGE MEDIA~~

* + 1. ~~Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:~~
       1. ~~Total Thickness: 1/16 inch.~~

# ~~PLAQUES~~

* + 1. ~~Metal Plaques:~~
       1. ~~Metal: Aluminum casting.~~
       2. ~~Metal Sheet Thickness: 1/8 inch, minimum.~~
       3. ~~Size and Design: To Be Determined.~~

# ~~ACCESSORIES~~

* + 1. ~~Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.~~
    2. ~~Tape Adhesive: Double sided tape, permanent adhesive.~~

# ~~PART 3 EXECUTION 3.01 EXAMINATION~~

~~A.~~ ~~Verify that substrate surfaces are ready to receive work.~~

# ~~INSTALLATION~~

* + 1. ~~Install in accordance with manufacturer's instructions.~~
    2. ~~Install neatly, with horizontal edges level.~~
    3. ~~Locate signs where indicated:~~
       1. ~~Room and Door Signs: Locate on wall at latch side of door with centerline of sign at 60 inches above finished floor.~~
       2. ~~If no location is indicated obtain Southern Arkansas University's instructions.~~
    4. ~~Protect from damage until Substantial Completion; repair or replace damage items.~~

# END OF SECTION

**~~PART 1 GENERAL 1.01 SECTION INCLUDES~~**

~~A.~~ ~~Chemical soil treatment.~~

# ~~REFERENCE STANDARDS~~

**SECTION 31 3116 ~~TERMITE CONTROL~~**

* + 1. ~~Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act; 1947 (Revised 2001).~~

# ~~SUBMITTALS~~

* + 1. ~~See Section 01 3000 - Administrative Requirements, for submittal procedures.~~
    2. ~~Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.~~
    3. ~~Manufacturer's Application Instructions: Indicate caution requirements .~~
    4. ~~Certificate of compliance from authority having jurisdiction indicating approval of toxicants.~~
    5. ~~Record moisture content of soil before application.~~

# ~~QUALITY ASSURANCE~~

* + 1. ~~Installer Qualifications: Company specializing in performing this type of work and:~~
       1. ~~Approved by manufacturer of treatment materials.~~
       2. ~~Licensed in State of Arkansas.~~

# ~~WARRANTY~~

* + 1. ~~See Section 01 7800 - Closeout Submittals, for additional warranty requirements.~~
    2. ~~Provide five year installer's warranty against damage to building caused by termites.~~
       1. ~~Inspect annually and report in writing to Southern Arkansas University. Provide inspection service for 4 years from Date of Substantial Completion.~~

# ~~PART 2 PRODUCTS 2.01 MATERIALS~~

1. ~~Manufacturers:~~
   1. ~~Bayer Environmental Science Corp:~~ [~~www.backedbybayer.com/pest-management.~~](http://www.backedbybayer.com/pest-management)
   2. ~~FMC Professional Solutions:~~ [~~www.fmcprosolutions.com.~~](http://www.fmcprosolutions.com/)
   3. ~~Syngenta Professional Products:~~ [~~www.syngentaprofessionalproducts.com.~~](http://www.syngentaprofessionalproducts.com/)
   4. ~~Substitutions: See Section 01 6000 - Product Requirements.~~
2. ~~Toxicant Chemical: EPA approved; synthetically color dyed to permit visual identification of treated soil.~~
3. ~~Diluent: Recommended by toxicant manufacturer.~~

# ~~MIXES~~

* + 1. ~~Mix toxicant to manufacturer's instructions.~~

# ~~PART 3 EXECUTION 3.01 EXAMINATION~~

1. ~~Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.~~
2. ~~Verify final grading is complete.~~

# ~~APPLICATION~~

* + 1. ~~Comply with requirements of U.S. EPA and applicable state and local codes.~~
    2. ~~Spray apply toxicant in accordance with manufacturer's instructions.~~

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* + 1. ~~Apply toxicant at following locations:~~
       1. ~~In Crawl Spaces.~~
       2. ~~At Both Sides of Foundation Surface.~~
    2. ~~At foundation walls, apply toxicant immediately prior to finish grading work outside foundations.~~
    3. ~~Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.~~
    4. ~~Re-treat disturbed treated soil with same toxicant as original treatment.~~
    5. ~~If inspection or testing identifies the presence of termites, re-treat soil and re-test.~~

# ~~PROTECTION~~

* + 1. ~~Do not permit soil grading over treated work.~~

# END OF SECTION

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# SECTION 32 1376 SIDEWALKS

**PART 1 - GENERAL**

* 1. **~~WORK INCLUDED~~**
     1. ~~Providing concrete sidewalk where shown on Drawings.~~
     2. ~~Providing concrete handicap ramps where shown on Drawings.~~

# ~~RELATED WORK~~

* + 1. ~~Section 31 20 00 – Earth Moving.~~
    2. ~~Section 32 05 23 – Cement and Concrete for Exterior Improvements.~~
    3. ~~Section 33 05 16 – Manholes and Structures.~~

# ~~SUBMITTALS~~

* + 1. ~~See Related Work~~

# ~~REFERENCE STANDARDS~~

* + 1. ~~American Society for Testing and Materials (ASTM):~~
       1. ~~ASTM D 1751, Specifications for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).~~

# ~~PART 2 - PRODUCTS~~

* 1. **~~CONCRETE~~**
     1. ~~General: Materials for use in sidewalk construction shall conform to the requirements for Section 32 05 23, and shall be 3500 psi concrete.~~

# ~~WORK INCLUDED~~

* + 1. ~~The joint filler for all expansion joints shall be manufactured according to ASTM D 1751 and shall be elastic waterproof pre-molded compound that will not become soft and push out in hot weather, nor hard and brittle and chip out in cold weather. The strips shall be ½” in thickness except where shown otherwise on the Drawings; their width shall at least equal the full thickness of the slab; and their length shall at least equal the width of the slab at the joint.~~

# ~~FORMS~~

* + 1. ~~Forms shall be steel or 2” nominal thickness lumber true to proper dimensions, smooth, sufficiently braced to resist springing out of shape, and accurately set to proper lines and grades. Used forms shall be free of dirt and mortar. Cross forms shall be ¼” steel of the full~~

~~width and depth of the concrete work and left in place until the wearing surface has been floated and has obtained its initial set.~~

# ~~CURING COMPOUND~~

* + 1. ~~Liquid membrane forming curing compound conforming to AASHTO M 148, Type 2, white pigmented (all-resin base).~~

# PART 3 - EXECUTION

* 1. **~~GRADING AND SUBGRADING~~**
     1. ~~Prepare subgrade for walks by excavating or filling to a depth below the top of an intended pavement equal to the thickness of the finished walk and in exact conformity to the grade approved by the Engineer. Remove vegetative matter or material that will not compact properly and replace with suitable material. Place all fill required to bring the subgrade to the proper level in thin layers not exceeding 4 inches deep, and thoroughly ram, tamp or roll until it has been made compact and solid. Bring subgrade to true grade in a uniformly firm condition before placing the concrete. Do not place concrete on the subgrade until the Engineer has inspected and approved both grade and condition of subgrade.~~

# ~~SETTING FORMS~~

* + 1. ~~Stake forms and hold to the established lines and grades. Provide minimum 1/8” per foot fall away from structures or as shown on the drawings.~~

# ~~TREATMENT~~

* + 1. ~~Wet wood and coat metal forms with oil, soft soap, or whitewash before depositing any material against them. Remove all mortar and dirt from forms that have been previously used.~~

# ~~MARKINGS~~

* + 1. ~~Cut surface of concrete walks into flags by marking with an edging tool having a radius of ¼”. Make flags not longer than 6 feet on any side nor longer than the width of the sidewalk. Round the slabs on all surface edges, including the cross markings between flags, to a radius of ¼”.~~

# ~~JOINTS~~

* + 1. ~~Provide an expansion joint ½” in thickness, extending full depth of the concrete and with filler as herein specified, at intervals of not more than 15 feet. Provide a similar joint ½” in thickness in each walkway at intersection of walkways. Also provide an expansion joint ½” in thickness at each intersection of sidewalk and street curb and at such other points as may be designated by the Engineer. Separate sidewalk from abutting structures by ½” expansion joints. Place expansion joints ½” in thickness extending full depth of the concrete in a square outline around each object in sidewalks, such as fire hydrants, utility poles light standards, etc.~~

# ~~PLACING CONCRETE~~

* + 1. ~~Place concrete only on a moist subgrade and not adjacent to or around utility structures until such structures have been set to the proper grade.~~
    2. ~~Transport from the mixer and place by such a means as will not cause segregation of materials or loss of ingredients. Deposit successive batches in one layer by a continuous operation, completing individual sections to the required depth and width. Do not use concrete that has taken its initial set. Fill forms and bring the concrete to the established grade by means of a strike board or straight edge. Thoroughly tamp concrete until mortar is flushed to the surface sufficiently to finish and mark the surface.~~
    3. ~~Spade and/or vibrate the concrete so that it will flow together and completely fill all void spaces especially along forms (including cross forms of joints) to prevent honeycombing and shall be struck off and tamped in an approved manner, until dense surface is obtained, free from porous or rough spots and at the required sections and grade.~~
    4. ~~Use method of placing the various sections so as to produce a straight clean-out joint between them, in order to make each section and independent unit. Do not use any concrete in excess of that needed to complete a section at the stopping of work.~~
    5. ~~Do not pour concrete when temperature is below 35 degrees Fahrenheit, and do not place concrete on frozen subgrade. Take all necessary precautions to prevent damage to concrete in excess of that needed to complete a section at the stopping of work.~~
    6. ~~At all times during construction period, maintain proper drainage, by natural flow or pumping as required, so that water will drain away from excavated areas. Do not allow water to stand in any excavations, or elsewhere, to be covered by concrete. Provide and maintain in proper working order all necessary pumping and other equipment required to maintain drainage.~~

# ~~FINISH~~

* + 1. ~~After the concrete has been brought to the established grade by means of a strike board and tamped to bring the mortar to surface, float to a true even surface and finish with steel trowel. After the trowel finish has taken its initial set, brush surface lightly at right angles to center line of sidewalk with a soft bristle brush.~~
    2. ~~Do not apply heat to the concrete surface to hasten its hardening.~~

# ~~CURING AND PROTECTION:~~

* + 1. ~~As soon as the concrete has hardened sufficiently to prevent damage, apply specified liquid membrane-forming curing compound in accordance with manufacturer’s written instructions.~~
    2. ~~Protect the freshly finished concrete from hot sun and drying winds until the curing compound is applied. Do not allow the concrete surface to be damaged or pitted by raindrops. Provide and use, when necessary, sufficient tarpaulins to completely cover all sections that have been placed within the proceeding twelve hours. Erect and maintain suitable barriers to protect the concrete. Repair any section damaged from traffic or other causes occurring prior to its official acceptance. Before the sidewalk is opened to traffic, remove and dispose of the covering.~~

# ~~FREEZING TEMPERATURE~~

* + 1. ~~If at any time during the progress of the work, the temperature is predicted to drop below 35 degrees Fahrenheit within 24 hours after placement, heat the water and aggregates and take precautions to protect the work from freezing for at least five days.~~

**PART 1 GENERAL**

* 1. **SUMMARY**

**SECTION 26 0000**

**SUPPLEMENTARY ELECTRICAL GENERAL CONDITIONS**

* + 1. Section includes supplementary general requirements for the following:
       1. Codes and Standards
       2. Conflicting Requirements
       3. Specifications and Drawing Conventions
       4. Phased Construction
       5. Coordination with Occupants
       6. Work Restrictions
       7. Fees, Permits, and Inspection
       8. Submittals
       9. Products
       10. Warranties
       11. Electrical License Requirement
       12. Delegated Design
       13. Coordination Drawings
       14. Operation and Maintenance Manuals
       15. Record Drawings
       16. Owner Training
       17. Demolition, Salvage, and Waste
       18. General Coordination for Electrical Work
       19. Cutting and Patching
       20. Excavation and Trenching
       21. Painting
       22. Continuity Tests
       23. Connection Torque Tests
       24. Ground Resistance Measurements
       25. Mechanical Operation Tests
       26. Rotational Tests
       27. 600 Volt Insulation Test
  1. **DEFINITIONS**
     1. General: Basic Contract definitions are included in the Conditions of the Contract.
     2. "Approved": When used to convey Owner's action on Contractor's submittals, applications, and requests, "approved" is limited to Owner's duties and responsibilities as stated in the Conditions of the Contract.
     3. "Directed": A command or instruction by Owner. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
     4. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
     5. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
     6. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
     7. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
     8. "Provide": Furnish and install, complete and ready for the intended use.
     9. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.
     10. 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.
     11. Basis-of-Design Product: A product in which a specific manufacturer's product is named on the drawings or is accompanied by the words "basis-of-design product" in the specifications, 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.
     12. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
     13. Informational Submittals: Written and graphic information and physical samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
     14. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
     15. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.
     16. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
     17. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
     18. 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.
     19. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
     20. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.
     21. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
     22. Subsystem: A portion of a system with characteristics similar to a system.
     23. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
     24. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.
  2. **ABBREVIATIONS AND ACRONYMS**
     1. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

|  |  |  |
| --- | --- | --- |
| AABC | Associated Air Balance Council [www.aabchq.com](http://www.aabchq.com/) | (202) 737-0202 |
| ABMA | American Bearing Manufacturers Association [www.abma-dc.org](http://www.abma-dc.org/) | (202) 367-1155 |
| AGA | American Gas Association [www.aga.org](http://www.aga.org/) | (202) 824-7000 |
| AHRI | Air-Conditioning, Heating, and Refrigeration Institute, The [www.ahrinet.org](http://www.ahrinet.org/) | (703) 524-8800 |
| AIA | American Institute of Architects (The) | (800) 242-3837 |
|  | [www.aia.org](http://www.aia.org/) | (202) 626-7300 |
| ANSI | American National Standards Institute [www.ansi.org](http://www.ansi.org/) | (202) 293-8020 |
| ASCE | American Society of Civil Engineers | (800) 548-2723 |
|  | [www.asce.org](http://www.asce.org/) | (703) 295-6300 |
| ASHRAE | American Society of Heating, Refrigerating and Air-Conditioning Engineers  [www.ashrae.org](http://www.ashrae.org/) | (800) 527-4723  (404) 636-8400 |
| ASME | ASME International | (800) 843-2763 |
|  | (American Society of Mechanical Engineers International) [www.asme.org](http://www.asme.org/) | (973) 882-1170 |
| ASTM | ASTM International  (American Society for Testing and Materials International) [www.astm.org](http://www.astm.org/) | (610) 832-9500 |
| AWS | American Welding Society | (800) 443-9353 |
|  | [www.aws.org](http://www.aws.org/) | (305) 443-9353 |
| CGA | Compressed Gas Association [www.cganet.com](http://www.cganet.com/) | (703) 788-2700 |
| CIMA | Cellulose Insulation Manufacturers Association | (888) 881-2462 |
|  | [www.cellulose.org](http://www.cellulose.org/) | (937) 222-2462 |
| CSI | Construction Specifications Institute (The) | (800) 689-2900 |
|  | [www.csinet.org](http://www.csinet.org/) | (703) 684-0300 |

|  |  |  |
| --- | --- | --- |
| EJMA | Expansion Joint Manufacturers Association, Inc. [www.ejma.org](http://www.ejma.org/) | (914) 332-0040 |
| HI | Hydronics Institute [www.gamanet.org](http://www.gamanet.org/) | (908) 464-8200 |
| HI/GAMA | Hydronics Institute/Gas Appliance Manufacturers Association Division of Air-Conditioning, Heating, and Refrigeration Institute (AHRI)  [www.ahrinet.org](http://www.ahrinet.org/) | (908) 464-8200 |
| IGMA | Insulating Glass Manufacturers Alliance [www.igmaonline.org](http://www.igmaonline.org/) | (613) 233-1510 |
| ISA | Instrumentation, Systems, and Automation Society, The [www.isa.org](http://www.isa.org/) | (919) 549-8411 |
| ISO | International Organization for Standardization [www.iso.ch](http://www.iso.ch/) | 41 22 749 01 11 |
| MSS | Manufacturers Standardization Society of The Valve and Fittings Industry Inc.  [www.mss-hq.com](http://www.mss-hq.com/) | (703) 281-6613 |
| NEBB | National Environmental Balancing Bureau [www.nebb.org](http://www.nebb.org/) | (301) 977-3698 |
| NEMA | National Electrical Manufacturers Association [www.nema.org](http://www.nema.org/) | (703) 841-3200 |
| NFPA | NFPA | (800) 344-3555 |
|  | (National Fire Protection Association) [www.nfpa.org](http://www.nfpa.org/) | (617) 770-3000 |
| SMACNA | Sheet Metal and Air Conditioning Contractors'  National Association [www.smacna.org](http://www.smacna.org/) | (703) 803-2980 |
| STI | Steel Tank Institute [www.steeltank.com](http://www.steeltank.com/) | (847) 438-8265 |
| TEMA | Tubular Exchanger Manufacturers Association [www.tema.org](http://www.tema.org/) | (914) 332-0040 |
| UL | Underwriters Laboratories Inc. | (877) 854-3577 |
|  | [www.ul.com](http://www.ul.com/) | (847) 272-8800 |
| USGBC | U.S. Green Building Council [www.usgbc.org](http://www.usgbc.org/) | (800) 795-1747 |

* + 1. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ICC International Code Council (888) 422-7233 [www.iccsafe.org](http://www.iccsafe.org/)

* + 1. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

|  |  |  |
| --- | --- | --- |
| COE | Army Corps of Engineers [www.usace.army.mil](http://www.usace.army.mil/) | (202) 761-0011 |
| DOD | Department of Defense [http://dodssp.daps.dla.mil](http://dodssp.daps.dla.mil/) | (215) 697-6257 |
| DOE | Department of Energy [www.energy.gov](http://www.energy.gov/) | (202) 586-9220 |
| EPA | Environmental Protection Agency [www.epa.gov](http://www.epa.gov/) | (202) 272-0167 |
| FAA | Federal Aviation Administration [www.faa.gov](http://www.faa.gov/) | (866) 835-5322 |
| FCC | Federal Communications Commission [www.fcc.gov](http://www.fcc.gov/) | (888) 225-5322 |
| GSA | General Services Administration [www.gsa.gov](http://www.gsa.gov/) | (800) 488-3111 |
| NIST | National Institute of Standards and Technology [www.nist.gov](http://www.nist.gov/) | (301) 975-6478 |
| OSHA | Occupational Safety & Health Administration | (800) 321-6742 |
|  | [www.osha.gov](http://www.osha.gov/) | (202) 693-1999 |
| PHS | Office of Public Health and Science <http://www.hhs.gov/ophs/> | (202) 690-7694 |
| USP | U.S. Pharmacopeia [www.usp.org](http://www.usp.org/) | (800) 227-8772 |
| USPS | Postal Service [www.usps.com](http://www.usps.com/) | (202) 268-2000 |

* + 1. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG Americans with Disabilities Act (ADA) (800) 872-2253

|  |  |  |
| --- | --- | --- |
| CFR | Code of Federal Regulations | (866) 512-1800 |
|  | Available from Government Printing Office [www.gpoaccess.gov/cfr/index.html](http://www.gpoaccess.gov/cfr/index.html) | (202) 512-1800 |
| DOD MIL  MIL-STD MELSPEC | Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point [http://dodssp.daps.dla.mil](http://dodssp.daps.dla.mil/) | (215) 697-2664 |
|  | Available from General Services Administration [www.gsa.gov](http://www.gsa.gov/) | (202) 619-8925 |
|  | Available from National Institute of Building Sciences [www.wbdg.org/ccb](http://www.wbdg.org/ccb) | (202) 289-7800 |
| UFAS | Uniform Federal Accessibility Standards | (800) 872-2253 |
|  | Available from Access Board [www.access-board.gov](http://www.access-board.gov/) | (202) 272-0080 |

* + 1. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

DBA Arkansas Department of Finance and Administration, Division of Building Authority [http://www.arkansasbuildingauthority.com](http://www.arkansasbuildingauthority.com/)

(501) 682-1833

* 1. **CODES AND STANDARDS**
     1. All materials and workmanship shall comply with all applicable codes, specifications, local ordinances, industry standards and utility company regulations. Where specific code requirements apply, they shall be included in the job, whether or not specifically shown or elsewhere specified.
     2. Applicable codes and standards shall include all state laws, local ordinances, utility company regulations, and the applicable requirements of the following adopted codes and standards.
        1. Building Codes for Arkansas
           1. International Building Code 2006
           2. Arkansas Fire Prevention Code 2007
           3. National Electrical Code 2014
           4. Arkansas Fuel Gas Code 2006 (International Fuel Gas Code 2006)
           5. International Existing Building Code 2006
           6. Arkansas Energy Code 2011 (based on ANSI/ASHRAE/IESNA Standard 90.1-2001)
           7. Arkansas State Plumbing Code 2006
           8. Arkansas Mechanical Code 2010
           9. Accessibility Code ICC/ANSI A117.1 2003
  2. **CONFLICTING REQUIREMENTS**
     1. Conflicting requirements: If compliance with standards, codes, regulations, and specifications establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Engineer for a decision before proceeding.
     2. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits.

To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Engineer for a decision before proceeding.

* 1. **SPECIFICATION AND DRAWING CONVENTIONS**
     1. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
        1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
        2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
     2. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
     3. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
        1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
        2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
        3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.
  2. **PHASED CONSTRUCTION**
     1. The Contractor shall refer to the General Requirements of this specification and prepare all work schedules required to perform all work as shown on the Drawings and as herein specified.
     2. All services such as, but not limited to, lighting, power and signaling shall be maintained to all areas of the building during this Contract. Temporary service connections will be required where necessary to maintain these services. The Contractor will make these connections as required to provide continuous service.
     3. It will be the responsibility of the Contractor to carefully review the drawings, specifications and existing conditions with reference to these types of services so that the building may function normally during the construction process.
  3. **COORDINATION WITH OCCUPANTS**
     1. Full Owner Occupancy: Owner will occupy site and building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
        1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
        2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.
     2. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.
        1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
        2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
     3. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
        1. Owner will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
        2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
        3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
        4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.
  4. **WORK RESTRICTIONS**
     1. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
        1. Notify Owner not less than 7 days in advance of proposed utility interruptions.
        2. Obtain Owner's written permission before proceeding with utility interruptions.
        3. Hours for Utility Shutdowns: after 10:00 p.m. and before 6:00 a.m.
  5. **FEES, PERMITS, AND INSPECTIONS**
     1. This Contractor shall be responsible for all costs incurred by the serving utilities and/or Owner for the relocation, removal, and installation of temporary or new services.
     2. The Contractor shall be responsible for coordinating and providing the exact service equipment and installation methods with the serving Utility and/or Owner prior to bidding. Failure to do so will not constitute sufficient grounds for an authorized change order to the project.
  6. **SUBMITTAL SCHEDULE**
     1. 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 revisions to submittals noted by Engineer and additional time for handling and reviewing submittals required by those corrections.
        1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
        2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
        3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
           1. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
        4. Format: Arrange the following information in a tabular format:
           1. Scheduled date for first submittal.
           2. Specification Section number and title.
           3. Submittal category: Action; informational.
           4. Name of subcontractor.
           5. Description of the Work covered.
           6. Scheduled date for Engineer's final release or approval.
  7. **SUBMITTAL ADMINISTRATIVE REQUIREMENTS**
     1. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
        1. Submit submittals to Owner.
        2. Engineer, through Owner, will return annotated file.
     2. Digital Data Files:
        1. Electronic digital data files of the Project drawings may be provided by Engineer for Contractor's use in preparing submittals.
        2. Electronic digital data files supplied for use in submittal preparation will be subject to terms and conditions of the Engineer’s Release Form. A signed release form and any payment required must be returned to the Engineer prior to the transmission of an electronic digital data files.
        3. Electronic digital data file formats may include AutoCAD drawings, Revit converted to AutoCAD drawings or Revit Model.
     3. 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. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
        3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
        4. 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.
           1. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
     4. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer'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 14 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer 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 14 days for review of each resubmittal.
     5. Paper Submittals: Place a permanent label or title block on each submittal item for identification.
        1. Indicate name of firm or entity that prepared each submittal on label or title block.
        2. Provide a space on label or beside title block to record Contractor's review and approval markings and action taken by Engineer.
        3. Include the following information for processing and recording action taken:
           1. Project name.
           2. Date.
           3. Name of Owner.
           4. Name of Engineer.
           5. Name of Contractor.
           6. Name of subcontractor.
           7. Name of supplier.
           8. Name of manufacturer.
           9. Submittal number or other unique identifier, including revision identifier.

Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 230900.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 230900.01.A).

* + - * 1. Number and title of appropriate Specification Section.
        2. Drawing number and detail references, as appropriate.
        3. Location(s) where product is to be installed, as appropriate.
        4. Other necessary identification.
      1. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Owner 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 Owner.
      2. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form.
         1. Transmittal Form for Paper Submittals: Provide locations on form for the following information:

Project name.

Date.

Destination (To:).

Source (From:).

Name and address of Owner.

Name of Construction Manager.

Name of Contractor.

Name of firm or entity that prepared submittal.

Names of subcontractor, manufacturer, and supplier.

Category and type of submittal.

Submittal purpose and description.

Specification Section number and title.

Specification paragraph number or drawing designation and generic name for each of multiple items.

Drawing number and detail references, as appropriate.

Indication of full or partial submittal.

Transmittal number.

Submittal and transmittal distribution record.

Remarks.

Signature of transmitter.

* + 1. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
       1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
       2. Name file with submittal number or other unique identifier, including revision identifier.
          1. 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 Engineer.
       4. Transmittal Form for Electronic Submittals: Use electronic form containing the following information:
          1. Project name.
          2. Date.
          3. Name and address of Engineer.
          4. Name of Construction Manager.
          5. Name of Contractor.
          6. Name of firm or entity that prepared submittal.
          7. Names of subcontractor, manufacturer, and supplier.
          8. Category and type of submittal.
          9. Submittal purpose and description.
          10. Specification Section number and title.
          11. Specification paragraph number or drawing designation and generic name for each of multiple items.
          12. Drawing number and detail references, as appropriate.
          13. Location(s) where product is to be installed, as appropriate.
          14. Related physical samples submitted directly.
          15. Indication of full or partial submittal.
          16. Transmittal number.
          17. Submittal and transmittal distribution record.
          18. Other necessary identification.
          19. Remarks.
       5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
          1. Project name.
          2. Number and title of appropriate Specification Section.
          3. Manufacturer name.
          4. Product name.
    2. Options: Identify options requiring selection by Engineer.
    3. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Engineer on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
    4. 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 Engineer's action stamp.
    5. 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.
    6. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Engineer's action stamp.
    7. 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. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
       2. Engineer’s Action: If necessary, Engineer will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Engineer will notify Contractor through Owner of approval or rejection of proposed comparable product request within 14 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
          1. Use product specified if Engineer does not issue a decision on use of a comparable product request within time allocated.
  1. **CLOSEOUT SUBMITTALS**
     1. Closeout submittals shall include, but not limited to, the following:
        1. Operation and Maintenance Materials
        2. Record Drawings
        3. Demonstration and Training Materials
        4. Final Approved Submittals
  2. **MAINTENANCE MATERIAL SUBMITTALS**
     1. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
        1. Engineer will comment on whether content of operations and maintenance submittals are acceptable.
        2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
     2. 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 Engineer.
           1. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
           2. Enable inserted reviewer comments on draft submittals.
        2. In addition to the electronic submit provide two paper copies of the corrected final submittal as part of the “Closeout Documents”. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Engineer, through Owner, will return two copies. The two paper copies will be provided to the Owner as part of the “Closeout Documents”
     3. Initial Manual Submittal: Submit draft copy of each manual at least 45 days before commencing demonstration and training. Engineer will comment on whether general scope and content of manual are acceptable.
     4. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 30 days before commencing demonstration and training. Engineer will return copy with comments.
        1. Correct or revise each manual to comply with Engineer's comments. Submit copies of each corrected manual within 15 days of receipt of Engineer's comments and prior to commencing demonstration and training.
  3. **TRAINING SUBMITTALS**
     1. Demonstration to the Owner personnel of the Electrical products and systems to be utilized on the project is required.
     2. Training of Owner personnel in operation and maintenance is required for:
        1. Electrical systems and equipment.
        2. All software-operated systems.
        3. Items specified in individual product Sections
     3. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
        1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
     4. Qualification Data: For instructor.
     5. Attendance Record: For each training module, submit list of participants and length of instruction time.
     6. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.
     7. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.
        1. Identification: On each copy, provide an applied label with the following information:
           1. Name of Project.
           2. Name and address of videographer.
           3. Name of Engineer.
           4. Name of Construction Manager.
           5. Name of Contractor.
           6. Date of video recording.
        2. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
        3. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
        4. At completion of training, submit complete training manual(s) for Owner's use prepared and bound in format matching operation and maintenance manuals and in PDF electronic file format on compact disc.
  4. **QUALITY ASSURANCE**
     1. Products:
        1. 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. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
           2. If a dispute arises between contractors over concurrently selectable but incompatible products, Owner will determine which products shall be used.
  5. **PRODUCT DELIVERY, STORAGE, AND HANDLING**
     1. 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.
     2. 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.
     3. 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 or moisture damage.
        4. Protect 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.
        7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.
  6. **PRODUCT WARRANTIES**
     1. 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.
     2. 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. See other Sections for specific content requirements and particular requirements for submitting special warranties.
     3. Submit warranties in accordance with “Closeout Procedures.”
  7. **FIELD CONDITIONS**
     1. The Contractor shall visit the site of the building before submitting a proposal on this work, and shall thoroughly familiarize himself with the existing conditions and operations. Failure on his part to do this will not be cause of extras after the contract is signed, by reason of unforeseen conditions.
  8. **WARRANTY**
     1. The Contractor shall, after completion of the original test of the installation, and acceptance by the Engineer, provide any service incidental to the proper performance of the electrical systems under guarantees outlined above for a period of 1 full year after acceptance by the Engineer and Owner. Regardless of anything to the contrary in warranties by the equipment manufacturer involved, the Contractor's warranty shall run for 1 full year after final acceptance by the Engineer.
  9. **ELECTRICAL LICENSE REQUIREMENT**
     1. No person shall perform electrical work on the contract without possessing an Arkansas State Master or Journeyman License from the Arkansas State Electrical Examiners Board. All electrical work and apprentice electricians shall be supervised by a Master or Journeyman Electrician on a one to one ratio.
     2. All electricians shall have a copy of their license with them and shall be required to show it to an appropriate inspector upon request.

**PART 2 PRODUCTS**

* 1. **SUBMITTAL PROCEDURES**
     1. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
        1. Submit electronic submittals to Engineer through the Owner.
           1. Engineer, through Owner, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
     2. 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:
           1. Manufacturer's catalog cuts.
           2. Manufacturer's product specifications.
           3. Standard color charts.
           4. Statement of compliance with specified referenced standards.
           5. Testing by recognized testing agency.
           6. Application of testing agency labels and seals.
           7. Notation of coordination requirements.
           8. Availability and delivery time information.
        4. For equipment, include the following in addition to the above, as applicable:
           1. Wiring diagrams showing factory-installed wiring.
           2. Printed performance curves.
           3. Operational range diagrams.
           4. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
     3. Shop Drawings: Prepare Project-specific information, drawn accurately to scale and sufficiently large to show all pertinent features of the item, method of connections, and notations clearly legible. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Engineer's digital data drawing files is otherwise permitted.
        1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
           1. Identification of products.
           2. Schedules.
           3. Compliance with specified standards.
           4. Notation of coordination requirements.
           5. Notation of dimensions established by field measurement.
           6. Relationship and attachment to adjoining construction clearly indicated.
           7. Seal and signature of professional engineer if specified.
        2. BIM File Incorporation: Develop and incorporate Shop Drawing files into Building Information Model established for Project.
     4. 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. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
        2. Manufacturer and product name, and model number if applicable.
        3. Number and name of room or space.
        4. Location within room or space.
     5. Coordination Drawing Submittals: Comply with requirements specified in Section 01 3100 "Project Management and Coordination."
     6. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 01 4000 "Quality Requirements."
     7. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 7700 "Closeout Procedures."
     8. Maintenance Data: Comply with requirements specified in Section 01 7823 "Operation and Maintenance Data."
     9. 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 Engineers and owners, and other information specified.
     10. 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 AWS forms. Include names of firms and personnel certified.
     11. 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.
     12. 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.
     13. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
     14. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
     15. 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.
     16. Product Test Reports: Submit written reports indicating that 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.
     17. 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. Include the following information:
         1. Name of evaluation organization.
         2. Date of evaluation.
         3. Time period when report is in effect.
         4. Product and manufacturers' names.
         5. Description of product.
         6. Test procedures and results.
         7. Limitations of use.
     18. 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.
     19. 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.
     20. Field Test Reports: Submit written 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.
  2. **DELEGATED-DESIGN SERVICES**
     1. 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 Engineer.
     2. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit 2 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.
     3. BIM File Incorporation: Provide delegated-design drawing and data files into Building Information Model established for Project.
  3. **PRODUCT SELECTION PROCEDURES**
     1. 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. Were two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.
        4. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
        5. Where products are accompanied by the term "as selected," Owner will make selection.
        6. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
        7. Products containing asbestos shall not be used.
        8. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
     2. 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:
           1. 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 shall be considered.
           2. 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:
           1. 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 be considered.
           2. 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.
     3. Visual Selection Specification: Where Specifications include the phrase "as selected by Owner” or similar phrase, select a product that complies with requirements. Owner will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
  4. **COMPARABLE PRODUCTS**
     1. Conditions for Consideration: Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Owner 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 owners, if requested.
        5. Contractor is responsible for any modification required by products other than the basis of design product at no additional cost to the owner including but not limited to modifications to supports and connections.
  5. **COORDINATION DRAWINGS**
     1. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally 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:
           1. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
           2. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
           3. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
           4. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
           5. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
           6. Indicate required installation sequences.
           7. 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 Owner indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
     2. 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. Supplement plan drawings with section drawings where required to adequately represent the Work.
        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. Indicate areas of conflict between light fixtures and other components.
        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. Mechanical and Plumbing Work: Show the following:
           1. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
           2. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
           3. Fire-rated enclosures around ductwork.
        6. Electrical Work: Show the following:
           1. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
           2. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
           3. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
           4. Location of pull boxes and junction boxes, dimensioned from column center lines.
        7. Fire-Protection System: Show the following:
           1. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
        8. Review: Owner will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Owner determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Owner will so inform Contractor, who shall make changes as directed and resubmit.
     3. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
        1. File Preparation Format: DXF operating in Microsoft Windows operating system.
        2. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format and supply Portable Data File (PDF) format.
        3. BIM File Incorporation: Provide coordination drawing files into Building Information Model established for Project.
           1. Provide three-dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Owner.
  6. **OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY**
     1. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
        1. List of documents.
        2. List of systems.
        3. List of equipment.
        4. Table of contents.
     2. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
     3. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
     4. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
     5. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to

ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

* 1. **REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS**
     1. 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.
     2. 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 Engineer.
        8. Name and contact information for Commissioning Authority.
        9. Names and contact information for major consultants to the Engineer that designed the systems contained in the manuals.
        10. Cross-reference to related systems in other operation and maintenance manuals.
     3. 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.
        1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
     4. 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.
     5. 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 on 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 on opening file.
     6. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
        1. Binders: Heavy-duty, three-ring, vinyl-covered, binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
           1. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross- reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
           2. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, subject matter of contents. 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. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
        5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
           1. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
           2. 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. **EMERGENCY MANUALS**
     1. Content: Organize manual into a separate section for each of the following:
        1. Type of emergency.
        2. Emergency instructions.
        3. Emergency procedures.
     2. 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.
     3. 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.
     4. 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.
  3. **OPERATION MANUALS**
     1. 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 has 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.
     2. 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.
     3. 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.
     4. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
     5. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.
  4. **PRODUCT MAINTENANCE MANUALS**
     1. 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.
     2. 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 and drawing or schedule designation or identifier where applicable.
     3. 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.
     4. 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.
     5. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
     6. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
        1. Include procedures to follow and required notifications for warranty claims.
  5. **SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS**
     1. 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.
     2. 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 and drawing or schedule designation or identifier where applicable.
     3. 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.
     4. 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.
     5. 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.
        1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
        2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
     6. 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.
     7. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
     8. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
        1. Include procedures to follow and required notifications for warranty claims.
  6. **RECORD DRAWINGS**
     1. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
        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.
           1. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
           2. Accurately record information in an acceptable drawing technique.
           3. Record data as soon as possible after obtaining it.
           4. Record and check the markup before enclosing concealed installations.
           5. Cross-reference record prints to corresponding archive photographic documentation.
        2. Content: Types of items requiring marking include, but are not limited to, the following:
           1. Dimensional changes to Drawings.
           2. Revisions to details shown on Drawings.
           3. Depths of foundations below first floor.
           4. Locations and depths of underground utilities.
           5. Revisions to routing of piping and conduits.
           6. Revisions to electrical circuitry.
           7. Actual equipment locations.
           8. Duct size and routing.
           9. Locations of concealed internal utilities.
           10. Changes made by Change Order or Change Directive.
           11. Changes made following Owner's written orders.
           12. Details not on the original Contract Drawings.
           13. Field records for variable and concealed conditions.
           14. Record information on the Work that is shown only schematically.
        3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
        4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
        5. Mark important additional information that was either shown schematically or omitted from original Drawings.
        6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
     2. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Engineer. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
        1. Format: DWG, Microsoft Windows operating system.
        2. Format: Annotated PDF electronic file with comment function enabled.
        3. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
        4. Refer instances of uncertainty to Engineer for resolution.
        5. Engineer will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
           1. See Section 01 3300 "Administrative Procedures" for requirements related to use of Engineer’s digital data files.
           2. Engineer will provide data file layer information. Record markups in separate layers.
     3. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Engineer determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
        1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
        2. Consult Engineer for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
     4. 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.
        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:
           1. Project name.
           2. Date.
           3. Designation "PROJECT RECORD DRAWINGS."
           4. Name of Engineer.
           5. Name of Contractor.
  7. **INSTRUCTION PROGRAM**
     1. 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.
     2. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
        1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
           1. System, subsystem, and equipment descriptions.
           2. Performance and design criteria if Contractor is delegated design responsibility.
           3. Operating standards.
           4. Regulatory requirements.
           5. Equipment function.
           6. Operating characteristics.
           7. Limiting conditions.
           8. Performance curves.
        2. Documentation: Review the following items in detail:
           1. Emergency manuals.
           2. Operations manuals.
           3. Maintenance manuals.
           4. Project record documents.
           5. Identification systems.
           6. Warranties and bonds.
           7. Maintenance service agreements and similar continuing commitments.
        3. Emergencies: Include the following, as applicable:
           1. Instructions on meaning of warnings, trouble indications, and error messages.
           2. Instructions on stopping.
           3. Shutdown instructions for each type of emergency.
           4. Operating instructions for conditions outside of normal operating limits.
           5. Sequences for electric or electronic systems.
           6. Special operating instructions and procedures.
        4. Operations: 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. Control sequences.
           6. Safety procedures.
           7. Instructions on stopping.
           8. Normal shutdown instructions.
           9. Operating procedures for emergencies.
           10. Operating procedures for system, subsystem, or equipment failure.
           11. Seasonal and weekend operating instructions.
           12. Required sequences for electric or electronic systems.
           13. Special operating instructions and procedures.
        5. Adjustments: Include the following:
           1. Alignments.
           2. Checking adjustments.
           3. Noise and vibration adjustments.
           4. Economy and efficiency adjustments.
        6. Troubleshooting: Include the following:
           1. Diagnostic instructions.
           2. Test and inspection procedures.
        7. Maintenance: Include 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. Procedures for routine cleaning.
           5. Procedures for preventive maintenance.
           6. Procedures for routine maintenance.
           7. Instruction on use of special tools.
        8. Repairs: Include the following:
           1. Diagnosis instructions.
           2. Repair instructions.
           3. Disassembly; component removal, repair, and replacement; and reassembly instructions.
           4. Instructions for identifying parts and components.
           5. Review of spare parts needed for operation and maintenance.
  8. **EQUIPMENT AND MATERIALS:**
     1. All materials shall be new and shall bear the manufacturer’s name, trade name and the UL label in every case where a standard has been established for the particular material. The equipment to be furnished under each section of the specification shall be essentially the standard product of a manufacturer regularly engaged in the production of the required type of equipment, and shall be the manufacturer’s latest approved design.
     2. When 2 or more units of materials or equipment of the same type or class are required, these units shall be products of 1 manufacturer. Equipment and materials of the same general type shall be of the same make throughout the work to provide uniform appearance, operation and maintenance. Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
     3. Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.
     4. Asbestos products or equipment or materials containing asbestos shall not be used.
     5. Equipment and materials shall be delivered to the site and stored in the original containers, suitably sheltered from the elements. Items subject to moisture damage (such as controls) shall be stored in dry, heated spaces.
     6. Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical injury and theft. At the completion of the work, fixtures, equipment, and materials shall be cleaned and polished thoroughly. Damage or defects developing before acceptance of the work shall be made good at the Contractor’s expense.
     7. It shall be the responsibility of the Contractor to insure that items to be furnished fit the space available. The Contractor shall make necessary field measurements to ascertain space requirements, including those for connections, and shall furnish and install such sizes and shapes of equipment that the final installation shall suit the true intent and meaning of the Drawings and Specifications.
     8. Manufacturer’s directions shall be followed completely in the delivery, storage, protection, and installation of all equipment and materials. Should the Contractor perform any work that does not comply with the manufacturer’s directions, he shall bear all costs arising in correcting the deficiencies.
  9. **EQUIPMENT ACCESSORIES:**
     1. The Contractor shall furnish and install all equipment, accessories, connections, and incidental items necessary to fully complete the work, ready for use, occupancy and operation by the Owner, whether or not specifically shown on the plans or herein specified.
     2. Connections: All final connections to equipment shall be installed as required by the manufacturer and/or Vendor.
     3. Connections Different From Those Shown: Where equipment requiring different arrangement or connections from those shown is approved, it shall be the responsibility of the Contractor to install the equipment to operate properly with the intent of the drawings and specifications. When directed, the Contractor shall submit drawings showing the proposed installation. If the proposed installation is approved, the Contractor shall make all incidental changes. The Contractor shall provide any additional equipment required for the proper operation of the system resulting from the selection of equipment, including all required changes in affected trades. The Contractor shall be responsible for the proper location of roughing in and connections by other trades. All changes shall be made at no increase in the contract amount or additional cost to the other trades.

**PART 3 EXECUTION**

* 1. **CONTRACTOR'S SUBMITTAL REVIEW**
     1. 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 Owner.
     2. 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.
  2. **ENGINEER'S SUBMITTAL ACTION**
     1. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or revisions required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
     2. Informational Submittals: Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Engineer will forward each submittal to the Owner to forward to the appropriate party.
     3. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Engineer.
     4. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
     5. Submittals not required by the Contract Documents may be returned by the Engineer without action.
  3. **SALVAGING DEMOLITION WASTE**
     1. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
        1. Clean salvaged items.
        2. Store items in a secure area until installation.
        3. Protect items from damage during transport and storage.
        4. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
     2. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:
        1. Clean salvaged items.
        2. Store items in a secure area until delivery to Owner.
        3. Transport items to Owner's storage area designated by Owner.
        4. Protect items from damage during transport and storage.
     3. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
     4. Plumbing Fixtures: Separate by type and size.
  4. **DISPOSAL OF WASTE**
     1. 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.
        3. Disposal: Remove waste materials from Owner's property and legally dispose of them.
  5. **OPERATION AND MAINTENANCE MANUAL PREPARATION**
     1. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
     2. 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.
     3. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
     4. 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.
        1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
        2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
     5. 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.
        1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
     6. 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.
        2. Comply with requirements of newly prepared record Drawings in "Project Record Documents."
     7. Comply with "Closeout Procedures" for schedule for submitting operation and maintenance documentation.
  6. **RECORD DRAWING RECORDING AND MAINTENANCE**
     1. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
  7. **COORDINATION OF WORK**
     1. The Contractor shall compare the Electrical Drawings and Specifications with the drawings and specifications for other trades and shall report any discrepancies between them to the Engineer and obtain written instructions for changes necessary in the Electrical Work. The Electrical Work shall be installed in cooperation with other trades installing related work. Before installation, the Contractor shall make proper provision to avoid interferences. All changes required in the work of the Contractor caused by a failure to coordinate the work with other trades shall be made by the Contractor at his own expense.
     2. Anchor bolts, sleeves, inserts and supports that may be required for the Electrical Work shall be furnished under the same section of the specifications as the respective items to be supported, and they shall be installed, except as otherwise specified, by the trade furnishing and installing the material in which they are to be located. Location of anchor bolts, sleeves, inserts and supports shall be directed by the trade requiring them, which trade shall also insure that they are properly installed. Any expense resulting from the improper location or installation

of anchor bolts, sleeves, inserts and supports shall be paid for by the Contractor under the section of the specifications for the trade with the responsibility for directing their proper location.

* + 1. Slots, chases, openings and recesses through floors, walls, ceilings and roofs as specified will be provided by the various trades in their respective materials, but the trade requiring them shall see that they are properly located, and shall do any cutting and patching caused by the neglect to do so. Slots, chases, openings and recesses in existing structure shall be cut by the trade requiring them and patched and repaired by that trade.
    2. Locations of conduits, equipment, etc. shall be adjusted to accommodate the work and to avoid interferences anticipated and encountered. The Contractor shall determine the exact route and location of each pipe and duct prior to fabrication.
       1. Right-of-Way: Lines which pitch shall have the right of way over those which do not pitch. For example: plumbing drains shall normally have right of way. Lines whose elevations cannot be changed shall have the right of way over lines whose elevations can be changed.
       2. Offsets, transitions and changes in direction in pipes and ducts shall be made as required to maintain proper head room and pitch of sloping lines whether or not indicated on the drawings. The Contractor shall furnish and install all traps, air vents, sanitary vents, etc., as required to affect these offsets, transitions and changes in direction.
       3. Installation and Arrangement: The Contractor shall install all Electrical Work to permit removal (without damage to other parts) of coils, heat exchanger bundles, belt guards, sheaves and drives, and all other parts requiring periodic replacement or maintenance. The Contractor shall arrange pipes and equipment to permit ready access to valves, cocks, control components and to clear the openings of swinging and overhead doors and of access panels.
       4. Access: The Contractor shall provide all necessary access panels in walls, ceilings, equipment, etc., as required for inspection of interiors and for proper maintenance and or installation of equipment valves. Where changes from the plans are made by the Contractor in the installation of his work, he shall provide any and all access panels required as a result of these changes.
    3. Connections Different From Those Shown: Where equipment requiring different arrangement or connections from those shown is approved, it shall be the responsibility of the Contractor to install the equipment to operate properly with the intent of the drawings and specifications. When directed, the Contractor shall submit drawings showing the proposed installation. If the proposed installation is approved, the Contractor shall make all incidental changes in conduit, back box, device locations, etc. The Contractor shall provide any additional conduit, fittings, and other additional equipment required for the proper operation of the system resulting from the selection of equipment, including all required changes in affected trades. The Contractor shall be responsible for the proper location of roughing in and connections by other trades. All changes shall be made at no increase in the contract amount or additional cost to the other trades.
    4. Connections: All conduit connecting to equipment shall be installed without strain at the conduit connection
    5. Inaccessible Equipment
       1. Where the Engineer or Owner determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled or remedial action (such as providing access panels) performed as directed at no additional cost to the Owner.
       2. The term "conveniently accessible" is defined as capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, fans, pumps, belt guards, transformers, high voltage lines, piping, and ductwork.
    6. Electrical Coordination
       1. Power: All power and motor wiring shall be performed under Division 26 unless otherwise noted for specific items. Control and interlock wiring shall be done by the Contractor of this Division.
       2. Starters and Drives: All motor starters and drives unless included in other sections of the specifications shall be by Division 26. Furnish auxiliary contacts on magnetic starters to permit interlocking of starting circuits.
       3. Disconnects: All equipment furnished under this Division required to have a means of disconnect shall be supplied with a disconnect or a disconnect shall be furnished and installed by Division 26.
    7. Dedicated Electrical Space: The space equal to the width and depth of the equipment and extending from the floor to a height of 6 feet above the equipment or to the structural ceiling, whichever is lower, shall be dedicated to the electrical installation. No piping, leak protection apparatus, or other equipment foreign to the electrical installation shall be located in this zone. The area above the dedicated space shall be permitted to contain foreign systems, provided protection is installed to avoid damage to the electrical equipment from condensation, leaks or breaks in foreign systems. Every effort shall be made to eliminate foreign systems above equipment to the structural ceiling. If this is not possible, the Contractor shall encase any pipe in a second pipe with a minimum number of joints.
    8. Lubrication: The Contractor shall be held responsible for all damage to bearings while the equipment is being operated up to the date of acceptance of the equipment. The Contractor shall be required to protect all bearings during installation and shall thoroughly grease steel shafts to prevent corrosion. All motors and other equipment shall be provided with covers as required for proper protection during construction. Fan shafts, pump shafts, motor shafts, etc. shall be coated to prevent deterioration in moist or wet atmospheres.
  1. **CUTTING AND PATCHING**
     1. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
        1. Under each section of the specifications, the Contractor shall be responsible for all required cutting, etc., incident to his work under that section, and shall make all satisfactory repairs, but in no case shall the Contractor cut into any major structural element, beam or column.
        2. Each trade shall bear the expense of all cutting, patching, repairing or replacing of the work of other trades because of fault, error or tardiness or because of any damage done by own workmanship.
        3. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
     2. 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.
     3. Temporary Support: Provide temporary support of work to be cut.
     4. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
     5. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements the “Occupant Coordination” article.
     6. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
     7. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
        1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
        2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
        3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
        4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
        5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
        6. Proceed with patching after construction operations requiring cutting are complete.
     8. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Section, where applicable.
        1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
        2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
           1. Clean piping, conduit, and similar features before applying paint or other finishing materials.
           2. Restore damaged pipe covering to its original condition.
        3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
           1. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
        4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
        5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
     9. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.
  2. **EXCAVATION AND TRENCHING FOR ELECTRICAL CONDUIT**
     1. The Contractor shall perform all excavation of every description and of whatever substances encountered to the depths indicated on the drawings or as otherwise specified. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. Such grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and any water accumulating therein shall be removed by pumping or by other methods. Unless otherwise indicated, excavation shall be by open cut except that short sections of a trench may be tunneled if the conduit or sleeves can be safely and properly installed and backfill can be properly tamped in such tunnel sections. Refer to Division 02 for additional requirements.
     2. Trench Excavation: Trenches shall be of necessary width for proper laying of the conduit, and the banks shall be as nearly vertical as practical. The bottom of the trenches shall be accurately graded to provide uniform bearing and support for the conduit on undisturbed soil at every point along its entire length. Except where rock is encountered, care shall be taken not to excavate below the depths indicated. Where rock excavations are required, the rock shall be excavated to a minimum overdepth of 4 inches below the trench depths indicated on the drawings, or specified. Overdepths in the rock excavation and unauthorized overdepths shall be backfilled with loose, granular, moist earth, thoroughly tamped. Whenever wet or otherwise unstable soil that is incapable of properly supporting the pipe is encountered in the bottom of the trench, such soil shall be removed to the depth required and the trench backfilled to the proper grade coarse sand, fine gravel or other suitable materials, as hereinafter specified.
     3. Depth of Cover: Trenches for utilities shall be of a depth that will provide the following minimum depths of cover from existing grade or from indicated finish grade, whichever is lower, unless otherwise specifically shown.

Voltage Depth (Minimum)

* + - 1. 600 and below 24 inches

2. 600 to 15,000 30 inches

* + 1. Protection of Existing Utilities: Existing utility lines to be retained that are shown on the Drawings or the locations of which are made known to the Contractor prior to excavation, as well as all utility lines uncovered during excavation operations, shall be protected from damage during excavation and backfilling, and if damaged, shall be repaired by the Contractor at his expense.
  1. **BACKFILLING OF TRENCHES**
     1. Trenches shall not be backfilled until all required pressure and other tests have been performed, witnessed by the Engineer, and until the utilities systems as installed confirm to the requirements of the drawings and specifications.
     2. Normal Backfill: Where compacted backfill is not specified the trenches shall be carefully backfilled with the materials approved for backfilling (See appropriate section), deposited in 6” layers and thoroughly and carefully rammed until the pipe has a cover of not less than one foot. The remainder of the backfill material shall then be carefully placed in the trench in one foot layers and tamped. Settling the backfill with water will not be permitted. The surface shall be graded to a reasonable uniformity and the mounding over trenches left in a uniform and neat condition. Surface condition shall be equipment to match the existing condition prior to trenching (sod, asphalt, etc.).
     3. Compacted backfill shall be used under slabs on grade, building structure, concrete paving and asphaltic concrete paving. The soils used in the fill shall be granular in nature and shall not contain roots, sod, rubbish or stones over 1-1/2” maximum dimension.
        1. Required Density
           1. All fills shall be compacted to a dry density equal to at least 90% of the maximum density determined in accordance with the Modified AASHO Method of Compaction. The maximum density and optimum moisture content shall be determined on the basis of laboratory tests conducted on the materials used in the fill.
           2. Modified AASHO Compaction Method provides that soil samples be compacted in 5 equal layers in a standard compaction cylinder having a volume of 1/30 cu. ft. using 25 18” blows of 10 pound rammer to compact each layer.
        2. Control Tests: Adequacy of compaction shall be determined on the basis of in-place density determinations that are to be conducted while the fills are being placed. The results of these tests shall be the basis on which satisfactory completion of the work is judged. Should the fills fail to meet the specified densities, the Contractor shall remove and recompact the soils until the specified densities are achieved.
        3. Equipment: The choice of compaction equipment shall be made by the Contractor; however, the equipment shall be adequate for achieving the specified densities. Use of

hand-operated, power-driven compaction equipment may be necessary at locations inaccessible to roller-type equipment.

* 1. **PAINTING**
     1. The Contractor shall remove all rust, oil and grease from exposed surfaces and clean all apparatus or materials specified to be painted under this section of the specifications. Contractor shall paint equipment, piping, etc., in accordance with Division 9. Equipment specified to have factory finishes shall be protected until completion of the Contract, with Contractor being responsible for maintaining finishes.
     2. Apply paint to exposed piping according to the following, unless otherwise indicated:
        1. Interior, Ferrous Piping: Use semi-gloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
        2. Interior, Galvanized-Steel Piping: Use semi-gloss, acrylic-enamel finish. Include 2 finish coats over galvanized metal primer.
        3. Interior, Ferrous Supports: Use semi-gloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
        4. Exterior, Ferrous Piping: Use semi-gloss, acrylic-enamel finish. Include 2 finish coats over rust-inhibitive metal primer.
        5. Exterior, Galvanized-Steel Piping: Use semi-gloss, acrylic-enamel finish. Include 2 finish coats over galvanized metal primer.
        6. Exterior, Ferrous Supports: Use semi-gloss, acrylic-enamel finish. Include 2 finish coats over rust-inhibitive metal primer.
        7. Do not paint piping specialties with factory-applied finish.
        8. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.
        9. Galvanized surfaces damaged during installation shall be repaired with a galvanized repair compound complying with Mil Spec DOD-P-21035B. Any equipment scratched, marred or damaged will be repainted to the original condition.
  2. **600 VOLT INSULATION TEST:**
     1. Prior to energizing the electrical system the Contractor shall provide insulation resistance tests for all distribution and utilization equipment. The Contractor shall provide a suitable and stable source of test power. The insulation test shall be a “megger” test at 500 volts D.C. for 1/2 minute. The test shall be scheduled in advance with the Owner/Engineer. A test report shall be submitted to the Owner/Engineer for approval. The minimum insulation resistance for all conductors shall be 1,000,000 ohms. Conductors testing below the minimum insulation resistance shall be replaced and tested again.
  3. **CONTINUITY TEST:**
     1. The Contractor shall perform a continuity test on the affected portion of the electrical system prior to energizing the system to insure proper cable connections.
  4. **CONNECTION TORQUE TESTS:**
     1. All larger conductor bolted connections shall be torque tested using a torque wrench. Torque shall be to National Electrical Testing Association’s (NETA) Standards.
  5. **GROUND RESISTANCE MEASUREMENTS:**
     1. Ground resistance measurements of each ground rod shall be taken and certified by the Contractor to the Owner. No part of the electrical distribution system shall be energized prior to the resistance testing of that system’s ground rods and grounding system and submission of test results to the Owner. Test reports shall indicate the location of the ground rod and grounding system and the resistance and the soil conditions at the time the test was performed. When the building water service is used as a ground of part of the grounding system, ground- resistance measurements shall also be made of this connection. Ground-resistance measurements shall be made in normally dry weather, not less than 48 hours after rainfall, and with the ground under test isolated from other grounds. The resistance to ground shall be measured using the fall-of-potential method described in IEEE No. 142.
  6. **MECHANICAL OPERATION TESTS:**
     1. All electrical equipment, such as switches, circuit breakers, etc., shall be tested by operating the device to verify that the mechanical portions of the device are functioning.
  7. **ROTATIONAL TESTS:**
     1. The Contractor shall assist all other trades in performing rotational tests on all motors provided under this contract. If rotational tests determine that conductors must be transposed to change direction of rotation, the conductors shall be changed at the make-up box on the motor; or if the change is made elsewhere, then the conductor’s color coding shall be changed.

**END OF SECTION**

**PART 1 GENERAL**

* 1. **RELATED DOCUMENTS**

**SECTION 26 0513 MEDIUM-VOLTAGE CABLES**

* + 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
  1. **SUMMARY**
     1. This Section includes cables and related splices, terminations, and accessories for medium- voltage electrical distribution systems.
  2. **DEFINITIONS**
     1. NETA ATS: Acceptance Testing Specification.
  3. **ACTION SUBMITTALS**
     1. Product Data: For each type of cable indicated. Include splices and terminations for cables and cable accessories.
     2. Samples: 16-inch lengths of each type of cable indicated.
  4. **INFORMATIONAL SUBMITTALS**
     1. Qualification Data: For Installer and Testing agency.
     2. Material Certificates: For each cable and accessory type, signed by manufacturers.
     3. Source quality-control test reports.
     4. Field quality-control test reports.
  5. **QUALITY ASSURANCE**
     1. Installer: Engage a cable splicer, trained and certified by splice material manufacturer, to install, splice, and terminate medium-voltage cable.
     2. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in

29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

* + 1. Source Limitations: Obtain cables and accessories through one source from a single manufacturer.
    2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
    3. Comply with IEEE C2 and NFPA 70.
  1. **PROJECT CONDITIONS**
     1. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
        1. Notify Owner no fewer than 15 days in advance of proposed interruption of electric service.
        2. Do not proceed with interruption of electric service without Owner's written permission.

**PART 2 PRODUCTS**

* 1. **MANUFACTURERS**
     1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
        1. Cables:
           1. American Insulated Wire Corp.; a Leviton Company.
           2. [General Cable Technologies Corporation.](http://www.specagent.com/LookUp/?uid=123456802845&amp;mf=04&amp;src=wd)
           3. [Kerite Co. (The); Hubbell Incorporated.](http://www.specagent.com/LookUp/?uid=123456817805&amp;mf=04&amp;src=wd)
           4. [Okonite Company (The).](http://www.specagent.com/LookUp/?uid=123456802846&amp;mf=04&amp;src=wd)
           5. [Pirelli Cables & Systems NA.](http://www.specagent.com/LookUp/?uid=123456802847&amp;mf=04&amp;src=wd)
           6. [Rome Cable Corporation.](http://www.specagent.com/LookUp/?uid=123456802848&amp;mf=04&amp;src=wd)
           7. [Southwire Company.](http://www.specagent.com/LookUp/?uid=123456802849&amp;mf=04&amp;src=wd)
        2. [Cable Splicing and Terminating Products and Accessories:](http://www.specagent.com/LookUp/?ulid=1696&amp;mf=04&amp;src=wd)
           1. [Engineered Products Company.](http://www.specagent.com/LookUp/?uid=123456802850&amp;mf=04&amp;src=wd)
           2. [G&W Electric Company.](http://www.specagent.com/LookUp/?uid=123456802851&amp;mf=04&amp;src=wd)
           3. [MPHusky.](http://www.specagent.com/LookUp/?uid=123456802852&amp;mf=04&amp;src=wd)
           4. [Raychem Corp.; Telephone Energy and Industrial Division; Tyco International Ltd.](http://www.specagent.com/LookUp/?uid=123456817806&amp;mf=04&amp;src=wd)
           5. RTE Components; Cooper Power Systems, Inc.
           6. Scott Fetzer Co. (The); Adalet.
           7. Thomas & Betts Corporation.
           8. Thomas & Betts Corporation/Elastimold.
           9. 3M; Electrical Products Division.
  2. **CABLES**
     1. Cable Type: MV105.
     2. Comply with UL 1072, AEIC CS 8, ICEA S-93-639, and ICEA S-97-682.
     3. Conductor: Copper. (See Alternative Bid below.)
     4. Conductor Stranding: Concentric lay, Class B.
     5. Strand Filling: Conductor interstices are filled with impermeable compound.
     6. Conductor Insulation: Crosslinked polyethylene.
     7. Conductor Insulation: Ethylene-propylene rubber.
        1. Voltage Rating: 5 kV.
        2. Insulation Thickness: 133 percent insulation level.
     8. Shielding: Solid copper wires, helically applied over semiconducting insulation shield.
     9. Shielding and Jacket: Corrugated copper drain wires embedded in extruded, chlorinated, polyethylene jacket.
     10. Cable Jacket: Chlorosulfonated polyethylene, CPE.
  3. **SPLICE KITS**
     1. Connectors and Splice Kits: Comply with IEEE 404; type as recommended by cable or splicing kit manufacturer for the application.
     2. Splicing Products: As recommended, in writing, by splicing kit manufacturer for specific sizes, ratings, and configurations of cable conductors. Include all components required for complete splice, with detailed instructions.
        1. Combination tape and cold-shrink-rubber sleeve kit with rejacketing by cast-epoxy-resin encasement or other waterproof, abrasion-resistant material.
        2. Heat-shrink splicing kit of uniform, cross-section, polymeric construction with outer heat- shrink jacket.
        3. Premolded, cold-shrink-rubber, in-line splicing kit.
        4. Premolded EPDM splicing body kit with cable joint sealed by interference fit of mating parts and cable.
  4. **SOLID TERMINATIONS**
     1. Multiconductor Cable Sheath Seals: Type recommended by seal manufacturer for type of cable and installation conditions, including orientation.
        1. Compound-filled, cast-metal body, metal-clad cable terminator for metal-clad cable with external plastic jacket.
        2. Cold-shrink sheath seal kit with preformed sleeve openings sized for cable and insulated conductors.
        3. Heat-shrink sheath seal kit with phase- and ground-conductor rejacketing tubes, cable-end sealing boot, and sealing plugs for unused ground-wire openings in boot.
        4. Cast-epoxy-resin sheath seal kit with wraparound mold and packaged, two-part, epoxy- resin casting material.
     2. Shielded-Cable Terminations: Comply with the following classes of IEEE 48. Insulation class is equivalent to that of cable. Include shield ground strap for shielded cable terminations.
        1. Class 1 Terminations: Modular type, furnished as a kit, with stress-relief tube; multiple, molded-silicone rubber, insulator modules; shield ground strap; and compression-type connector.
        2. Class 1 Terminations: Heat-shrink type with heat-shrink inner stress control and outer nontracking tubes; multiple, molded, nontracking skirt modules; and compression-type connector.
        3. Class 1 Terminations: Modular type, furnished as a kit, with stress-relief shield terminator; multiple-wet-process, porcelain, insulator modules; shield ground strap; and compression- type connector.
        4. Class 1 Terminations, Indoors: Kit with stress-relief tube, nontracking insulator tube, shield ground strap, compression-type connector, and end seal.
        5. Class 2 Terminations, Indoors: Kit with stress-relief tube, nontracking insulator tube, shield ground strap, and compression-type connector. Include silicone-rubber tape, cold- shrink-rubber sleeve, or heat-shrink plastic-sleeve moisture seal for end of insulation whether or not supplied with kits.
        6. Class 3 Terminations: Kit with stress cone and compression-type connector.
     3. Nonshielded-Cable Terminations: Kit with compression-type connector. Include silicone- rubber tape, cold-shrink-rubber sleeve, or heat-shrink plastic-sleeve moisture seal for end of insulation whether or not supplied with kits.
  5. **SEPARABLE INSULATED CONNECTORS**
     1. Description: Modular system, complying with IEEE 386, with disconnecting, single-pole, cable terminators and with matching, stationary, plug-in, dead-front terminals designed for cable voltage and for sealing against moisture.
     2. Terminations at Distribution Points: Modular type, consisting of terminators installed on cables and modular, dead-front, terminal junctions for interconnecting cables.
     3. Load-Break Cable Terminators: Elbow-type units with 200-A load make/break and continuous- current rating; coordinated with insulation diameter, conductor size, and material of cable being terminated. Include test point on terminator body that is capacitance coupled.
  6. **SOURCE QUALITY CONTROL**
     1. Test and inspect cables according to ICEA before shipping.
     2. Test strand-filled cables for water-penetration resistance according to ICEA T-31-610, using a test pressure of 5 psig.

**PART 3 EXECUTION**

* 1. **INSTALLATION**
     1. Install cables according to IEEE 576.
     2. Pull Conductors: Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
        1. Where necessary, use manufacturer-approved pulling compound or lubricant that will not deteriorate conductor or insulation.
        2. Use pulling means, including fish tape, cable, rope, and basket-weave cable grips that will not damage cables and raceways. Do not use rope hitches for pulling attachment to cable.
     3. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.
     4. Support cables according to Section 26 0529 "Supporting Devices."
     5. In manholes, handholes, pull boxes, junction boxes, and cable vaults, train cables around walls by the longest route from entry to exit and support cables at intervals adequate to prevent sag.
     6. Install cable splices at pull points and elsewhere as indicated; use standard kits.
     7. Install terminations at ends of conductors and seal multiconductor cable ends with standard kits.
     8. Seal around cables passing through fire-rated elements according to Section 07 8400 "Firestopping."
     9. Ground shields of shielded cable at terminations, splices, and separable insulated connectors. Ground metal bodies of terminators, splices, cable and separable insulated-connector fittings, and hardware.
     10. Identify cables according to Section 26 0553 "Identification for Electrical Systems."
  2. **FIELD QUALITY CONTROL**
     1. Testing: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:
     2. Perform the following field tests and inspections and prepare test reports:
        1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters.
        2. After installing medium-voltage cables and before electrical circuitry has been energized, test for compliance with requirements.
     3. Remove and replace malfunctioning units and retest as specified above.

**END OF SECTION**

**SECTION 26 0519**

**LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES PART 1 GENERAL**

* 1. **SUMMARY**
     1. This Section includes the following:
        1. Building wires and cables rated 600 V and less.
        2. Connectors, splices, and terminations rated 600 V and less.
     2. Related Sections include the following:
        1. Section 27 1500 "Structured Cabling" for cabling used for voice and data circuits.
  2. **DEFINITIONS**
     1. EPDM: Ethylene-propylene-diene terpolymer rubber.
     2. NBR: Acrylonitrile-butadiene rubber.
  3. **ACTION SUBMITTALS**
     1. Product Data: For each type of product indicated.
  4. **INFORMATIONAL SUBMITTALS**
     1. Qualification Data: For testing agency.
     2. Field quality-control test reports.
  5. **QUALITY ASSURANCE**
     1. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in

29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

* + 1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
    2. Comply with NFPA 70.

**PART 2 PRODUCTS**

* 1. **CONDUCTORS AND CABLES**
     1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
        1. Alcan Products Corporation; Alcan Cable Division.
        2. American Insulated Wire Corp.; a Leviton Company.
        3. General Cable Corporation.
        4. Senator Wire & Cable Company.
        5. Southwire Company.
     2. Aluminum and Copper Conductors: Comply with NEMA WC 70.
     3. Conductor Insulation: Comply with NEMA WC 70 for Types THW, and THHN-THWN.
     4. Multiconductor Cable: Comply with NEMA WC 70 for metal-clad cable, Type MC with ground wire.
  2. **CONNECTORS AND SPLICES**
     1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
        1. AFC Cable Systems, Inc.
        2. Hubbell Power Systems, Inc.
        3. O-Z/Gedney; EGS Electrical Group LLC.
        4. 3M; Electrical Products Division.
        5. Tyco Electronics Corp.
     2. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

**PART 3 EXECUTION**

* 1. **CONDUCTOR MATERIAL APPLICATIONS**
     1. Feeders: Aluminum for all feeders except as noted on Riser diagram. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
     2. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
  2. **CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS**
     1. Service Entrance: Type THHN-THWN, single conductors in raceway.
     2. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
     3. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceways.
     4. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN- THWN, single conductors in raceway.
     5. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-THWN, single conductors in raceway or Metal-clad cable.
     6. Branch Circuits Concealed in hard Ceilings: Type THHN-THWN, single conductors in raceway, MC cable, Nonmetallic-Sheathed Cable.
     7. Branch Circuits Concealed in lay-in Ceilings: Type THHN-THWN, single conductors in raceway or MC cable. Nonmetallic-Sheathed Cable not permitted.
     8. Branch Circuits, Walls, and Partitions: Type THHN-THWN, single conductors in raceway, Metal-clad cable, Type MC, Nonmetallic-Sheathed Cable.
     9. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
     10. Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
     11. Class 1 Control Circuits: Type THHN-THWN, in raceway.
     12. Class 2 Control Circuits: Type THHN-THWN plenum rated.
  3. **INSTALLATION OF CONDUCTORS AND CABLES**
     1. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
     2. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
     3. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
     4. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
     5. Support cables according to Section 26 0529 "Hangers and Supports for Electrical Systems."
     6. Identify and color-code conductors and cables according to Section 26 0553 "Identification for Electrical Systems."
  4. **CONNECTIONS**
     1. Tighten electrical connectors and terminals according to manufacturer's published torque- tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
     2. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.
        1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.
     3. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.
  5. **SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS**
     1. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 0544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."
  6. **FIRESTOPPING**
     1. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 07 8400 "Firestopping."
  7. **FIELD QUALITY CONTROL**
     1. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
     2. Contractor to perform tests and inspections and prepare test reports.
     3. Tests and Inspections:
        1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, and conductors feeding the Elevato**r** for compliance with requirements.
        2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
        3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.
           1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
           2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
           3. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
     4. Test Reports: Prepare a written report to record the following:
        1. Test procedures used.
        2. Test results that comply with requirements.
        3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
     5. Remove and replace malfunctioning units and retest as specified above.

**END OF SECTION**

**PART 1 GENERAL**

* 1. **SUMMARY**

**SECTION 26 0526**

**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

* + 1. Section Includes: Grounding systems and equipment.
    2. Section includes grounding systems and equipment, plus the following special applications:
       1. Overhead-line grounding.
       2. Underground distribution grounding.
       3. Ground bonding common with lightning protection system.
  1. **ACTION SUBMITTALS**
     1. Product Data: For each type of product indicated.
  2. **INFORMATIONAL SUBMITTALS**
     1. Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
        1. Test wells.
        2. Ground rods.
        3. Ground rings.
        4. Grounding arrangements and connections for separately derived systems.
        5. Grounding for sensitive electronic equipment.
     2. Qualification Data: For qualified testing agency and testing agency's field supervisor.
     3. Field quality-control reports.
  3. **CLOSEOUT SUBMITTALS**
     1. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01, include the following:
        1. Instructions for periodic testing and inspection of grounding features at grounding connections for separately derived systems based on NFPA 70B.
           1. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
           2. Include recommended testing intervals.
  4. **QUALITY ASSURANCE**
     1. Testing Agency Qualifications: Member company of NETA or an NRTL.
        1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
     2. 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.
     3. Comply with UL 467 for grounding and bonding materials and equipment.

**PART 2 PRODUCTS**

* 1. **CONDUCTORS**
     1. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
     2. Bare Copper Conductors:
        1. Solid Conductors: ASTM B 3.
        2. Stranded Conductors: ASTM B 8.
        3. Tinned Conductors: ASTM B 33.
        4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
        5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
        6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
        7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
     3. Bare Grounding Conductor and Conductor Protector for Wood Poles:
        1. No. 4 AWG minimum, soft-drawn copper.
        2. Conductor Protector: Half-round PVC or wood molding; if wood, use pressure-treated fir, cypress, or cedar.
     4. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.
  2. **CONNECTORS**
     1. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
     2. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
        1. Pipe Connectors: Clamp type, sized for pipe.
     3. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
     4. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
  3. **GROUNDING ELECTRODES**
     1. Ground Rods: Copper-clad steel; 5/8 by 96 inches in diameter.
     2. Chemical-Enhanced Grounding Electrodes: Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts.
        1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches long.
        2. Backfill Material: Electrode manufacturer's recommended material.

**PART 3 EXECUTION**

* 1. **APPLICATIONS**
     1. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
     2. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.
        1. Bury at least 24 inches below grade.
     3. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
        1. Install bus on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
        2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down to specified height above floor; connect to horizontal bus.
     4. Conductor Terminations and Connections:
        1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
        2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
        3. Connections to Ground Rods at Test Wells: Bolted connectors.
        4. Connections to Structural Steel: Welded connectors.
  2. **EQUIPMENT GROUNDING**
     1. Install insulated equipment grounding conductors with all feeders and branch circuits.
     2. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
        1. Feeders and branch circuits.
        2. Lighting circuits.
        3. Receptacle circuits.
        4. Single-phase motor and appliance branch circuits.
        5. Three-phase motor and appliance branch circuits.
        6. Flexible raceway runs.
        7. Armored and metal-clad cable runs.
        8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
        9. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power- distribution units.
        10. X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.
     3. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
     4. Water Heater, Heat-Tracing, and Anti-frost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
     5. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J- STD-607-A.
        1. For telephone, alarm, voice and data, and other communication equipment, provide

No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

* + - 1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4-by-12-inch grounding bus.
      2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
    1. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.
  1. **INSTALLATION**
     1. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
     2. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system

ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

* + 1. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
       1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
       2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
    2. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 26 0543 "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches deep, with cover.
       1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
    3. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
       1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
       2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
       3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
    4. Grounding and Bonding for Piping:
       1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
       2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
       3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
    5. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.
    6. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.
    7. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column extending around the perimeter of building.
       1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
       2. Bury ground ring not less than 24 inches from building's foundation.
  1. **LABELING**
     1. Comply with requirements in Section 26 0553 "Identification for Electrical Systems" for instruction signs. The label or its text shall be green.
     2. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.
        1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."
  2. **FIELD QUALITY CONTROL**
     1. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
     2. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
     3. Contractor to perform tests and inspections.
        1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
     4. Tests and Inspections:
        1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
        2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
        3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test

wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.

* + - * 1. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
        2. Perform tests by fall-of-potential method according to IEEE 81.
      1. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
    1. Grounding system will be considered defective if it does not pass tests and inspections.
    2. Prepare test and inspection reports.
    3. Report measured ground resistances that exceed the following values:
       1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
       2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
       3. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
       4. Substations and Pad-Mounted Equipment: 5 ohms.
       5. Manhole Grounds: 10 ohms.
    4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Owner promptly and include recommendations to reduce ground resistance.

**END OF SECTION**

**PART 1 GENERAL**

* 1. **SUMMARY**

**SECTION 26 0529**

**HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

* + 1. This Section includes the following:
       1. Hangers and supports for electrical equipment and systems.
       2. Construction requirements for concrete bases.
    2. Related Sections include the following:
       1. Section 26 0548 "Vibration and Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.
  1. **DEFINITIONS**
     1. EMT: Electrical metallic tubing.
     2. IMC: Intermediate metal conduit.
     3. RMC: Rigid metal conduit.
  2. **PERFORMANCE REQUIREMENTS**
     1. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
     2. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
     3. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
     4. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.
  3. **ACTION SUBMITTALS**
     1. Product Data: For the following:
        1. Steel slotted support systems.
        2. Nonmetallic slotted support systems.
     2. Shop Drawings: Show fabrication and installation details and include calculations for the following:
        1. Trapeze hangers. Include Product Data for components.
        2. Steel slotted channel systems. Include Product Data for components.
        3. Nonmetallic slotted channel systems. Include Product Data for components.
        4. Equipment supports.
  4. **INFORMATIONAL SUBMITTALS**
     1. Welding certificates.
  5. **QUALITY ASSURANCE**
     1. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
     2. Comply with NFPA 70.
  6. **COORDINATION**
     1. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.
     2. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 07 7200 "Roof Accessories."

**PART 2 PRODUCTS**

* 1. **SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS**
     1. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
        1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
           1. Allied Tube & Conduit.
           2. Cooper B-Line, Inc.; a division of Cooper Industries.
           3. ERICO International Corporation.
           4. GS Metals Corp.
           5. Thomas & Betts Corporation.
           6. Unistrut; Tyco International, Ltd.
           7. Wesanco, Inc.
        2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
        3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
        4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
        5. Channel Dimensions: Selected for applicable load criteria.
     2. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- diameter holes at a maximum of 8 inches o.c., in at least 1 surface.
        1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
           1. Allied Tube & Conduit.
           2. Cooper B-Line, Inc.; a division of Cooper Industries.
           3. Fabco Plastics Wholesale Limited.
           4. Seasafe, Inc.
        2. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
        3. Fitting and Accessory Materials: Same as channels and angles**,** except metal items may be stainless steel.
        4. Rated Strength: Selected to suit applicable load criteria.
     3. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
     4. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
     5. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
     6. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
     7. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
        1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
           1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Hilti Inc.

ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.

MKT Fastening, LLC.

Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

* + - 1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
         1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Cooper B-Line, Inc.; a division of Cooper Industries.

Empire Tool and Manufacturing Co., Inc.

Hilti Inc.

ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.

MKT Fastening, LLC.

* + - 1. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
      2. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
      3. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
      4. Toggle Bolts: All-steel springhead type.
      5. Hanger Rods: Threaded steel.
  1. **FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES**
     1. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
     2. Materials: Comply with requirements in Section 05 5000 "Metal Fabrications" for steel shapes and plates.

**PART 3 EXECUTION**

* 1. **APPLICATION**
     1. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
     2. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
     3. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted **or** other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
        1. Secure raceways and cables to these supports with clamps single-bolt conduit clamps using spring friction action for retention in support channel.
     4. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1- 1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.
  2. **SUPPORT INSTALLATION**
     1. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
     2. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
     3. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
     4. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
        1. To Wood: Fasten with lag screws or through bolts.
        2. To New Concrete: Bolt to concrete inserts.
        3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
        4. To Existing Concrete: Expansion anchor fasteners.
        5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
        6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
        7. To Light Steel: Sheet metal screws.
        8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
     5. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.
  3. **INSTALLATION OF FABRICATED METAL SUPPORTS**
     1. Comply with installation requirements in Section 05 5000 "Metal Fabrications" for site-fabricated metal supports.
     2. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
     3. Field Welding: Comply with AWS D1.1/D1.1M.
  4. **CONCRETE BASES**
     1. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
     2. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified **in** Section "Cast-in-Place Concrete."
     3. Anchor equipment to concrete base.
        1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
        2. Install anchor bolts to elevations required for proper attachment to supported equipment.
        3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
  5. **PAINTING**
     1. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
        1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
     2. Touchup: Comply with requirements in "Exterior Painting" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
     3. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

**END OF SECTION**

**PART 1 GENERAL**

* 1. **SUMMARY**

**SECTION 26 0533**

**RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS**

* + 1. Section Includes:
       1. Metal conduits, tubing, and fittings.
       2. Nonmetal conduits, tubing, and fittings.
       3. Metal wireways and auxiliary gutters.
       4. Nonmetal wireways and auxiliary gutters.
       5. Surface raceways.
       6. Boxes, enclosures, and cabinets.
       7. Handholes and boxes for exterior underground cabling.
    2. Related Requirements:
       1. Section 27 0528 "Pathways for Communications Systems" for conduits, wireways, surface pathways, innerduct, boxes, faceplate adapters, enclosures, cabinets, and handholes serving communications systems.
       2. Section 28 0528 "Pathways for Electronic Safety and Security" for conduits, surface pathways, innerduct, boxes, and faceplate adapters serving electronic safety and security.
  1. **DEFINITIONS**
     1. ARC: Aluminum rigid conduit.
     2. GRC: Galvanized rigid steel conduit.
     3. IMC: Intermediate metal conduit.
  2. **ACTION SUBMITTALS**
     1. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
     2. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.
  3. **INFORMATIONAL SUBMITTALS**
     1. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
        1. Structural members in paths of conduit groups with common supports.
        2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.
     2. Qualification Data: For professional engineer.
     3. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.
        1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
        2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
        3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
        4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.
     4. Source quality-control reports.

**PART 2 PRODUCTS**

* 1. **METAL CONDUITS, TUBING, AND FITTINGS**
     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:
        1. AFC Cable Systems, Inc.
        2. Allied Tube & Conduit; a Tyco International Ltd. Co.
        3. Anamet Electrical, Inc.
        4. Electri-Flex Company.
        5. O-Z/Gedney; a brand of EGS Electrical Group.
        6. Picoma Industries, a subsidiary of Mueller Water Products, Inc.
        7. Republic Conduit.
        8. Robroy Industries.
        9. Southwire Company.
        10. Thomas & Betts Corporation.
        11. Western Tube and Conduit Corporation.
        12. Wheatland Tube Company; a division of John Maneely Company.
     2. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
     3. GRC: Comply with ANSI C80.1 and UL 6.
     4. ARC: Comply with ANSI C80.5 and UL 6A.
     5. IMC: Comply with ANSI C80.6 and UL 1242.
     6. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
        1. Comply with NEMA RN 1.
        2. Coating Thickness: 0.040 inch, minimum.
     7. EMT: Comply with ANSI C80.3 and UL 797.
     8. FMC: Comply with UL 1; zinc-coated steel.
     9. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
     10. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
         1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
         2. Fittings for EMT:
            1. Material: Steel or die cast.
            2. Type: compression.
         3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
         4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.
     11. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.
  2. **NONMETALLIC CONDUITS, TUBING, AND FITTINGS**
     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:
        1. AFC Cable Systems, Inc.
        2. Anamet Electrical, Inc.
        3. Arnco Corporation.
        4. CANTEX Inc.
        5. CertainTeed Corp.
        6. Condux International, Inc.
        7. Electri-Flex Company.
        8. Kraloy.
        9. Lamson & Sessions; Carlon Electrical Products.
        10. Niedax-Kleinhuis USA, Inc.
        11. RACO; a Hubbell company.
        12. Thomas & Betts Corporation.
     2. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
     3. ENT: Comply with NEMA TC 13 and UL 1653.
     4. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
     5. LFNC: Comply with UL 1660.
     6. Rigid HDPE: Comply with UL 651A.
     7. Continuous HDPE: Comply with UL 651B.
     8. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.
     9. RTRC: Comply with UL 1684A and NEMA TC 14.
     10. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
     11. Fittings for LFNC: Comply with UL 514B.
     12. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
     13. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
  3. **METAL WIREWAYS AND AUXILIARY GUTTERS**
     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:
        1. Cooper B-Line, Inc.
        2. Hoffman; a Pentair company.
        3. Mono-Systems, Inc.
        4. Square D; a brand of Schneider Electric.
     2. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
        1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
     3. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
     4. Wireway Covers: Screw-cover type unless otherwise indicated.
     5. Finish: Manufacturer's standard enamel finish.
  4. **NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS**
     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:
        1. Allied Moulded Products, Inc.
        2. Hoffman; a Pentair company.
        3. Lamson & Sessions; Carlon Electrical Products.
        4. Niedax-Kleinhuis USA, Inc.
     2. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
     3. Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.
     4. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.
     5. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.
     6. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
     7. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
  5. **BOXES, ENCLOSURES, AND CABINETS**
     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:
        1. Adalet.
        2. Cooper Technologies Company; Cooper Crouse-Hinds.
        3. EGS/Appleton Electric.
        4. Erickson Electrical Equipment Company.
        5. FSR Inc.
        6. Hoffman; a Pentair company.
        7. Hubbell Incorporated; Killark Division.
        8. Kraloy.
        9. Milbank Manufacturing Co.
        10. Mono-Systems, Inc.
        11. O-Z/Gedney; a brand of EGS Electrical Group.
        12. RACO; a Hubbell Company.
        13. Robroy Industries.
        14. Spring City Electrical Manufacturing Company.
        15. Stahlin Non-Metallic Enclosures; a division of Robroy Industries.
        16. Thomas & Betts Corporation.
        17. Wiremold / Legrand.
     2. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
     3. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
     4. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.
     5. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
     6. Metal Floor Boxes:
        1. Material: Cast metal or sheet metal.
        2. Type**:** Semi-adjustable.
        3. Shape: Rectangular.
        4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
     7. Nonmetallic Floor Boxes: Nonadjustable, round.
        1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
     8. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.
     9. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb.
        1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
     10. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
     11. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
     12. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
     13. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.
     14. Gangable boxes are allowed.
  6. **HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING**
     1. General Requirements for Handholes and Boxes:
        1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
        2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
     2. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of fiberglass.
        1. Basis-of-Design Product:
           1. Armorcast Products Company.
           2. Carson Industries LLC.
           3. CDR Systems Corporation; Hubbell Power Systems.
           4. NewBasis.
           5. Nordic Fiberglass, Inc.
           6. Oldcastle Precast, Inc.; Christy Concrete Products.
           7. Synertech Moulded Products; a division of Oldcastle Precast, Inc.
        2. Standard: Comply with SCTE 77.
        3. Color of Frame and Cover: Green.
        4. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
        5. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
        6. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
        7. Cover Legend: Molded lettering, "ELECTRIC.".
        8. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
        9. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.
  7. **SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES**
     1. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
        1. Tests of materials shall be performed by an independent testing agency.
        2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
        3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

**PART 3 EXECUTION**

* 1. **RACEWAY APPLICATION**
     1. Outdoors: Apply raceway products as specified below unless otherwise indicated:
        1. Exposed Conduit: GRC.
        2. Concealed Conduit, Aboveground: EMT.
        3. Underground Conduit: RNC, Type EPC-40-PVC.
        4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
        5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
     2. Indoors: Apply raceway products as specified below unless otherwise indicated:
        1. Exposed, Not Subject to Physical Damage, and Panel and Transformer feeders: EMT.
        2. Concealed in Ceilings and Interior Walls and Partitions: None required.
        3. Connection to Vibrating Equipment (Including Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): Not required, except use LFMC in damp or wet locations.
        4. Boxes and Enclosures: NEMA 250, Type 1.
     3. Minimum Raceway Size: **1/2-inch** trade size.
     4. Raceway Fittings: Compatible with raceways and suitable for use and location.
        1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
        2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
        3. EMT: Use **compression cast-metal** fittings. Comply with NEMA FB 2.10.
        4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
     5. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
     6. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
     7. Install surface raceways only where indicated on Drawings.
  2. **INSTALLATION**
     1. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
     2. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
     3. Complete raceway installation before starting conductor installation.
     4. Comply with requirements in Section 26 0529 "Hangers and Supports for Electrical Systems" for hangers and supports.
     5. Arrange stub-ups so curved portions of bends are not visible above finished slab.
     6. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
     7. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
     8. Support conduit within 12 inches of enclosures to which attached.
     9. Raceways Embedded in Slabs:
        1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-footintervals.
        2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
        3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
        4. Do not embed threadless fittings in concrete unless specifically approved by Owner for each specific location.
     10. Stub-ups to Above Recessed Ceilings:
         1. Use EMT, IMC, or RMC for raceways.
         2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
     11. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
     12. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
     13. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
     14. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
     15. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
     16. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
     17. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
     18. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
     19. Surface Raceways:
         1. Install surface raceway with a minimum 2-inchradius control at bend points.
         2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
     20. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
     21. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
         1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
         2. Where an underground service raceway enters a building or structure.
         3. Where otherwise required by NFPA 70.

V. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

1. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed luminaires equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
   1. Use LFMC in damp or wet locations subject to severe physical damage.
   2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
2. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
3. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
4. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

AA. Locate boxes so that cover or plate will not span different building finishes.

BB. For power, lighting and low voltage systems, backboxes for flush mounted wall devices shall be provided a supplemental bracket to permanently maintain alignment of the device coverplate with the face of the finish surface. The bracket shall serve to hold the backbox firmly in place and prevent any twisting or other movement of box within the wall cavity; e.g. such as may result from the plug or unplug action at a duplex receptacle.

* 1. Where horizontal dimensioning of a backbox requires a precise position, or where the backbox is three gangs or more, then provide a telescoping bracket anchored to the framing member at each side of the wall cavity; Cooper B-Line #BB2-16T, or equal.
  2. Where horizontal position of device permits installation adjacent to a stud, use CADDY

#H23 (for stud depth=2-1/2”-3-1/2”), or CADDY #H6 (for stud depth=6”), or equal.

* 1. For other applications or proposed alternate assemblies, provide product submittal to engineer for evaluation.

CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

DD. Set metal floor boxes level and flush with finished floor surface.

EE. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

* 1. **INSTALLATION OF UNDERGROUND CONDUIT**
     1. Direct-Buried Conduit:
        1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 31 2000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
        2. Install backfill as specified in Section 31 2000 "Earth Moving."
        3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 31 2000 "Earth Moving."
        4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
        5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
           1. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
           2. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of

60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

* + - 1. Warning Planks: Bury warning planks approximately 12 inches above direct-buried conduits but a minimum of 6 inches below grade. Align planks along centerline of conduit.
      2. Underground Warning Tape: Comply with requirements in Section 26 0553 "Identification for Electrical Systems."
  1. **INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES**
     1. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
     2. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
     3. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
     4. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.
     5. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
  2. **SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS**
     1. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 0544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."
  3. **FIRESTOPPING**
     1. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 07 8400 "Firestopping."
  4. **PROTECTION**
     1. Protect coatings, finishes, and cabinets from damage and deterioration.
        1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
        2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

**END OF SECTION**

**SECTION 26 0543**

**UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS PART 1 GENERAL**

* 1. **SUMMARY**
     1. This Section includes the following:
        1. Conduit, ducts, and duct accessories for direct-buried duct banks.
        2. Handholes and boxes.
        3. Manholes.
  2. **DEFINITION**
     1. RNC: Rigid nonmetallic conduit.
  3. **ACTION SUBMITTALS**
     1. Product Data: For the following:
        1. Duct-bank materials, including separators and miscellaneous components.
        2. Ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
        3. Accessories for manholes, handholes, boxes.
        4. Warning tape.
        5. Warning planks.
     2. Shop Drawings for Factory-Fabricated Handholes and Boxes Other Than Precast Concrete: Include dimensioned plans, sections, and elevations, and fabrication and installation details, including the following:
        1. Duct entry provisions, including locations and duct sizes.
        2. Cover design.
        3. Grounding details.
        4. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
  4. **INFORMATIONAL SUBMITTALS**
     1. Duct-Bank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures.
        1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.
        2. Drawings shall be signed and sealed by a qualified professional engineer.
  5. **QUALITY ASSURANCE**
     1. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
     2. Comply with ANSI C2.
     3. Comply with NFPA 70.
  6. **PROJECT CONDITIONS**
     1. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
        1. Notify Owner no fewer than two days in advance of proposed interruption of electrical service.
        2. Do not proceed with interruption of electrical service without Owner's written permission.
  7. **COORDINATION**
     1. Coordinate layout and installation of ducts, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field.
     2. Coordinate elevations of ducts and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of ducts and duct banks as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations

from those indicated as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Owner.

**PART 2 PRODUCTS**

* 1. **CONDUIT**
     1. RNC: NEMA TC 2, Type EPC-40-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.
  2. **NONMETALLIC DUCTS AND DUCT ACCESSORIES**
     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:
     3. Basis-of-Design Product:
        1. ARNCO Corp.
        2. Beck Manufacturing.
        3. Cantex, Inc.
        4. CertainTeed Corp.; Pipe & Plastics Group.
        5. Condux International, Inc.
        6. ElecSys, Inc.
        7. Electri-Flex Company.
        8. IPEX Inc.
        9. Lamson & Sessions; Carlon Electrical Products.
     4. Duct Accessories:
        1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and sizes of ducts with which used, and selected to provide minimum duct spacings indicated while supporting ducts during concreting or backfilling.
        2. Warning Tape: Underground-line warning tape specified in Section 26 0553 "Identification for Electrical Systems."
        3. Concrete Warning Planks: Nominal 12 by 24 by 3 inches in size, manufactured from 6000-psi concrete.
           1. Mark each plank with "ELECTRIC" in 2-inch- high, 3/8-inch- deep letters.

**PART 3 EXECUTION**

* 1. **UNDERGROUND DUCT APPLICATION**
     1. Ducts for Electrical Feeders 600 V and Less: RNC**,** NEMA Type EPC-40-PVC, in direct-buried duct bank, unless otherwise indicated.
     2. Ducts for Electrical Branch Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank, unless otherwise indicated.
     3. Underground Ducts for Telephone, Communications, or Data Utility Service Cables: RNC, NEMA Type EPC-40-PVC, in concrete-encased duct bank, unless otherwise indicated.
     4. Underground Ducts for Telephone, Communications, or Data Utility Service Cables: RNC, NEMA Type EPC-40-PVC, installed in direct-buried duct bank, unless otherwise indicated.
     5. Underground Ducts for Telephone, Communications, or Data Circuits: RNC, NEMA Type EPC- 40-PVC, in direct-buried duct bank, unless otherwise indicated.
     6. Underground Ducts Crossing Driveways: RNC, NEMA Type EPC-40-PVC, encased in reinforced concrete.
  2. **EARTHWORK**
     1. Excavation and Backfill: Comply with Section 31 2000 "Earthmoving," but do not use heavy- duty, hydraulic-operated, compaction equipment.
     2. Restore surface features at areas disturbed by excavation and reestablish original grades, unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
     3. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary top-soiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Section 32 9219 "Seeding" and Section 32 9300 "Plants."
     4. Cut and patch existing pavement in the path of underground ducts and utility structures according to Section 01 7329 "Cutting and Patching."
  3. **DUCT INSTALLATION**
     1. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes to drain in both directions.
     2. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches, both horizontally and vertically, at other locations, unless otherwise indicated.
     3. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.
     4. Duct Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches o.c. for 5-inch ducts, and vary proportionately for other duct sizes.
        1. Begin change from regular spacing to end-bell spacing 10 feet from the end bell without reducing duct line slope and without forming a trap in the line.
        2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to manhole or handhole.
        3. Grout end bells into structure walls from both sides to provide watertight entrances.
     5. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet outside the building wall without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition. Install conduit penetrations of building walls as specified in Section 26 0544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."
     6. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.
     7. Pulling Cord: Install 100-lbf- test nylon cord in ducts, including spares.
     8. Direct-Buried Duct Banks:
        1. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
        2. Space separators close enough to prevent sagging and deforming of ducts, with not less than 4 spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches between tiers.
        3. Excavate trench bottom to provide firm and uniform support for duct bank. Prepare trench bottoms as specified in Section 31 2000 "Earthmoving" for pipes less than 6 inches in nominal diameter.
        4. Install backfill as specified in Section 31 2000 "Earthmoving."
        5. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand-place backfill to 4 inches over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction as specified in Section 31 2000 "Earthmoving."
        6. Install ducts with a minimum of 3 inches between ducts for like services and 6 inches between power and signal ducts.
        7. Depth: Install top of duct bank at least 36 inches below finished grade, unless otherwise indicated.
        8. Set elevation of bottom of duct bank below the frost line.
        9. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
        10. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.
            1. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
            2. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.
        11. Warning Planks: Bury warning planks approximately 12 inches above direct-buried ducts and duct banks, placing them 24 inches o.c. Align planks along the width and along the centerline of duct bank. Provide an additional plank for each 12-inch increment of ductbank width over a nominal 18 inches. Space additional planks 12 inches apart, horizontally.
  4. **INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE**
     1. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by the manufacturer.
     2. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
     3. Elevation: In paved areas and traffic-ways, set so cover surface will be flush with finished grade. Set covers of other handholes 1 inch above finished grade.
     4. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.
     5. Field-cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
  5. **GROUNDING**
     1. Ground underground ducts and utility structures according to Section 26 0526 "Grounding and Bonding for Electrical Systems."
  6. **FIELD QUALITY CONTROL**
     1. Perform the following tests and inspections and prepare test reports:
        1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
        2. Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of- round duct. Provide mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
     2. Correct deficiencies and retest as specified above to demonstrate compliance.
  7. **CLEANING**
     1. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.
     2. Clean internal surfaces of manholes, including sump. Remove foreign material.

**END OF SECTION**

**SECTION 26 0544**

**SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING PART 1 GENERAL**

* 1. **SUMMARY**
     1. Section Includes:
        1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
        2. Sleeve-seal systems.
        3. Sleeve-seal fittings.
        4. Grout.
        5. Silicone sealants.
     2. Related Requirements:
        1. Section 07 8400 "Firestopping" for penetration firestopping installed in fire-resistance- rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.
  2. **ACTION SUBMITTALS**
     1. Product Data: For each type of product.

**PART 2 PRODUCTS**

* 1. **SLEEVES**
     1. Wall Sleeves:
        1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
        2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
     2. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized- steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
     3. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
     4. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.
     5. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
     6. Sleeves for Rectangular Openings:
        1. Material: Galvanized sheet steel.
        2. Minimum Metal Thickness:
           1. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
           2. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.
  2. **GROUT**
     1. Description: Non-shrink; recommended for interior and exterior sealing openings in non-fire- rated walls or floors.
     2. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
     3. Design Mix: 5000-psi, 28-day compressive strength.
     4. Packaging: Premixed and factory packaged.
  3. **SILICONE SEALANTS**
     1. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
        1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
     2. Silicone Foams: Multi-component, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.

**PART 3 EXECUTION**

* 1. **SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS**
     1. Comply with NECA 1.
     2. Comply with NEMA VE 2 for cable tray and cable penetrations.
     3. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
        1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
           1. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 07 9005 "Joint Sealers."
           2. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
        2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
        3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
        4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. De-burr after cutting.
        5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.
     4. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
     5. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.
  2. **SLEEVE-SEAL-SYSTEM INSTALLATION**
     1. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
     2. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
  3. **SLEEVE-SEAL-FITTING INSTALLATION**
     1. Install sleeve-seal fittings in new walls and slabs as they are constructed.
     2. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
     3. Secure nailing flanges to concrete forms.
     4. Using grout, seal the space around outside of sleeve-seal fittings.

**END OF SECTION**

**PART 1 GENERAL**

* 1. **SUMMARY**
     1. Section Includes:

**SECTION 26 0553 IDENTIFICATION FOR ELECTRICAL SYSTEMS**

* + - 1. Identification for raceways.
      2. Identification of power and control cables.
      3. Identification for conductors.
      4. Underground-line warning tape.
      5. Warning labels and signs.
      6. Instruction signs.
      7. Equipment identification labels.
      8. Miscellaneous identification products.
  1. **ACTION SUBMITTALS**
     1. Product Data: For each electrical identification product indicated.
     2. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.
     3. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.
  2. **QUALITY ASSURANCE**
     1. Comply with ANSI A13.1.
     2. Comply with NFPA 70.
     3. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
     4. Comply with ANSI Z535.4 for safety signs and labels.
     5. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.
  3. **COORDINATION**
     1. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
     2. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
     3. Coordinate installation of identifying devices with location of access panels and doors.
     4. Install identifying devices before installing acoustical ceilings and similar concealment.

**PART 2 PRODUCTS**

* 1. **POWER RACEWAY IDENTIFICATION MATERIALS**
     1. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
     2. Colors for Raceways Carrying Circuits at 600 V or Less:
        1. Black letters on an orange field.
        2. Legend: Indicate voltage.
     3. Colors for Raceways Carrying Circuits at More Than 600 V:
        1. Black letters on an orange field.
        2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- high letters on 20-inch centers.
     4. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
     5. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
     6. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
     7. Tape and Stencil for Raceways Carrying Circuits More Than 600 V: 4-inch- wide black stripes on 10-inch centers diagonally over orange background that extends full length of raceway or duct and is 12 inches wide. Stop stripes at legends.
     8. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.
     9. Write-On Tags: Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
        1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
  2. **ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS**
     1. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
     2. Colors for Raceways Carrying Circuits at 600 V and Less:
        1. Black letters on an orange field.
        2. Legend: Indicate voltage.
     3. Colors for Raceways Carrying Circuits at More Than 600 V:
        1. Black letters on an orange field.
        2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- high letters on 20-inch centers.
     4. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
     5. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.
  3. **POWER AND CONTROL CABLE IDENTIFICATION MATERIALS**
     1. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
     2. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
     3. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.
     4. Write-On Tags: Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
        1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
     5. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
     6. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
  4. **CONDUCTOR IDENTIFICATION MATERIALS**
     1. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
     2. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
     3. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
     4. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
     5. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
  5. **UNDERGROUND-LINE WARNING TAPE**
     1. Tape:
        1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
        2. Printing on tape shall be permanent and shall not be damaged by burial operations.
        3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.
     2. Color and Printing:
        1. Comply with ANSI Z535.1 through ANSI Z535.5.
        2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
        3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.
     3. Tag:
        1. Pigmented polyolefin, bright-colored, compounded for direct-burial service.
        2. Thickness: 4 mils.
        3. Weight: 18.5 lb/1000 sq. ft.
        4. 3-Inch Tensile According to ASTM D 882: 30 lbf, and 2500 psi.
  6. **WARNING LABELS AND SIGNS**
     1. Comply with NFPA 70 and 29 CFR 1910.145.
     2. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
     3. Baked-Enamel Warning Signs:
        1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
        2. 1/4-inch grommets in corners for mounting.
        3. Nominal size, 7 by 10 inches.
     4. Metal-Backed, Butyrate Warning Signs:
        1. Weather-resistant, non-fading, preprinted, cellulose-acetate butyrate signs with 0.0396- inch galvanized-steel backing; and with colors, legend, and size required for application.
        2. 1/4-inch grommets in corners for mounting.
        3. Nominal size, 10 by 14 inches.
     5. Warning label and sign shall include, but are not limited to, the following legends:
        1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
        2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."
  7. **INSTRUCTION SIGNS**
     1. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.
        1. Engraved legend with black letters on white face.
        2. Punched or drilled for mechanical fasteners.
        3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.
     2. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.
     3. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.
  8. **EQUIPMENT IDENTIFICATION LABELS**
     1. The manufacturer nameplate equipment label for electrical distribution equipment, used to identify the electrical constraints for safe use, shall be a durable factory mounted metal identification tag listing the manufacturer, model number, serial number, and key criteria for safe operation; including where applicable but not limited to criteria such as voltage class, amperage rating, kAIC rating, number of phases, number of wires (busses), etc. The equipment specific value for electrical criteria shall be embossed in relief onto the metal. The metal nameplate shall be riveted or otherwise permanently affixed with fasteners.
     2. Electrical equipment shall bear a label indicating an approval listing from a nationally recognized testing laboratory.
     3. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.
     4. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.
     5. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.
     6. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.
     7. Stenciled Legend: In non-fading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

**PART 3 EXECUTION**

* 1. **INSTALLATION**
     1. Verify identity of each item before installing identification products.
     2. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
     3. Apply identification devices to surfaces that require finish after completing finish work.
     4. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
     5. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
     6. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
     7. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
     8. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
        1. Outdoors: UV-stabilized nylon.
        2. In Spaces Handling Environmental Air: Plenum rated.
     9. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.
     10. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.
  2. **IDENTIFICATION SCHEDULE**
     1. Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil 4- inch- wide black stripes on 10-inch centers over orange background that extends full length of raceway or duct and is 12 inches wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- high black letters on 20-inch centers. Stop stripes at legends. Apply to the following finished surfaces:
        1. Floor surface directly above conduits running beneath and within 12 inches of a floor that is in contact with earth or is framed above unexcavated space.
        2. Wall surfaces directly external to raceways concealed within wall.
        3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.
     2. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
        1. Color-Coding for Phase Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
           1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
           2. Colors for 208/120-V Circuits:

Phase A: Black.

Phase B: Red.

Phase C: Blue.

* + - * 1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
    1. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
       1. Labeling Instructions:
          1. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.
          2. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
          3. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
          4. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
       2. Equipment to Be Labeled:
          1. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be self-adhesive, engraved, laminated acrylic or melamine label.
          2. Enclosures and electrical cabinets.
          3. Access doors and panels for concealed electrical items.
          4. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
          5. Enclosed switches.
          6. Enclosed circuit breakers.

**END OF SECTION**

**PART 1 GENERAL**

* 1. **SUMMARY**
     1. Section Includes

**SECTION 26 0800 COMMISSIONING OF ELECTRICAL SYSTEMS**

* + - 1. Division 26 responsibilities in the commissioning process.
      2. Commissioning Lighting Control Systems

PART 2 Related Sections

1. Section 22 0800
2. Section 23 0800
   1. **DEFINITIONS**
      1. CxA: Commissioning Agent
      2. GC: Contractor; General Contractor, not a Subcontractor
      3. O&M: Operations and Maintenance
   2. **DESCRIPTION**
      1. This Section describes commissioning requirements applicable to commissioned items and systems specified in Division 26 to ensure that all systems are operating in a manner consistent with the Contract Documents.
      2. Conform to commissioning requirements and the commissioning plan.
   3. **RESPONSIBILITIES**
      1. Construction and Acceptance Phases
         1. Include the cost of commissioning in the contract price.
         2. In each purchase order or subcontract written, include requirements for submittal data, O&M data and training.
         3. Conduct a commissioning scoping meeting and other meetings necessary to facilitate the Commissioning process.
         4. Provide requested documentation to the CxA, developed for functional testing procedures.
         5. Assist in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
         6. Provide functional performance test procedures. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
         7. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the prefunctional checklists for all commissioned equipment. Submit to GC for review prior to startup. CxA will verify plan for compliance.
         8. During the startup and initial checkout process, execute and document the electrical- related portions of the prefunctional checklists provided by the CxA for all commissioned equipment.
         9. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the GC.
         10. Address current A/E punch list items before functional testing. Systems shall be completed with discrepancies and problems remedied before functional testing of the respective systems.
         11. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
         12. Provide all test equipment necessary to fulfill specified testing requirements.
         13. Perform functional performance testing under the direction of the CxA for specified equipment. Assist the CxA in interpreting the monitoring data, as necessary.
         14. Correct deficiencies (differences between specified and observed performance) as interpreted by the CxA and A/E, and retest the equipment.
         15. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
         16. During construction, maintain as-built red-line drawings for all drawings and final CAD as- builts for contractor-generated coordination drawings. Update after completion of commissioning (excluding deferred testing). Prepare red-line as-built drawings for all drawings and final as-builts for contractor-generated coordination drawings.
         17. Provide training of the Owner's operating personnel as specified.
         18. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.
      2. Operation Manuals shall include:
         1. A table of all set-points and implications when changing them.
         2. Schedules.
         3. Instructions for operation of each piece of equipment for emergencies.
         4. Startup and shutdown.
         5. Recommendations for re-commissioning frequency by equipment type.
      3. Warranty Period
         1. Execute deferred functional performance testing, witnessed by the CxA, according to the specifications.
         2. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.
   4. **SUBMITTALS**
      1. Provide submittal documentation relative to commissioning as required in this Section, and other specified requirements.

**PART 2 - PRODUCTS NOT USED**

**PART 3 - EXECUTION**

* 1. **STARTUP**
     1. The electrical contractors shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this section and in 01 91 13. Division 26 has start-up responsibility and is required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the Commissioning Agent or Owner.
     2. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems, or sub-systems at the discretion of the CxA and GC. Beginning system testing before full completion, does not relieve the Contractor from fully completing the system, including all prefunctional checklists as soon as possible.
  2. **OPERATIONS AND MAINTENANCE (O&M) MANUALS**
     1. The following O&M manual requirements do not replace O&M manual documentation requirements elsewhere in these specifications.
     2. Division 26 shall compile and prepare documentation for all commissioned systems covered in Division 26 and deliver this documentation to the GC for inclusion in the O&M manuals prior to the training of Owner personnel.
  3. **TRAINING OF OWNER PERSONNEL**
     1. The GC shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed.
     2. The GC shall be responsible for reviewing the content and adequacy of the training of Owner personnel for commissioned equipment or systems. CxA will verify compliance.
     3. Electrical Contractor. The electrical contractor shall have the following training responsibilities:
        1. Provide the GC with a training plan four weeks before the planned training.
        2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each major piece of commissioned electrical equipment or system.
        3. Training shall start with classroom sessions, if necessary, followed by hands on training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, power failure, etc.
        4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
        5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.
        6. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
        7. Training shall include:
           1. Use the printed installation, operation and maintenance instruction material included in the O&M manuals.
           2. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
           3. Discussion of relevant health and safety issues and concerns.
           4. Discussion of warranties and guarantees.
           5. Common troubleshooting problems and solutions.
           6. Explanation of information included in the O&M manuals.
           7. Discussion of any peculiarities of equipment installation or operation.
           8. Classroom sessions shall include the use of overhead projections, slides, video and audio taped material as might be appropriate.
        8. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and maintenance of all pieces of equipment.
           1. Training shall occur after functional testing is complete, unless approved otherwise by the GC.
        9. Minimum Duration of Training: The electrical contractor shall provide training on each piece of equipment according to the periods indicated in the individual Division 26 Sections. Provide a 4 hour training session to cover, As-builts, O&M's, and systems installed.

**END OF SECTION**

**PART 1 GENERAL**

* 1. **SUMMARY**
     1. Section Includes:

**SECTION 26 0923 LIGHTING CONTROL DEVICES**

* + - 1. Indoor occupancy sensors.
      2. Lighting contactors.
    1. Related Requirements:
       1. Section 26 2726 "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.
  1. **ACTION SUBMITTALS**
     1. Product Data: For each type of product.
     2. Shop Drawings: Show installation details for occupancy and light-level sensors.
        1. Interconnection diagrams showing field-installed wiring.
        2. Include diagrams for power, signal, and control wiring.
  2. **INFORMATIONAL SUBMITTALS**
     1. Field quality-control reports.
  3. **CLOSEOUT SUBMITTALS**
     1. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

**PART 2 PRODUCTS**

* 1. **TIME SWITCHES**
     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 manufacturers listed on the lighting fixture schedule.
     2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
        1. Leviton Mfg. Company Inc.
        2. NSi Industries LLC; TORK Products.
        3. Tyco Electronics; ALR Brand.
        4. Sensor Switch.
  2. **OUTDOOR PHOTOELECTRIC SWITCHES**
     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 manufacturers listed on the lighting fixture schedule.
        1. Cooper Industries, Inc.
        2. Intermatic, Inc.
        3. NSi Industries LLC; TORK Products.
     2. Description: Solid state, with dry contacts rated for 1800-VA metal halide to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.
        1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
        2. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range**,** and a directional lens in front of the photocell to prevent fixed light sources from causing turn-off.
        3. Time Delay: Fifteen second minimum, to prevent false operation.
        4. Surge Protection: Metal-oxide varistor.
        5. Mounting: Twist lock complies with NEMA C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.
     3. Description: Solid state, with dry contacts rated for 1800 VA, to operate connected load, complying with UL 773.
        1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
        2. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range.
        3. Time Delay: Thirty-second minimum, to prevent false operation.
        4. Lightning Arrester: Air-gap type.
        5. Mounting: Twist lock complying with NEMA C136.10, with base.
  3. **INDOOR OCCUPANCY SENSORS**
     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 manufacturers listed on the lighting fixture schedule.
        1. Lithonia Lighting; Acuity Lighting Group, Inc.
        2. Sensor Switch, Inc.
        3. Watt Stopper.
     2. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.
        1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
        2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
        3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
        4. Power Pack: Dry contacts rated for 20-A ballast load at 120- ac, Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
        5. Mounting:
           1. Sensor: Suitable for mounting in any position on a standard outlet box.
           2. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
           3. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
        6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
        7. Bypass Switch: Override the "on" function in case of sensor failure.
        8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.
     3. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
        1. Sensitivity Adjustment: Separate for each sensing technology.
        2. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
        3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.
  4. **SWITCHBOX-MOUNTED OCCUPANCY SENSORS**
     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 manufacturers listed on the lighting fixture schedule.
        1. Lithonia Lighting; Acuity Lighting Group, Inc.
        2. Sensor Switch, Inc.
        3. Watt Stopper.
     2. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.
        1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application
        2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
        3. Switch Rating: Not less than 800-VA fluorescent at 120 V,
        4. "OS" and "OS1" in "Wall-Switch Sensor Tag OS" and "Wall-Switch Sensor Tag OS1" paragraphs below are a suggested marking system on Drawings when detectors with different sensor characteristics are required.
     3. Wall-Switch Sensor Tag OS:
        1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 900 sq. ft.
        2. Sensing Technology: Dual technology - PIR and ultrasonic.
        3. Switch Type: SP, field selectable automatic "on," automatic "off."
        4. Voltage: Match the circuit voltage type.
        5. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
        6. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
     4. Wall-Switch Sensor Tag OS1:
        1. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft.
        2. Sensing Technology: PIR.
        3. Switch Type: SP, field selectable manual "on" automatic "off."
        4. Voltage: Match the circuit voltage type.
        5. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
        6. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
  5. **LIGHTING CONTACTORS**
     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 manufacturers listed on the lighting fixture schedule.
        1. Eaton Corporation.
        2. General Electric Company; GE Consumer & Industrial - Electrical Distribution; Total Lighting Control.
        3. Square D; a brand of Schneider Electric.
     2. Description: Electrically operated and mechanically held, combination-type lighting contactors with fusible switch, complying with NEMA ICS 2 and UL 508.
        1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
        2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
        3. Enclosure: Comply with NEMA 250.
        4. Provide with control and pilot devices as indicated on Drawings matching the NEMA type specified for the enclosure.
  6. **CONDUCTORS AND CABLES**
     1. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."
     2. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."
     3. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."

**PART 3 EXECUTION**

* 1. **SENSOR INSTALLATION**
     1. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
     2. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.
  2. **CONTACTOR INSTALLATION**
     1. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure- borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.
  3. **WIRING INSTALLATION**
     1. Wiring Method: Comply with Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.
     2. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and non-power- limited conductors according to conductor manufacturer's written instructions.
     3. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
     4. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.
  4. **IDENTIFICATION**
     1. Identify components and power and control wiring according to Section 26 0553 "Identification for Electrical Systems."
        1. Identify controlled circuits in lighting contactors.
        2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
     2. Label time switches and contactors with a unique designation.
  5. **FIELD QUALITY CONTROL**
     1. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
     2. Contractor to perform the following tests and inspections with the assistance of a factory- authorized service representative:
        1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
        2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
     3. Lighting control devices will be considered defective if they do not pass tests and inspections.
     4. Prepare test and inspection reports.
  6. **ADJUSTING**
     1. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
        1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
        2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
        3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.
  7. **DEMONSTRATION**
     1. Coordinate demonstration of products specified in this Section.
     2. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

**END OF SECTION**

**PART 1 GENERAL**

* 1. **RELATED DOCUMENTS**

**SECTION 26 1200**

**MEDIUM-VOLTAGE TRANSFORMERS**

* + 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
  1. **SUMMARY**
     1. This Section includes the following types of transformers with medium-voltage primaries:
        1. Pad-mounted, liquid-filled transformers.
  2. **DEFINITIONS**
     1. NETA ATS: Acceptance Testing Specification.
  3. **ACTION SUBMITTALS**
     1. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, location of each field connection, and performance for each type and size of transformer indicated.
     2. Shop Drawings: Diagram power wiring.
  4. **INFORMATIONAL SUBMITTALS**
     1. Coordination Drawings: Floor plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
        1. Underground primary and secondary conduit stub-up location.
        2. Dimensioned concrete base, outline of transformer, and required clearances.
        3. Ground rod and grounding cable locations.
     2. Qualification Data: For testing agency.
     3. Source quality-control test reports.
     4. Field quality-control test reports.
     5. Follow-up service reports.
  5. **CLOSEOUT SUBMITTALS**
     1. Operation and Maintenance Data: For transformer and accessories to include in emergency, operation, and maintenance manuals.
  6. **QUALITY ASSURANCE**
     1. Testing Agency Qualifications: An independent testing agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
        1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
     2. Product Options: Drawings indicate size, profiles, and dimensional requirements of transformers and are based on the specific system indicated. Refer to Section 01 6000 "Product Requirements."
     3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
     4. Comply with IEEE C2.

E. Comply with ANSI C57.12.10, ANSI C57.12.28, IEEE C57.12.70, and IEEE C57.12.80.

F. Comply with NFPA 70.

* 1. **DELIVERY, STORAGE, AND HANDLING**
     1. Store transformer so condensation will not form on or in units. Provide temporary heating according to manufacturer's written instructions.
  2. **PROJECT CONDITIONS**
     1. Service Conditions: IEEE C37.121, usual service conditions except for the following:
        1. Exposure to shock or to abnormal vibration, shock, or tilting.
  3. **COORDINATION**
     1. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.
     2. Coordinate installation of louvers, doors, spill retention areas, and sumps. Coordinate installation so no piping or conduits are installed in space allocated for medium-voltage transformers except those directly associated with transformers.

**PART 2 PRODUCTS**

* 1. **MANUFACTURERS**
     1. [Manufacturers:](http://www.specagent.com/LookUp/?ulid=1985&amp;mf=04&amp;src=wd) Subject to compliance with requirements, provide products by one of the following:
        1. [Cooper Industries; Cooper Power Systems Division.](http://www.specagent.com/LookUp/?uid=123456817963&amp;mf=04&amp;src=wd)
        2. [Cutler-Hammer](http://www.specagent.com/LookUp/?uid=123456803100&amp;mf=04&amp;src=wd).
        3. [GE Electrical Distribution & Control.](http://www.specagent.com/LookUp/?uid=123456803101&amp;mf=04&amp;src=wd)
        4. [Square D; Schneider Electric.](http://www.specagent.com/LookUp/?uid=123456817966&amp;mf=04&amp;src=wd)
  2. **PAD-MOUNTED, LIQUID-FILLED TRANSFORMER**
     1. Description: ANSI C57.12.13, pad-mounted, 2-winding transformer with aluminum windings. Stainless-steel tank base.
     2. Insulating Liquid: Less flammable, dielectric, and UL listed as complying with NFPA 70 requirements for fire point of not less than 300 deg C when tested according to ASTM D 92. Liquid shall be biodegradable and nontoxic.
     3. Insulation Temperature Rise: 55 deg C when operated at rated kVA output in a 40 deg C ambient temperature. Transformer shall be rated to operate at rated kilovolt ampere in an average ambient temperature of 30 deg C over 24 hours with a maximum ambient temperature of 40 deg C without loss of service life expectancy.
     4. Basic Impulse Level: 95 kV.
     5. Full-Capacity Voltage Taps: Four 2.5 percent taps, 2 above and 2 below rated high voltage; with externally operable tap changer for de-energized use and with position indicator and padlock hasp.
     6. High-Voltage Switch: 200 A, make-and-latch rating of 10-kA RMS, symmetrical, arranged for radial feed with 3-phase, 2-position, gang-operated, load-break switch that is oil immersed in transformer tank with hook-stick operating handle in primary compartment.
     7. Primary Fuses: 150-kV fuse assembly with fuses complying with IEEE C37.47. Rating of current-limiting fuses shall be 50-kA RMS at specified system voltage.
        1. Current-limiting type in dry-fuse holder wells, mechanically interlocked with liquid- immersed switch in transformer tank to prevent disconnect under load.
     8. Surge Arresters: Distribution class, one for each primary phase; complying with IEEE C62.11 and NEMA LA 1; support from tank wall within high-voltage compartment. Transformers shall have three arresters for radial-feed circuits.
     9. High-Voltage Terminations and Equipment: Live front with externally clamped porcelain bushings and cable connectors suitable for terminating primary cable.
     10. High-Voltage Terminations and Equipment: Dead front with universal-type bushing wells for dead-front bushing-well inserts, complying with IEEE 386 and including the following:
         1. Bushing-Well Inserts: One for each high-voltage bushing well.
         2. Surge Arresters: Dead-front, elbow-type, metal-oxide-varistor units.
         3. Parking Stands: One for each high-voltage bushing well.
         4. Portable Insulated Bushings: Arranged for parking insulated, high-voltage, load-break cable terminators; one for each primary feeder conductor terminating at transformer.
     11. Accessories:
         1. Drain Valve: 1 inch, with sampling device.
         2. Dial-type thermometer.
         3. Liquid-level gage.
         4. Pressure-vacuum gage.
         5. Pressure Relief Device: Self-sealing with an indicator.
         6. Mounting provisions for low-voltage current transformers.
         7. Mounting provisions for low-voltage potential transformers.
         8. Alarm contacts for gages and thermometer listed above.
  3. **IDENTIFICATION DEVICES**
     1. Nameplates: Engraved, laminated-plastic or metal nameplate for each transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in

Section 26 0553 "Identification for Electrical Systems."

* 1. **SOURCE QUALITY CONTROL**
     1. Factory Tests: Perform design and routine tests according to standards specified for components.

**PART 3 EXECUTION**

* 1. **EXAMINATION**
     1. Examine areas and conditions for compliance with requirements for medium-voltage transformers.
     2. Examine roughing-in of conduits and grounding systems to verify the following:
        1. Wiring entries comply with layout requirements.
        2. Entries are within conduit-entry tolerances specified by manufacturer and no feeders will have to cross section barriers to reach load or line lugs.
     3. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.
     4. Verify that ground connections are in place and that requirements in Section 26 0526 "Grounding and Ground-Fault Protection" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.
     5. Proceed with installation only after unsatisfactory conditions have been corrected.
  2. **INSTALLATION**
     1. Install transformers on concrete bases.
        1. Anchor transformers to concrete bases according to manufacturer's written instructions and requirements in Section 26 0529 "Hangers and Supports for Electrical Systems."
        2. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit and 4 inches high.
        3. Use 3000-psi 28-day compressive-strength concrete and reinforcement as specified in Section 03 3000 "Cast-in-Place Concrete."
        4. Install dowel rods to connect concrete bases to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of base.
        5. Install epoxy-coated anchor bolts, for supported equipment, that extend through concrete base and anchor into structural concrete floor.
        6. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
        7. Tack-weld or bolt transformers to channel-iron sills embedded in concrete bases. Install sills level and grout flush with floor or base.
     2. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.
  3. **IDENTIFICATION**
     1. Identify field-installed wiring and components and provide warning signs as specified in Section 26 0553 "Identification for Electrical Systems."
  4. **CONNECTIONS**
     1. Ground equipment according to Section 26 0526 "Grounding and Ground-Fault Protection."
     2. Connect wiring according to Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."
  5. **FIELD QUALITY CONTROL**
     1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect**,** test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
     2. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:
     3. Perform the following field tests and inspections and prepare test reports:
        1. After installing transformers but before primary is energized, verify that grounding system at substation is tested at specified value or less.
        2. After installing transformers and after electrical circuitry has been energized, test for compliance with requirements.
        3. Perform visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters.
        4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
     4. Remove and replace malfunctioning units and retest as specified above.
     5. Test Reports: Prepare written reports to record the following:
        1. Test procedures used.
        2. Test results that comply with requirements.
        3. Test results that do not comply with requirements and corrective actions taken to achieve compliance with requirements.
  6. **FOLLOW-UP SERVICE**
     1. Voltage Monitoring and Adjusting: If requested by Owner, perform the following voltage monitoring after Substantial Completion but not more than six months after Final Acceptance:
        1. During a period of normal load cycles as evaluated by Owner, perform seven days of three-phase voltage recording at secondary terminals of the transformer. Use voltmeters with calibration traceable to National Institute of Science and Technology standards and with a chart speed of not less than 1 inch per hour. Voltage unbalance greater than

1 percent between phases, or deviation of any phase voltage from nominal value by more than plus or minus 5 percent during test period, is unacceptable.

* + - 1. Corrective Actions: If test results are unacceptable, perform the following corrective actions, as appropriate:
         1. Adjust transformer taps.
         2. Prepare written request for voltage adjustment.
      2. Retests: After corrective actions have been performed, repeat monitoring until satisfactory results are obtained.
      3. Report: Prepare written report covering monitoring and corrective actions performed.

**END OF SECTION**

**PART 1 GENERAL**

* 1. **SUMMARY**
     1. Section Includes:

**SECTION 26 2413 SWITCHBOARDS**

* + - 1. Service and distribution switchboards rated 600 V and less.
      2. Transient voltage suppression devices.
      3. Disconnecting and overcurrent protective devices.
      4. Instrumentation.
      5. Control power.
      6. Accessory components and features.
      7. Identification.
      8. Mimic bus.
  1. **ACTION SUBMITTALS**
     1. Product Data: For each type of switchboard, overcurrent protective device, transient voltage suppression device, ground-fault protector, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
     2. Shop Drawings: For each switchboard and related equipment.
        1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
        2. Detail enclosure types for types other than NEMA 250, Type 1.
        3. Detail bus configuration, current, and voltage ratings.
        4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
        5. Include descriptive documentation of optional barriers specified for electrical insulation and isolation.
        6. Detail utility company's metering provisions with indication of approval by utility company.
        7. Include evidence of NRTL listing for series rating of installed devices.
        8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
        9. Include time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.
        10. Include diagram and details of proposed mimic bus.
        11. Include schematic and wiring diagrams for power, signal, and control wiring.
     3. Samples: Representative portion of mimic bus with specified material and finish, for color selection.
  2. **INFORMATIONAL SUBMITTALS**
     1. Field Quality-Control Reports:
        1. Test procedures used.
        2. Test results that comply with requirements.
        3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
  3. **CLOSEOUT SUBMITTALS**
     1. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 7000 "Execution and Closeout Requirements" include the following:
        1. Routine maintenance requirements for switchboards and all installed components.
        2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
        3. Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.
  4. **MAINTENANCE MATERIAL SUBMITTALS**
     1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
        1. Potential Transformer Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
        2. Control-Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
        3. Fuses and Fusible Devices for Fused Circuit Breakers: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
        4. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
        5. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
        6. Indicating Lights: Equal to 10 percent of quantity installed for each size and type, but no fewer than one of each size and type.
  5. **QUALITY ASSURANCE**
     1. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.
     2. Testing Agency Qualifications: Member company of NETA or an NRTL.
        1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
     3. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
     4. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
     5. 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.
     6. Comply with NEMA PB 2.
     7. Comply with NFPA 70.
     8. Comply with UL 891.
  6. **DELIVERY, STORAGE, AND HANDLING**
     1. Deliver switchboards in sections or lengths that can be moved past obstructions in delivery path.
     2. Handle and prepare switchboards for installation according to NECA 400.
  7. **PROJECT CONDITIONS**
     1. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.
     2. Environmental Limitations:
        1. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
        2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
           1. Ambient Temperature: Not exceeding 104 deg F.
           2. Altitude: Not exceeding 6600 feet.
     3. Service Conditions: NEMA PB 2, usual service conditions, as follows:
        1. Ambient temperatures within limits specified.
        2. Altitude not exceeding 6600 feet.
        3. Comply with NFPA 70E.
  8. **COORDINATION**
     1. Coordinate layout and installation of switchboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
     2. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.
  9. **WARRANTY**
     1. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.
        1. Warranty Period: Five years from date of Substantial Completion.

**PART 2 PRODUCTS**

* 1. **MANUFACTURED UNITS**
     1. Basis-of-Design Product:
        1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
        2. Siemens Energy & Automation, Inc.
        3. Square D; a brand of Schneider Electric.
     2. Front-Connected, Front-Accessible Switchboards:
        1. Main Devices: Panel mounted.
        2. Branch Devices: Panel mounted.
        3. Sections front and rear aligned.
     3. Nominal System Voltage: 208Y/120 V.
     4. Indoor Enclosures: Steel, NEMA 250, Type 1.
     5. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.
     6. Buses and Connections: Three phase, four wire unless otherwise indicated.
        1. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity, with tin- plated aluminum or copper feeder circuit-breaker line connections.
        2. Phase- and Neutral-Bus Material: Tin-plated, high-strength, electrical-grade aluminum alloy with tin-plated aluminum circuit-breaker line connections.
        3. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity or tin- plated, high-strength, electrical-grade aluminum alloy.
        4. Load Terminals: Insulated, rigidly braced, runback bus extensions, of same material as through buses, equipped with mechanical connectors for outgoing circuit conductors. Provide load terminals for future circuit-breaker positions at full-ampere rating of circuit- breaker position.
        5. Ground Bus: Minimum-size required by UL 891, hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit ground

conductors. For busway feeders, extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.

* + - 1. Main Phase Buses and Equipment Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
      2. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.
      3. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.
    1. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.
  1. **DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES**
     1. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
        1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
        2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
        3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field- replicable electronic trip; and the following field-adjustable settings:
           1. Instantaneous trip.
           2. Long- and short-time pickup levels.
           3. Long- and short-time time adjustments.
           4. Ground-fault pickup level, time delay, and I2t response.
        4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
        5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
        6. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
        7. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
        8. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
           1. Standard frame sizes, trip ratings, and number of poles.
           2. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
           3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.

**PART 3 EXECUTION**

* 1. **EXAMINATION**
     1. Receive, inspect, handle, and store switchboards according to NECA 400 NEMA PB 2.1.
     2. Examine switchboards before installation. Reject switchboards that are moisture damaged or physically damaged.
     3. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance of the Work.
     4. Proceed with installation only after unsatisfactory conditions have been corrected.
  2. **INSTALLATION**
     1. Install switchboards and accessories according to NECA 400 NEMA PB 2.1.
     2. Equipment Mounting: Install switchboards on concrete base, 4-inch nominal thickness.
     3. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.
     4. Comply with mounting and anchoring requirements specified in Section 26 0548 "Vibration and Seismic Controls for Electrical Systems."
     5. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.
     6. Install filler plates in unused spaces of panel-mounted sections.
     7. Install overcurrent protective devices, transient voltage suppression devices, and instrumentation.
        1. Set field-adjustable switches and circuit-breaker trip ranges.
     8. Install spare-fuse cabinet.
     9. Comply with NECA 1.
  3. **IDENTIFICATION**
     1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."
     2. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."
     3. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."
  4. **FIELD QUALITY CONTROL**
     1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
     2. Perform tests and inspections.
        1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
     3. Acceptance Testing Preparation:
        1. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit.
        2. Test continuity of each circuit.
     4. Tests and Inspections:
        1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
        2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  5. **ADJUSTING**
     1. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
     2. Set field-adjustable circuit-breaker trip ranges as indicated.
  6. **PROTECTION**
     1. Temporary Heating: Apply temporary heat, to maintain temperature according to manufacturer's written instructions, until switchboard is ready to be energized and placed into service.

**END OF SECTION**

**PART 1 GENERAL**

* 1. **SUMMARY**
     1. Section Includes:
        1. Distribution panelboards.

**SECTION 26 2416 PANELBOARDS**

* + - 1. Lighting and appliance branch-circuit panelboards.
      2. Load centers.
      3. Electronic-grade panelboards.
  1. **DEFINITIONS**
     1. SVR: Suppressed voltage rating.
     2. TVSS: Transient voltage surge suppressor.
  2. **ACTION SUBMITTALS**
     1. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
     2. Shop Drawings: For each panelboard and related equipment.
        1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
        2. Detail enclosure types and details for types other than NEMA 250, Type 1.
        3. Detail bus configuration, current, and voltage ratings.
        4. Short-circuit current rating of panelboards and overcurrent protective devices.
        5. Include evidence of NRTL listing for series rating of installed devices.
        6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
        7. Include wiring diagrams for power, signal, and control wiring.
        8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.
  3. **INFORMATIONAL SUBMITTALS**
     1. Qualification Data: For qualified testing agency.
     2. Seismic Qualification Certificates: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Section 26 0548 "Vibration and Seismic Controls for Electrical Systems." Include the following:
        1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
        2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
        3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
     3. Field Quality-Control Reports:
        1. Test procedures used.
        2. Test results that comply with requirements.
        3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
     4. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.
  4. **CLOSEOUT SUBMITTALS**
     1. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 7000 "Execution and Closeout Requirements" include the following:
        1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
        2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.
  5. **MAINTENANCE MATERIAL SUBMITTALS**
     1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
        1. Keys: Two spares for each type of panelboard cabinet lock.
        2. Circuit Breakers Including GFCI and Ground Fault Equipment Protection (GFEP) Types: Two spares for each panelboard.
        3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
        4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
  6. **QUALITY ASSURANCE**
     1. Testing Agency Qualifications: Member company of NETA or an NRTL.
        1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
     2. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
     3. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
     4. 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.
     5. Comply with NEMA PB 1.
     6. Comply with NFPA 70.
  7. **DELIVERY, STORAGE, AND HANDLING**
     1. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
     2. Handle and prepare panelboards for installation according to NECA 407.
  8. **PROJECT CONDITIONS**
     1. Environmental Limitations:
        1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
        2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
           1. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.
           2. Altitude: Not exceeding 6600 feet.
     2. Service Conditions: NEMA PB 1, usual service conditions, as follows:
        1. Ambient temperatures within limits specified.
        2. Altitude not exceeding 6600 feet.
     3. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
        1. Notify Owner no fewer than two days in advance of proposed interruption of electric service.
        2. Do not proceed with interruption of electric service without Owner's written permission.
        3. Comply with NFPA 70E.
  9. **COORDINATION**
     1. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
     2. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.
  10. **WARRANTY**
      1. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.
         1. Warranty Period: Five years from date of Substantial Completion.

**PART 2 PRODUCTS**

* 1. **GENERAL REQUIREMENTS FOR PANELBOARDS**
     1. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 26 0548 "Vibration and Seismic Controls for Electrical Systems."
     2. Enclosures: Surface-mounted cabinets.
        1. Rated for environmental conditions at installed location.
           1. Indoor Dry and Clean Locations: NEMA 250, Type 1.
           2. Outdoor Locations: NEMA 250, Type 3R.
        2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
        3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
        4. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
        5. Finishes:
           1. Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pre-treating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
           2. Back Boxes: Galvanized steel.
           3. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.
        6. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover.
     3. Incoming Mains Location: Bottom.
     4. Phase, Neutral, and Ground Buses:
        1. Material: Hard-drawn copper, 98 percent conductivity.
        2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
        3. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
        4. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.
        5. Split Bus: Vertical buses divided into individual vertical sections.
     5. Conductor Connectors: Suitable for use with conductor material and sizes.
        1. Material: Hard-drawn copper, 98 percent conductivity.
        2. Main and Neutral Lugs**:** Compression type.
        3. Ground Lugs and Bus-Configured Terminators: Compression type.
        4. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
        5. Sub-feed (Double) Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
        6. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.
     6. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.
     7. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
     8. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, listed and labeled for series-connected short- circuit rating by an NRTL.
     9. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.
  2. **DISTRIBUTION PANELBOARDS**
     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:
        1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
        2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
        3. Siemens Energy & Automation, Inc.
        4. Square D; a brand of Schneider Electric.
     2. Panelboards: NEMA PB 1, power and feeder distribution type.
     3. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
        1. For doors more than 36 inches high, provide two latches, keyed alike.
     4. Mains: Circuit breaker or Lugs only as indicated.
     5. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
     6. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.
     7. Branch Overcurrent Protective Devices: Fused switches.
     8. Contactors in Main Bus: NEMA ICS 2, Class A, mechanically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.
        1. Internal Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.
        2. External Control-Power Source: 120-V branch circuit.
  3. **LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS**
     1. Basis-of-Design Product:
        1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
        2. Siemens Energy & Automation, Inc.
        3. Square D; a brand of Schneider Electric.
     2. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
     3. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.
     4. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.
  4. **DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES**
     1. Basis-of-Design Product:
        1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
        2. Siemens Energy & Automation, Inc.
        3. Square D; a brand of Schneider Electric.
     2. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
        1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
        2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
        3. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
        4. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
        5. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
        6. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
           1. Standard frame sizes, trip ratings, and number of poles.
           2. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
           3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
           4. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
           5. Multi-pole units enclosed in a single housing or factory assembled to operate as a single unit.

**PART 3 EXECUTION**

* 1. **EXAMINATION**
     1. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.
     2. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
     3. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
     4. Proceed with installation only after unsatisfactory conditions have been corrected.
  2. **INSTALLATION**
     1. Install panelboards and accessories according to NEMA PB 1.1.
     2. Comply with mounting and anchoring requirements specified in Section 26 0548 "Vibration and Seismic Controls for Electrical Systems."
     3. Mount top of trim 90 inches above finished floor unless otherwise indicated.
     4. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with backbox.
     5. Install overcurrent protective devices and controllers not already factory installed.
        1. Set field-adjustable, circuit-breaker trip ranges.
     6. Install filler plates in unused spaces.
     7. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.
     8. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
     9. Comply with NECA 1.
  3. **IDENTIFICATION**
     1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 26 0553 "Identification for Electrical Systems."
     2. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
     3. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."
        1. The manufacturer nameplate equipment label, used to identify the electrical constraints for safe use, shall be a durable factory mounted metal identification tag listing the manufacturer, model number, serial number, and key criteria for safe operation; including where applicable but not limited to criteria such as voltage class, amperage rating, kAIC rating, number of phases, number of wires (busses), etc. The equipment specific value for electrical criteria shall be embossed in relief onto the metal. The metal nameplate shall be riveted or otherwise permanently affixed with fasteners.
        2. Electrical equipment shall bear a label indicating an approval listing from a nationally recognized testing laboratory.
     4. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."
  4. **FIELD QUALITY CONTROL**
     1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
     2. Perform tests and inspections.
        1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
     3. Acceptance Testing Preparation:
        1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
        2. Test continuity of each circuit.
     4. Tests and Inspections:
        1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
        2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
     5. Panelboards will be considered defective if they do not pass tests and inspections.
     6. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
  5. **ADJUSTING**
     1. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.
     2. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.
        1. Measure as directed during period of normal system loading.
        2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
        3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
        4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.
  6. **PROTECTION**
     1. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

**END OF SECTION**

**PART 1 GENERAL**

* 1. **GENERAL**

**SECTION 26 2701 ELECTRICAL SERVICE ENTRANCE**

* + 1. Extend the existing overhead 4160 volt distribution system from existing utility pole to the new pad mount transformer at the new building. The work includes the following:
       1. Modifications to the existing utility pole including guying from which the new service is to be extended from.
       2. New utility poles with guying. Match existing types and heights.
       3. New overhead aerial 4160 volt cable between the existing utility pole and the new utility poles.
       4. Raceway and 5 KV cable from the new utility pole to the new pad mount transformer at the new building
    2. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
       1. Notify Owner no fewer than 15 days in advance of proposed interruption of electrical service.
       2. Do not proceed with interruption of electrical service without Owner’s written permission.
  1. **RELATED SECTIONS**
     1. Section 26 0513 - Medium Voltage Cables
     2. Section 26 0543 - Underground Ducts and Raceways for Electrical Systems
     3. Section 26 0575 - Short Circuit, Overcurrent Protective Device, and Arc Flash Study
  2. **REFERENCE STANDARDS**
     1. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.
     2. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.
     3. IEE C2-2012 - National Electrical Safety Code (NESC).
  3. **SYSTEM DESCRIPTION**
     1. Primary System Characteristics: 4160V, three phase, 60 Hertz.
     2. Secondary System Characteristics: 208/120 Volts, three phase, four wire, 60 Hertz.
  4. **ADMINISTRATIVE REQUIREMENTS**
     1. Preinstallation Meeting: Convene one week prior to commencing work of this section. Review service entrance requirements and details with Utility Company representative.
  5. **SUBMITTALS**
     1. See Section 01 3300 for submittal procedures.
     2. Product Data as follows:
        1. New Utility poles and accessories
        2. New 5KV aerial cable and accessories
        3. New 5 KV underground cable
  6. **QUALITY ASSURANCE**
     1. Perform work in accordance with Owner written requirements and NFPA 70.
        1. Maintain one copy of each document on site.
     2. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**PART 2 PRODUCTS**

* 1. **MANUFACTURERS**
     1. Utility Poles
        1. Cobb Lumber
        2. Ace pole Company
     2. Utility Pole accessories
        1. S & C Electric
     3. Aerial 5 KV Cable
        1. Southwire Corporation

**PART 2 EXECUTION**

**3.01 INSTALLATION:** Install in accordance with NESC.

**END OF SECTION**

**PART 1 GENERAL**

* 1. **SUMMARY**
     1. Section Includes:

**SECTION 26 2726 WIRING DEVICES**

* + - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
      2. Twist-locking receptacles.
      3. Weather-resistant receptacles.
      4. Snap switches and wall-box dimmers.
      5. Communications outlets.
      6. Pendant cord-connector devices.
      7. Cord and plug sets.
      8. Floor service outlets, poke-through assemblies, service poles, and multi-outlet assemblies.
  1. **DEFINITIONS**
     1. EMI: Electromagnetic interference.
     2. GFCI: Ground-fault circuit interrupter.
     3. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
     4. RFI: Radio-frequency interference.
     5. TVSS: Transient voltage surge suppressor.
     6. UTP: Unshielded twisted pair.
  2. **ADMINISTRATIVE REQUIREMENTS**
     1. Coordination:
        1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
        2. Cord and Plug Sets: Match equipment requirements.
  3. **ACTION SUBMITTALS**
     1. Product Data: For each type of product.
     2. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.
     3. Samples: One for each type of device and wall plate specified, in each color specified.
  4. **INFORMATIONAL SUBMITTALS**
     1. Field quality-control reports.
  5. **CLOSEOUT SUBMITTALS**
     1. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing- label warnings and instruction manuals that include labeling conditions.

**PART 2 PRODUCTS**

* 1. **MANUFACTURERS**
     1. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
        1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
        2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
        3. Leviton Mfg. Company Inc. (Leviton).
        4. Pass & Seymour/Legrand (Pass & Seymour).
     2. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.
  2. **GENERAL WIRING-DEVICE REQUIREMENTS**
     1. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
     2. Comply with NFPA 70.
     3. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
        1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
        2. Devices shall comply with the requirements in this Section.
  3. **STRAIGHT-BLADE RECEPTACLES**
     1. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
        1. Products: Subject to compliance with requirements, provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following:
           1. Cooper; 5351 (single), CR5362 (duplex).
           2. Hubbell; HBL5351 (single), HBL5352 (duplex).
           3. Leviton; 5891 (single), 5352 (duplex).
           4. Pass & Seymour; 5361 (single), 5362 (duplex).
  4. **GFCI RECEPTACLES**
     1. General Description:
        1. Straight blade, non-feed-through type.
        2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
        3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
     2. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
        1. Products:
           1. Cooper; VGF20.
           2. Hubbell; GFR5352L.
           3. Pass & Seymour; 2095.
           4. Leviton; 7590.
  5. **TWIST-LOCKING RECEPTACLES**
     1. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
        1. Products:
           1. Cooper; CWL520R.
           2. Hubbell; HBL2310.
           3. Leviton; 2310.
           4. Pass & Seymour; L520-R.
  6. **PENDANT CORD-CONNECTOR DEVICES**
     1. Description:
        1. Matching, locking-type plug and receptacle body connector.
        2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
        3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
        4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.
  7. **CORD AND PLUG SETS**
     1. Description:
        1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
        2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
        3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.
  8. **TOGGLE SWITCHES**
     1. Comply with NEMA WD 1, UL 20, and FS W-S-896.
     2. Switches, 120/277 V, 20 A:
        1. Products:
           1. Single Pole:

Cooper; AH1221.

Hubbell; HBL1221. 3) Leviton; 1221-2.

4) Pass & Seymour; CSB20AC1.

* + - * 1. Two Pole:

Cooper; AH1222.

Hubbell; HBL1222. 3) Leviton; 1222-2.

4) Pass & Seymour; CSB20AC2.

* + - * 1. Three Way:

Cooper; AH1223.

Hubbell; HBL1223. 3) Leviton; 1223-2.

4) Pass & Seymour; CSB20AC3.

* + - * 1. Four Way:

Cooper; AH1224.

Hubbell; HBL1224. 3) Leviton; 1224-2.

4) Pass & Seymour; CSB20AC4.

* 1. **WALL-BOX DIMMERS**
     1. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
     2. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.
     3. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.
        1. 600 W; dimmers shall require no de-rating when ganged with other devices.
     4. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.
  2. **WALL PLATES**
     1. Single and combination types shall match corresponding wiring devices.
        1. Plate-Securing Screws: Metal with head color to match plate finish.
        2. Material for Finished Spaces: Steel with white baked enamel, suitable for field painting.
        3. Material for Unfinished Spaces: Galvanized steel.
        4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
     2. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather- resistant, die-cast aluminum with lockable cover.
  3. **FLOOR SERVICE FITTINGS**
     1. Type: Modular, flush-type, dual-service units suitable for wiring method used.
     2. Compartments: Barrier separates power from voice and data communication cabling.
     3. Service Plate: Rectangular, solid brass with satin finish.
     4. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.
  4. **FINISHES**
     1. Device Color:
        1. Wiring Devices Connected to Normal Power System: Ivory unless otherwise indicated or required by NFPA 70 or device listing.
     2. Wall Plate Color: For plastic covers, match device color.

**PART 3 EXECUTION**

* 1. **INSTALLATION**
     1. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
     2. Coordination with Other Trades:
        1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
        2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
        3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
        4. Install wiring devices after all wall preparation, including painting, is complete.
     3. Conductors:
        1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
        2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
        3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
        4. Existing Conductors:
           1. Cut back and pigtail, or replace all damaged conductors.
           2. Straighten conductors that remain and remove corrosion and foreign matter.
           3. Pig-tailing existing conductors is permitted, provided the outlet box is large enough.
     4. Device Installation:
        1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
        2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
        3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
        4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
        5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
        6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
        7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
        8. Tighten unused terminal screws on the device.
        9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device- mounting screws in yokes, allowing metal-to-metal contact.
     5. Receptacle Orientation:
     6. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
     7. Dimmers:
        1. Install dimmers within terms of their listing.
        2. Verify that dimmers used for fan speed control are listed for that application.
        3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.
     8. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.
     9. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.
  2. **GFCI RECEPTACLES**
     1. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.
  3. **IDENTIFICATION**
     1. Comply with Section 26 0553 "Identification for Electrical Systems."
  4. **FIELD QUALITY CONTROL**
     1. Tests for Convenience Receptacles:
        1. Line Voltage: Acceptable range is 105 to 132 V.
        2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
        3. Ground Impedance: Values of up to 2 ohms are acceptable.
        4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
        5. Using the test plug, verify that the device and its outlet box are securely mounted.
        6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
     2. Wiring device will be considered defective if it does not pass tests and inspections.
     3. Prepare test and inspection reports.

**END OF SECTION**

**PART 1 GENERAL**

* 1. **SUMMARY**
     1. Section Includes:

**SECTION 26 2813 FUSES**

* + - 1. Cartridge fuses rated 600-V ac and less for use in enclosed switches.
  1. **ACTION SUBMITTALS**
     1. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:
        1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
           1. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
           2. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
        2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
        3. Current-limitation curves for fuses with current-limiting characteristics.
        4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
        5. Coordination charts and tables and related data.
        6. Fuse sizes for elevator feeders and elevator disconnect switches.
  2. **CLOSEOUT SUBMITTALS**
     1. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01, include the following:
        1. Ambient temperature adjustment information.
        2. Current-limitation curves for fuses with current-limiting characteristics.
        3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
        4. Coordination charts and tables and related data.
  3. **MAINTENANCE MATERIAL SUBMITTALS**
     1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
        1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
  4. **QUALITY ASSURANCE**
     1. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.
     2. 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.
     3. Comply with NEMA FU 1 for cartridge fuses.
     4. Comply with NFPA 70.
     5. Comply with UL 248-11 for plug fuses.
  5. **PROJECT CONDITIONS**
     1. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.
  6. **COORDINATION**
     1. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

**PART 2 PRODUCTS**

* 1. **MANUFACTURERS**
     1. Manufacturers:
        1. Cooper Bussmann, Inc.
        2. Edison Fuse, Inc.
        3. Ferraz Shawmut, Inc.
        4. Littelfuse, Inc.
  2. **CARTRIDGE FUSES**
     1. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.
  3. **PLUG FUSES**
     1. Characteristics: UL 248-11, nonrenewable plug fuses; 125-V ac.
  4. **PLUG-FUSE ADAPTERS**
     1. Characteristics: Adapters for using Type S, rejection-base plug fuses in Edison-base fuseholders or sockets; ampere ratings matching fuse ratings; irremovable once installed.
  5. **SPARE-FUSE CABINET**
     1. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key- coded cam lock and pull.
        1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
        2. Finish: Gray, baked enamel.
        3. Identification: "SPARE FUSES" in 1-1/2-inch- high letters on exterior of door.
        4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

**PART 3 EXECUTION**

* 1. **EXAMINATION**
     1. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
     2. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
     3. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
     4. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
     5. Proceed with installation only after unsatisfactory conditions have been corrected.
  2. **FUSE APPLICATIONS**
     1. Cartridge Fuses:
        1. Service Entrance: Class L, fast acting.
  3. **INSTALLATION**
     1. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
  4. **IDENTIFICATION**
     1. Install labels complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

**END OF SECTION**

**PART 1 GENERAL**

* 1. **SUMMARY**

**SECTION 26 2816**

**ENCLOSED SWITCHES AND CIRCUIT BREAKERS**

* + 1. Section Includes:
       1. Fusible switches.
       2. Nonfusible switches.
  1. **DEFINITIONS**
     1. NC: Normally closed.
     2. NO: Normally open.
     3. SPDT: Single pole, double throw.
  2. **ACTION SUBMITTALS**
     1. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
        1. Enclosure types and details for types other than NEMA 250, Type 1.
        2. Current and voltage ratings.
        3. Short-circuit current ratings (interrupting and withstand, as appropriate).
        4. Include evidence of NRTL listing for series rating of installed devices.
        5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
     2. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
        1. Wiring Diagrams: For power, signal, and control wiring.
  3. **CLOSEOUT SUBMITTALS**
     1. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01, include the following:
        1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
  4. **QUALITY ASSURANCE**
     1. Testing Agency Qualifications: Member company of NETA or an NRTL.
        1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
     2. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
     3. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
     4. 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.
     5. Comply with NFPA 70.
  5. **PROJECT CONDITIONS**
     1. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
        1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
        2. Altitude: Not exceeding 6600 feet.
  6. **COORDINATION**
     1. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

**PART 2 PRODUCTS**

* 1. **FUSIBLE SWITCHES**
     1. Basis-of-Design Product:
        1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
        2. Siemens Energy & Automation, Inc.
        3. Square D; a brand of Schneider Electric.
     2. Type GD, General Duty, Single Throw, 240-V ac, 800 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with cartridge fuse interiors to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
     3. Type HD, Heavy Duty, Single Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
     4. Type HD, Heavy Duty, Six Pole, Single Throw, 240-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
     5. Type HD, Heavy Duty, Double Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
     6. Accessories:
        1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
        2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
        3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
        4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
        5. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
        6. Lugs: Mechanical type, suitable for number, size, and conductor material.
        7. Service-Rated Switches: Labeled for use as service equipment.
  2. **NONFUSIBLE SWITCHES**
     1. Basis-of-Design Product:
        1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
        2. Siemens Energy & Automation, Inc.
        3. Square D; a brand of Schneider Electric.
     2. Type GD, General Duty, Single Throw, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
     3. Type HD, Heavy Duty, Single Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
     4. Accessories:
        1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
        2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
        3. Lugs: Mechanical type, suitable for number, size, and conductor material.
  3. **ENCLOSURES**
     1. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
        1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
        2. Outdoor Locations: NEMA 250, Type 3R.

**PART 3 EXECUTION**

* 1. **EXAMINATION**
     1. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
     2. Proceed with installation only after unsatisfactory conditions have been corrected.
  2. **INSTALLATION**
     1. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
     2. Comply with mounting and anchoring requirements specified in Section 26 0548 "Vibration and Seismic Controls for Electrical Systems."
     3. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
     4. Install fuses in fusible devices.
     5. Comply with NECA 1.
  3. **IDENTIFICATION**
     1. Comply with requirements in Section 26 0553 "Identification for Electrical Systems."
        1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
        2. Label each enclosure with engraved metal or laminated-plastic nameplate.
  4. **FIELD QUALITY CONTROL**
     1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
     2. Perform tests and inspections.
        1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
     3. Acceptance Testing Preparation:
        1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
        2. Test continuity of each circuit.
     4. Tests and Inspections:
        1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
        2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
        3. Perform the following infrared scan tests and inspections and prepare reports:
           1. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
           2. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
           3. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
        4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
     5. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
     6. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
  5. **ADJUSTING**
     1. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

**END OF SECTION**

**PART 1 GENERAL**

* 1. **SUMMARY**
     1. Section Includes:

**SECTION 26 5100 INTERIOR LIGHTING**

* + - 1. Interior lighting fixtures, lamps, and ballasts.
      2. Emergency lighting units.
      3. Exit signs.
      4. Lighting fixture supports.
    1. Related Sections:
       1. Section 26 0923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and contactors.
       2. Section 26 2726 "Wiring Devices" for manual wall-box dimmers for incandescent lamps.
  1. **DEFINITIONS**
     1. BF: Ballast factor.
     2. CCT: Correlated color temperature.
     3. CRI: Color-rendering index.
     4. LER: Luminaire efficacy rating.
     5. Lumen: Measured output of lamp and luminaire, or both.
     6. Luminaire: Complete lighting fixture, including ballast housing if provided.
     7. LED: Light emitting diode
  2. **ACTION SUBMITTALS**
     1. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
        1. Physical description of lighting fixture including dimensions in product specification sheets.
        2. Emergency lighting units including battery and charger.
        3. Ballast, including BF.
        4. Energy-efficiency data
        5. Maximum power in watts.
        6. Air and Thermal Performance Data: For air-handling lighting fixtures. Furnish data required in "Action Submittals" Article in Section 23 3713 "Diffusers, Registers, and Grilles."
        7. Sound Performance Data: For air-handling lighting fixtures. Indicate sound power level and sound transmission class in test reports certified according to standards specified in Section 23 3713 "Diffusers, Registers, and Grilles."
        8. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
        9. LED luminaire lumen output shall not decrease by more than 30% over the minimum operational life of 50,000 hours. The documentation shall indicate L80 in hours when extrapolated for the worse case operating temperature. TM21 report shall be submitted to demonstrate the fixture meets L80.
        10. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.
            1. Testing Agency Certified Data: For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by manufacturer.
            2. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
     2. Shop Drawings: For nonstandard or custom lighting fixtures. Include plans, elevations, sections, details, and attachments to other work.
        1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
        2. Wiring Diagrams: For power, signal, and control wiring.
     3. Samples: For each lighting fixture indicated in the Interior Lighting Fixture Schedule. Each Sample shall include the following:
        1. Lamps and ballasts installed
        2. LED and driver installed.
        3. Pendant support system.
     4. Installation instructions.
  3. **INFORMATIONAL SUBMITTALS**
     1. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
        1. Lighting fixtures.
        2. Suspended ceiling components.
        3. Partitions and millwork that penetrate the ceiling or extends to within 12 inches of the plane of the luminaires.
        4. Ceiling-mounted projectors.
        5. Structural members to which suspension systems for lighting fixtures will be attached.
        6. Other items in finished ceiling including the following:
           1. Air outlets and inlets.
           2. Speakers.
           3. Sprinklers.
           4. Smoke and fire detectors.
           5. Occupancy sensors.
           6. Access panels.
        7. Perimeter moldings.
     2. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.
     3. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, from manufacturer.
     4. Field quality-control reports.
     5. Warranty: Sample of special warranty.
  4. **CLOSEOUT SUBMITTALS**
     1. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.
        1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.
  5. **MAINTENANCE MATERIAL SUBMITTALS**
     1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
        1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
        2. Plastic Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
        3. Fluorescent-fixture-mounted, emergency battery pack: One for every 20 emergency lighting units.
        4. Ballasts: One for every 100 of each type and rating installed. Furnish at least one of each type.
        5. LED Drivers: One for every 100 of each type and rating installed. Furnish at least one of each type.
        6. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.
  6. **QUALITY ASSURANCE**
     1. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
     2. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910, complying with the IESNA Lighting Measurements Testing & Calculation Guides.
     3. FM Global Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
     4. Mockups: Provide interior lighting fixtures for room or module mockups, complete with power and control connections.
        1. Obtain Owner's approval of fixtures for mockups before starting installations.
        2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
        3. Approved fixtures in mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
  7. **COORDINATION**
     1. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire- suppression system, and partition assemblies.
  8. **WARRANTY**
     1. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
        1. Warranty Period for Emergency Lighting Unit Batteries: 10 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.
        2. Warranty Period for Emergency Fluorescent Ballast, Emergency LED battery packs, and Self-Powered Exit Sign Batteries: Seven years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining six years.

**PART 2 PRODUCTS**

* 1. **MANUFACTURERS**
     1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, product(s) indicated on Drawings.
  2. **GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS**
     1. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
     2. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
     3. LED Fixtures: Comply with UL 8750, UL 496 and ANSI-NEMA-C78.377.
     4. Metal Parts: Free of burrs and sharp corners and edges.
     5. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.
     6. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit re-lamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during re-lamping and when secured in operating position.
     7. Diffusers and Globes:
        1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
           1. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
           2. UV stabilized.
        2. Glass: Annealed crystal glass unless otherwise indicated.
     8. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
        1. Label shall include the following lamp and ballast characteristics:
           1. "USE ONLY" and include specific lamp type.
           2. Lamp diameter code (T-4, T-5, T-8, T-12, etc.), tube configuration (twin, quad, triple, etc.), base type, and nominal wattage for fluorescent, compact fluorescent, and LED luminaires.
           3. Start type (preheat, rapid start, instant start, etc.) for fluorescent and compact fluorescent luminaires.
           4. CCT and CRI for all luminaires.
     9. Electromagnetic-Interference Filters: Factory installed to suppress conducted electromagnetic interference as required by MIL-STD-461E. Fabricate lighting fixtures with one filter on each ballast indicated to require a filter.
  3. **BALLASTS FOR LINEAR FLUORESCENT LAMPS**
     1. General Requirements for Electronic Ballasts:
        1. Comply with UL 935 and with ANSI C82.11.
        2. Designed for type and quantity of lamps served.
        3. Ballasts shall be designed for full light output unless another BF, dimmer, or bi-level control is indicated.
        4. Sound Rating: Class A See Evaluations for discussion on harmonic considerations.
        5. Total Harmonic Distortion Rating: Less than 10 percent.
        6. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
        7. Operating Frequency: 42 kHz or higher.
        8. Lamp Current Crest Factor: 1.7 or less.
        9. BF: 0.88 or higher.
        10. Power Factor: 0.98 or higher.
        11. Parallel Lamp Circuits: Multiple lamp ballasts shall comply with ANSI C82.11 and shall be connected to maintain full light output on surviving lamps if one or more lamps fail.
     2. Luminaires controlled by occupancy sensors shall have programmed-start ballasts.
     3. Electronic Programmed-Start Ballasts for T8 Lamps: Comply with ANSI C82.11 and the following:
        1. Lamp end-of-life detection and shutdown circuit for T5 diameter lamps.
        2. Automatic lamp starting after lamp replacement.
     4. Electromagnetic Ballasts: Comply with ANSI C82.1; energy saving, high-power factor, Class P, and having automatic-reset thermal protection.
        1. Ballast Manufacturer Certification: Indicated by label.
     5. Single Ballasts for Multiple Lighting Fixtures: Factory wired with ballast arrangements and bundled extension wiring to suit final installation conditions without modification or rewiring in the field.
     6. Ballasts for Low-Temperature Environments:
        1. Temperatures 0 Deg F and Higher: Electronic type rated for 0 deg F starting and operating temperature with indicated lamp types.
        2. Temperatures minus 20 Deg F and Higher: Electromagnetic type designed for use with indicated lamp types.
     7. Ballasts for Residential Applications: Fixtures designated as "Residential" may use low-power- factor electronic ballasts having a Class B sound rating and total harmonic distortion of approximately 30 percent.
     8. Ballasts for Low Electromagnetic-Interference Environments: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for consumer equipment.
     9. Ballasts for Dimmer-Controlled Lighting Fixtures: Electronic type.
        1. Dimming Range: 100 to 5 percent of rated lamp lumens.
        2. Ballast Input Watts: Can be reduced to 20 percent of normal.
        3. Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated.
  4. **BALLASTS FOR COMPACT FLUORESCENT LAMPS**
     1. Description: Electronic-programmed rapid-start type, complying with UL 935 and with

ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:

* + - 1. Lamp end-of-life detection and shutdown circuit.
      2. Automatic lamp starting after lamp replacement.
      3. Sound Rating: Class A.
      4. Total Harmonic Distortion Rating: Less than 20 percent.
      5. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
      6. Operating Frequency: 20 kHz or higher.
      7. Lamp Current Crest Factor: 1.7 or less.
      8. BF: 0.95 or higher unless otherwise indicated.
      9. Power Factor: 0.98 or higher.
      10. Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
  1. **EMERGENCY FLUORESCENT POWER UNIT**
     1. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with ballast. Comply with UL 924.
        1. Emergency Connection: Operate one fluorescent lamp(s) continuously at an output of 1100 lumens each. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
        2. Nightlight Connection: Operate one fluorescent lamp continuously.
        3. Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
           1. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
           2. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
        4. Battery: Sealed, maintenance-free, nickel-cadmium type.
        5. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
        6. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
        7. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.
     2. External Type: Self-contained, modular, battery-inverter unit, suitable for powering one or more fluorescent lamps, remote mounted from lighting fixture. Comply with UL 924.
        1. Emergency Connection: Operate one fluorescent lamp continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
        2. Nightlight Connection: Operate one fluorescent lamp in a remote fixture continuously.
        3. Battery: Sealed, maintenance-free, nickel-cadmium type.
        4. Charger: Fully automatic, solid-state, constant-current type.
        5. Housing: NEMA 250, Type 1 enclosure.
        6. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
        7. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
        8. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
        9. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.
  2. **LED light emitting diodes and drivers**
     1. Description: Solid State LED, light emitting diode, lighting shall comply with UL 8750, UL 496 and ANSI-NEMA-C78.377. The luminaire shall be a single, self-contained, device, fully assembled for installation. LED computer boards shall be suitable for service from below the ceiling with modular electrical connections utilizing snap fit connectors. LED boards shall be upgradable. All electrical components shall be RoHS compliant.
        1. Sound Rating: Class A.
        2. Total Harmonic Distortion Rating: Less than 20 percent.
        3. Power Factor: 0.90 or higher.
        4. Transient Voltage Protection: ANS/IEEE C62.41 Category A or better.
        5. Operating Frequency: 20 kHz or higher.
        6. RF Interference: The luminaire and associated on-board circuitry must meet Class A emissions limits referred in Federal Communications Commission Title 47, Subpart B, Section 15 non-consumer requirements for EMI/RFI emissions.
        7. Lumen Maintenance: The lumen output shall not decrease by more than 30% over the minimum operational life of 50,000 hours. LED lighting shall meet LM-79 and IES LM-80.
        8. Thermal Management: LED luminaires shall have thermal management of the heat generated by the LEDs. The thermal management shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life. The driver manufacturer’s maximum case temperature shall not be exceeded at the maximum operating ambient operating temperature. The thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.
        9. Dimming Range: LED drivers shall be suitable for full range dimming if required on plans. Dimming shall be controlled by a 0-10V signal. The luminaire shall be capable of continuous dimming without perceivable flicker to 100% of rated lumen output with a smooth shut off function.
  3. **EXIT SIGNS**
     1. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
     2. Internally Lighted Signs:
        1. Lamps for AC Operation: Fluorescent, two for each fixture, 20,000 hours of rated lamp life.
        2. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
        3. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
           1. Battery: Sealed, maintenance-free, nickel-cadmium type.
           2. Charger: Fully automatic, solid-state type with sealed transfer relay.
           3. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
           4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
           5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
           6. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
           7. Integral Self-Test: Factory-installed electronic device automatically initiates code- required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.
        4. Master/Remote Sign Configurations:
           1. Master Unit: Comply with requirements above for self-powered exit signs, and provide additional capacity in LED power supply and battery for power connection to remote unit.
           2. Remote Unit: Comply with requirements above for self-powered exit signs, except omit power supply, battery, and test features. Arrange to receive full power requirements from master unit. Connect for testing concurrently with master unit as a unified system.
     3. Self-Luminous Signs: Powered by tritium gas, with universal bracket for flush-ceiling, wall, or end mounting. Signs shall be guaranteed by manufacturer to maintain the minimum brightness requirements in UL 924 for 10 years.
     4. Self-Luminous Signs: Using strontium oxide aluminate compound to store ambient light and release the stored energy when the light is removed. Provide with universal bracket for flush- ceiling, wall, or end mounting.
  4. **EMERGENCY LIGHTING UNITS**
     1. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.
        1. Battery: Sealed, maintenance-free, lead-acid type.
        2. Charger: Fully automatic, solid-state type with sealed transfer relay.
        3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
        4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
        5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
        6. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures.
        7. Integral Time-Delay Relay: Holds unit on for fixed interval of 15 minutes when power is restored after an outage.
        8. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
        9. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.
  5. **FLUORESCENT LAMPS**
     1. T8 rapid-start lamps, rated 32 W maximum, nominal length of 48 inches, 2800 initial lumens (minimum), CRI 75 (minimum), color temperature 3500 K, and average rated life 20,000 hours unless otherwise indicated.
     2. Compact Fluorescent Lamps: 4-Pin, CRI 80 (minimum), color temperature 3500 K, average rated life of 10,000 hours at three hours operation per start otherwise indicated.
        1. 26 W: T4, double or triple tube, rated 1800 initial lumens (minimum).
        2. 32 W: T4, triple tube, rated 2400 initial lumens (minimum).
        3. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).
  6. **LED Lamps**
     1. LED light emitting diodes: CRI 80 (minimum), color temperature 3500 K, average rated life of 50,000 hours at 70% lumen maintenance unless otherwise indicated.
        1. LED maximum wattage shall be equal to or less than the wattage indicated on the lighting fixture schedule on plans.
        2. LED minimum lumens shall be equal to or more than the lumens indicated on the lighting fixture schedule on plans.
  7. **LIGHTING FIXTURE SUPPORT COMPONENTS**
     1. Comply with Section 26 0529 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.
     2. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
     3. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
     4. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.
     5. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.
     6. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
     7. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.
     8. Provide and Install same as or equal to TENMAT# FF1301E for all recessed mounting fixtures for fire rating. For surface mounted fixtures, contractor shall provide and install fire putty to the back of the box to seal the penetration.

**PART 3 EXECUTION**

* 1. **INSTALLATION**
     1. Lighting fixtures:
        1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
        2. Install lamps in each luminaire.
     2. Temporary Lighting: If it is necessary, and approved by Owner, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary.

When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.

* + 1. Remote Mounting of Ballasts: Distance between the ballast and fixture shall not exceed that recommended by ballast manufacturer. Verify, with ballast manufacturers, maximum distance between ballast and luminaire.
    2. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.
       1. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each fixture. Locate not more than 6 inches from lighting fixture corners.
       2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
       3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
       4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.
    3. Suspended Lighting Fixture Support:
       1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
       2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
       3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
       4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.
    4. Connect wiring according to Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."
  1. **IDENTIFICATION**
     1. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."
  2. **FIELD QUALITY CONTROL**
     1. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.
     2. Verify that self-luminous exit signs are installed according to their listing and the requirements in NFPA 101.
     3. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.
  3. **STARTUP SERVICE**
     1. Burn-in all lamps that require specific aging period to operate properly, prior to occupancy by Owner. Burn-in LED, fluorescent, and compact fluorescent lamps intended to be dimmed, for at least 100 hours at full voltage.
  4. **ADJUSTING**
     1. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark.
        1. Adjust aimable luminaires in the presence of Owner.

**END OF SECTION**

**PART 1 GENERAL**

* 1. **SUMMARY**
     1. Section Includes:

**SECTION 26 5600 EXTERIOR LIGHTING**

* + - 1. Exterior luminaires with lamps, ballasts, and drivers.
      2. Poles and accessories.
    1. Related Sections:
       1. Section 26 5100 "Interior Lighting" for exterior luminaires normally mounted on exterior surfaces of buildings.
  1. **DEFINITIONS**
     1. CCT: Correlated color temperature.
     2. CRI: Color-rendering index.
     3. HID: High-intensity discharge.
     4. LER: Luminaire efficacy rating.
     5. LED: Light emitting diode
     6. Luminaire: Complete lighting fixture, including ballast housing if provided.
     7. Pole: Luminaire support structure, including tower used for large area illumination.
     8. Standard: Same definition as "Pole" above.
  2. **STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION**
     1. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in AASHTO LTS-4-M.
     2. Live Load: Single load of 500 lbf, distributed as stated in AASHTO LTS-4-M.
     3. Ice Load: Load of 3 lbf/sq. ft., applied as stated in AASHTO LTS-4-M Ice Load Map.
     4. Wind Load: Pressure of wind on pole and luminaire and banners and banner arms, calculated and applied as stated in AASHTO LTS-4-M.
        1. Basic wind speed for calculating wind load for poles 50 feet high or less is 100 mph.
           1. Wind Importance Factor: 1.0.
           2. Minimum Design Life: 25 years.
           3. Velocity Conversion Factors: 1.0.
  3. **ACTION SUBMITTALS**
     1. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:
        1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
        2. Details of attaching luminaires and accessories.
        3. Details of installation and construction.
        4. Luminaire materials.
        5. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps, ballasts, and accessories.
           1. Testing Agency Certified Data: For indicated luminaires, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
           2. Manufacturer Certified Data: Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
        6. Photoelectric relays.
        7. Ballasts or driver, including energy-efficiency data.
        8. Lamps, including life, output, CCT, CRI, lumens, and energy-efficiency data.
        9. Materials, dimensions, and finishes of poles.
        10. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
        11. Anchor bolts for poles.
        12. LED luminaire lumen output shall not decrease by more than 30% over the minimum operational life of 50,000 hours. The documentation shall indicate L80 in hours when extrapolated for the worse case operating temperature. TM21 report shall be submitted to demonstrate the fixture meets L80.
        13. Manufactured pole foundations.
     2. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
        1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
        2. Anchor-bolt templates keyed to specific poles and certified by manufacturer.
        3. Design calculations, certified by a qualified professional engineer, indicating strength of screw foundations and soil conditions on which they are based.
        4. Wiring Diagrams: For power, signal, and control wiring.
     3. Samples: For products designated for sample submission in the Exterior Lighting Device Schedule. Each Sample shall include lamps and ballasts.
  4. **INFORMATIONAL SUBMITTALS**
     1. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements in AASHTO LTS-4-M and that load imposed by luminaire and attachments has been included in design. The certification shall be based on design calculations by a professional engineer.
     2. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.
     3. Field quality-control reports.
     4. Warranty: Sample of special warranty.
  5. **CLOSEOUT SUBMITTALS**
     1. Operation and Maintenance Data: For **luminaires and poles** to include in emergency, operation, and maintenance manuals.
  6. **MAINTENANCE MATERIAL SUBMITTALS**
     1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
        1. Lamps: One for every 100 of each type and rating installed. Furnish at least one of each type.
        2. Glass and Plastic Lenses, Covers, and Other Optical Parts: One for every 100 of each type and rating installed. Furnish at least one of each type.
        3. Ballasts: One for every 100 of each type and rating installed. Furnish at least one of each type.
        4. LED Driver: One for every 100 of each type and rating installed. Furnish at least one of each type.
        5. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.
  7. **QUALITY ASSURANCE**
     1. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
     2. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.
     3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
     4. Comply with IEEE C2, "National Electrical Safety Code."
  8. **DELIVERY, STORAGE, AND HANDLING**
     1. Package aluminum poles for shipping according to ASTM B 660.
     2. Store poles on decay-resistant-treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.
     3. Handle wood poles so they will not be damaged. Do not use pointed tools that can indent pole surface more than 1/4 inch deep. Do not apply tools to section of pole to be installed below ground line.
     4. Retain factory-applied pole wrappings on fiberglass and laminated wood poles until right before pole installation. Handle poles with web fabric straps.
     5. Retain factory-applied pole wrappings on metal poles until right before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.
  9. **WARRANTY**
     1. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.
        1. Warranty Period for Luminaires: Five years from date of Substantial Completion.
        2. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.
        3. Warranty Period for Color Retention: Five years from date of Substantial Completion.
        4. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than three years from date of Substantial Completion.

**PART 2 PRODUCTS**

* 1. **MANUFACTURERS**
     1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, product(s) indicated on Drawings.
  2. **GENERAL REQUIREMENTS FOR LUMINAIRES**
     1. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.
        1. LER Tests Incandescent Fixtures: Where LER is specified, test according to NEMA LE 5A.
        2. LER Tests Fluorescent Fixtures: Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
        3. LER Tests HID Fixtures: Where LER is specified, test according to NEMA LE 5B.
        4. LED fixtures: Comply with UL 8750, UL 496 and ANSI-NEMA-C78.377.
     2. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.
     3. Metal Parts: Free of burrs and sharp corners and edges.
     4. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.
     5. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
     6. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit re-lamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during re-lamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.
     7. Exposed Hardware Material: Stainless steel.
     8. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
     9. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.
     10. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
         1. White Surfaces: 85 percent.
         2. Specular Surfaces: 83 percent.
         3. Diffusing Specular Surfaces: 75 percent.
     11. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
     12. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
     13. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
         1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
         2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
            1. Color: As selected from manufacturer's standard catalog of colors.
            2. Color: Match Owner's sample of manufacturer's standard color.
            3. Color: As selected by Owner from manufacturer's full range.
     14. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
         1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
         2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.
         3. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
         4. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.
            1. Color: Match existing fixtures on campus.
     15. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
         1. Label shall include the following lamp and ballast characteristics:
            1. "USES ONLY" and include specific lamp type.
            2. Lamp diameter code (T-4, T-5, T-8, T-12), tube configuration (twin, quad, triple), base type, and nominal wattage for fluorescent and compact fluorescent, and LED luminaires.
            3. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
            4. Start type (preheat, rapid start, instant start) for fluorescent and compact fluorescent luminaires.
            5. ANSI ballast type (M98, M57, etc.) for HID luminaires.
            6. CCT and CRI for all luminaires.
  3. **LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS**
     1. Comply with UL 773 or UL 773A.
     2. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc and off at 4.5 to 10 fc with 15-second minimum time delay. Relay shall have directional lens in front of photocell to prevent artificial light sources from causing false turnoff**.**
        1. Relay with locking-type receptacle shall comply with ANSI C136.10.
        2. Adjustable window slide for adjusting on-off set points.
  4. **FLUORESCENT BALLASTS AND LAMPS**
     1. Ballasts for Low-Temperature Environments:
        1. Temperatures 0 Deg F and Higher: Electronic type rated for 0 deg F starting and operating temperature with indicated lamp types.
        2. Temperatures Minus 20 Deg F and Higher: Electromagnetic type designed for use with indicated lamp types.
     2. Ballast Characteristics:
        1. Power Factor: 90 percent, minimum.
        2. Sound Rating: Class A.
        3. Total Harmonic Distortion Rating: Less than 10 percent.
        4. Electromagnetic Ballasts: Comply with ANSI C82.1, energy-saving, high power factor, Class P, automatic-reset thermal protection.
        5. Case Temperature for Compact Lamp Ballasts: 65 deg C, maximum.
        6. Transient-Voltage Protection: Comply with IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
     3. Low-Temperature Lamp Capability: Rated for reliable starting and operation with ballast provided at temperatures 0 deg F and higher.
  5. **BALLASTS FOR HID LAMPS**
     1. Comply with ANSI C82.4 and UL 1029 and capable of open-circuit operation without reduction of average lamp life. Include the following features unless otherwise indicated:
        1. Ballast Circuit: Constant-wattage autotransformer or regulating high-power-factor type.
        2. Minimum Starting Temperature: Minus 22 deg F.
        3. Normal Ambient Operating Temperature: 104 deg F.
        4. Ballast Fuses: One in each ungrounded power supply conductor. Voltage and current ratings as recommended by ballast manufacturer.
     2. Auxiliary, Instant-On, Quartz System: Factory-installed feature automatically switches quartz lamp on when fixture is initially energized and when momentary power outages occur. System automatically turns quartz lamp off when HID lamp reaches approximately 60 percent of light output.
  6. **HID LAMPS**
     1. Pulse-Start, Metal-Halide Lamps: Minimum CRI 65, and CCT color temperature 5100 K.
  7. **LED LIGHT EMITTING DIODES AND DRIVERS**
     1. Description: Solid State LED, light emitting diode, lighting shall comply with UL 8750, UL 496 and ANSI-NEMA-C78.377. The luminaire shall be a single, self-contained, device, fully assembled for installation. LED computer boards shall be suitable for service from below the ceiling with modular electrical connections utilizing snap fit connectors. LED boards shall be upgradable. All electrical components shall be RoHS compliant.
        1. Sound Rating: Class A.
        2. Total Harmonic Distortion Rating: Less than 20 percent.
        3. Power Factor: 0.90 or higher.
        4. Transient Voltage Protection: ANSI/IEEE C62.41 Category A or better.
        5. Operating Frequency: 20 kHz or higher.
        6. RF Interference: The luminaire and associated on-board circuitry must meet Class A emissions limits referred in Federal Communications Commission Title 47, Subpart B, Section 15 non-consumer requirements for EMI/RFI emissions.
        7. Lumen Maintenance: The lumen output shall not decrease by more than 30% over the minimum operational life of 50,000 hours. LED lighting shall meet LM-79 and IES LM-80.
        8. Thermal Management: LED luminaires shall have thermal management of the heat generated by the LEDs. The thermal management shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life. The driver manufacturer’s maximum case temperature shall not be exceeded at the maximum operating ambient operating temperature. The thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.
        9. Dimming Range: LED drivers shall be suitable for full range dimming if required on plans. Dimming shall be controlled by a 0-10V signal. The luminaire shall be capable of continuous dimming without perceivable flicker to 100% of rated lumen output with a smooth shut off function.
        10. LED Lamps: Minimum CRI 80 and CCT color temperature 5100 K, average rated life of 50,000 hours at 70% lumen maintenance unless otherwise indicated.
            1. LED maximum wattage shall be equal to or less than the wattage indicated on the lighting fixture schedule on plans.
            2. LED minimum lumens shall be equal to or more than the lumens indicated on the lighting fixture schedule on plans.
  8. **GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS**
     1. Structural Characteristics: Comply with AASHTO LTS-4-M.
        1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article.
        2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.
     2. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.
     3. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
        1. Materials: Shall not cause galvanic action at contact points.
        2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.
        3. Anchor-Bolt Template: Plywood or steel.
     4. Handhole: Oval-shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws.
     5. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Section 03 3000 "Cast-in-Place Concrete."
     6. Power-Installed Screw Foundations: Factory fabricated by pole manufacturer, with structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to

ASTM A 123/A 123M; and with top-plate and mounting bolts to match pole base flange and strength required to support pole, luminaire, and accessories.

* + 1. Breakaway Supports: Frangible breakaway supports, tested by an independent testing agency acceptable to authorities having jurisdiction, according to AASHTO LTS-4-M.
  1. **DECORATIVE POLES**
     1. Pole Material:
        1. Cast aluminum.
     2. Mounting Provisions:
        1. Bolted to concrete foundation.
        2. Embedded.
     3. Pole Finish: Match existing.

**PART 3 EXECUTION**

* 1. **LUMINAIRE INSTALLATION**
     1. Install lamps in each luminaire.
     2. Fasten luminaire to indicate structural supports.
        1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
     3. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.
  2. **POLE INSTALLATION**
     1. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.
     2. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 03 3000 "Cast-in-Place Concrete."
     3. Raise and set poles using web fabric slings (not chain or cable).
  3. **CORROSION PREVENTION**
     1. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
     2. Steel Conduits: Comply with Section 26 0533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.
  4. **GROUNDING**
     1. Ground metal poles and support structures according to Section 26 0526 "Grounding and Bonding for Electrical Systems."
        1. Install grounding electrode for each pole unless otherwise indicated.
        2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.
     2. Ground nonmetallic poles and support structures according to Section 26 0526 "Grounding and Bonding for Electrical Systems."
        1. Install grounding electrode for each pole.
        2. Install grounding conductor and conductor protector.
        3. Ground metallic components of pole accessories and foundations.
  5. **FIELD QUALITY CONTROL**
     1. Inspect each installed fixture for damage. Replace damaged fixtures and components.
     2. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.
        1. Verify operation of photoelectric controls.
     3. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.
  6. **DEMONSTRATION**
     1. Train Owner's maintenance personnel to adjust, operate, and maintain luminaire lowering devices.

**END OF SECTION**

# END OF SECTION