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**UNIVERSITY OF SOUTH CAROLINA**

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**ONE WOOD FARM EQUESTRIAN-  
LOCKER ROOM PROJECT**

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**H27-Z004**

**FOR CONSTRUCTION**

**MARCH 11, 2013**



A/E PROJECT # 11040.02  
 **GMK**  
ASSOCIATES, INC.

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# SE-310 REQUEST FOR ADVERTISEMENT

PROJECT NAME: One Wood Farm Equestrian - Locker Room Project

PROJECT NUMBER: H27-Z004

PROJECT LOCATION: Blythewood, SC

Contractor may be subject to performance appraisal at close of project

BID SECURITY REQUIRED? Yes  No

PERFORMANCE & PAYMENT BONDS REQUIRED? Yes  No

CONSTRUCTION COST RANGE: \$400,000 - \$450,000

DESCRIPTION OF PROJECT: The project consists of the addition of an athletic locker room facility at the existing farm. The new facility is a 1,770 square foot wood framed structure with exterior cementitious siding panels, standing seam metal roof metal clad wood windows, interior wood framed gypsum board partitions and tiled showers. Sitework is also included. Bidders are responsible for obtaining all updates to bidding documents from the USC Procurement website: <http://purchasing.sc.edu> (See Facilities/Construction Solicitation and Awards) Small and minority business participation is encouraged. The only site visit will be offered the day of the pre-bid from approximately 3-4:30 pm.

A/E NAME: GMK Associates

A/E CONTACT: Tom Weiland

A/E ADDRESS: Street/PO Box: 1201 Main Street, Suite 2100

City: Columbia

State: SC ZIP: 29201-

EMAIL: tweiland@gmka.com

TELEPHONE: 803-256-0000

FAX: 803-255-7243

All questions & correspondence concerning this Invitation shall be addressed to the A/E.

BIDDING DOCUMENTS/PLANS MAY BE OBTAINED FROM: USC Procurement website: <http://purchasing.sc.edu> (See Facilities/Construction Solicitation and Awards)

PLAN DEPOSIT AMOUNT: \$0.00 IS DEPOSIT REFUNDABLE: Yes  No

Only those Bidding Documents/Plans obtained from the above listed source(s) are official. Bidders rely on copies of Bidding Documents/Plans obtained from any other source at their own risk.

BIDDING DOCUMENTS/PLANS ARE ALSO ON FILE FOR VIEWING PURPOSES ONLY AT *(list name and location for each plan room or other entity):*

USC: Columbia <http://purchasing.sc.edu> (See Facilities /Construction Solicitation and Awards)

PRE-BID CONFERENCE? Yes  No  MANDATORY ATTENDANCE? Yes  No

DATE: 4/9/2013 TIME: 2:00 pm PLACE: 743 Greene St, Cola SC 29208 Cf. Rm. #53

AGENCY: University of South Carolina

NAME OF AGENCY PROCUREMENT OFFICER: Ms. Juaquana Brookins

ADDRESS: Street/PO Box: 743 Greene Street

City: Columbia

State: SC ZIP: 29208-

EMAIL: jbrookin@fmc.sc.edu

TELEPHONE: 803-777-3596

FAX: 803-777-7334

BID CLOSING DATE: 4/23/2013 TIME: 2:00 pm LOCATION: 743 Greene St, Cola SC 29208 Cf. Rm. #53

BID DELIVERY ADDRESSES:

HAND-DELIVERY:

Attn: Ms. Juaquana Brookins

University of South Carolina

743 Greene Street

Columbia, SC 29208

MAIL SERVICE:

Attn: Ms. Juaquana Brookins

University of South Carolina

743 Greene Street

Columbia, SC 29208

IS PROJECT WITHIN AGENCY CONSTRUCTION CERTIFICATION? *(Agency MUST check one)* Yes  No

**SE-310**  
**REQUEST FOR ADVERTISEMENT**

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**2011 Edition**  
Rev. 7/20/2011

**APPROVED BY** (*Office of State Engineer*): \_\_\_\_\_

**DATE:** \_\_\_\_\_

**UNIVERSITY OF SOUTH CAROLINA  
ONE WOOD FARM EQUESTRIAN -  
LOCKER ROOM PROJECT  
BLYTHEWOOD, SC**

**STATE PROJECT H27-Z004  
A/E PROJECT #11040.02**

**SECTION 00200 - INSTRUCTIONS TO BIDDERS**

FORM OF INSTRUCTIONS TO BIDDERS

1.01 See AIA Document A701 (1997 Edition), Instructions to Bidders available at the office of GMK Associates, Inc., 1201 Main Street Suite 2100, Columbia, SC 29201. 803-256-0000 OR,

A. Copies of this document may be obtained from The American Institute of Architects, 1522 Richland Street., Columbia, SC 29201. 803-252-6050.

1.02 Refer to document 00201-OSE 2011 for modifications to this document.

END OF INSTRUCTIONS TO BIDDERS

# OSE FORM 00201 – STANDARD SUPPLEMENTAL INSTRUCTIONS TO BIDDERS

2011 Edition

**OWNER:** University of South Carolina

**PROJECT NUMBER:** H27-Z004

**PROJECT NAME:** One Wood Farm Equestrian - Locker Room Project

**PROJECT LOCATION:** Blythewood, SC

**PROCUREMENT OFFICER:** Ms. Juaquana Brookins, University of South Carolina

## 1. STANDARD SUPPLEMENTAL INSTRUCTIONS TO BIDDERS

**1.1.** These Standard Supplemental Instructions To Bidders amend or supplement Instructions To Bidders (AIA Document A701-1997) and other provisions of Bidding and Contract Documents as indicated below.

**1.2.** Compliance with these Standard Supplemental Instructions is required by the Office of State Engineer (OSE) for all State projects when competitive sealed bidding is used as the method of procurement.

**1.3.** All provisions of A701-1997, which are not so amended or supplemented, remain in full force and effect.

**1.4.** Bidders are cautioned to carefully examine the Bidding and Contract Documents for additional instructions or requirements.

## 2. MODIFICATIONS TO A701-1997

**2.1.** *Delete Section 1.1 and insert the following:*

**1.1** Bidding Documents, collectively referred to as the **Invitation for Bids**, include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement, Instructions to Bidders (A-701), Supplementary Instructions to Bidders, the bid form (SE-330), the Intent to Award Notice (SE-370), and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda issued prior to execution of the Contract, and other documents set forth in the Bidding Documents. Any reference in this document to the Agreement between the Owner and Contractor, AIA Document A101, or some abbreviated reference thereof, shall mean the AIA A101, 2007 Edition as modified by OSE Form 00501 – Standard Modification to Agreement Between Owner and Contractor. Any reference in this document to the General Conditions of the Contract for Construction, AIA Document A201, or some abbreviated reference thereof, shall mean the AIA A201, 2007 Edition as modified by OSE Form 00811 – Standard Supplementary Conditions.

**2.2.** *In Section 1.8, delete the words “and who meets the requirements set forth in the Bidding Documents”.*

**2.3.** *In Section 2.1, delete the word “making” and substitute the word “submitting.”*

**2.4.** *In Section 2.1.1:*

*After the words “Bidding Documents,” delete the word “or” and substitute the word “and.”*

*Insert the following at the end of this section:*

Bidders are expected to examine the Bidding Documents and Contract Documents thoroughly and should request an explanation of any ambiguities, discrepancies, errors, omissions, or conflicting statements. Failure to do so will be at the Bidder’s risk. Bidder assumes responsibility for any patent ambiguity that Bidder does not bring to the Owner’s attention prior to bid opening.

**2.5.** *In Section 2.1.3, insert the following after the term “Contract Documents” and before the period:*

and accepts full responsibility for any pre-bid existing conditions that would affect the Bid that could have been ascertained by a site visit. As provided in Regulation 19-445.2042(B), A bidder’s failure to attend an advertised pre-bid conference will not excuse its responsibility for estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expense to the State.

**2.6. Insert the following Sections 2.2 through 2.6:**

**2.2 CERTIFICATION OF INDEPENDENT PRICE DETERMINATION**

GIVING FALSE, MISLEADING, OR INCOMPLETE INFORMATION ON THIS CERTIFICATION MAY RENDER YOU SUBJECT TO PROSECUTION UNDER SECTION 16-9-10 OF THE SOUTH CAROLINA CODE OF LAWS AND OTHER APPLICABLE LAWS.

(a) By submitting an bid, the bidder certifies that—

(1) The prices in this bid have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other bidder or competitor relating to—

- (i) Those prices;
- (ii) The intention to submit an bid; or
- (iii) The methods or factors used to calculate the prices offered.

(2) The prices in this bid have not been and will not be knowingly disclosed by the bidder, directly or indirectly, to any other bidder or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the bidder to induce any other concern to submit or not to submit an bid for the purpose of restricting competition.

(b) Each signature on the bid is considered to be a certification by the signatory that the signatory—

(1) Is the person in the bidder's organization responsible for determining the prices being offered in this bid, and that the signatory has not participated and will not participate in any action contrary to paragraphs (a)(1) through (a)(3) of this certification; or

(2)(i) Has been authorized, in writing, to act as agent for the bidder's principals in certifying that those principals have not participated, and will not participate in any action contrary to paragraphs (a)(1) through (a)(3) of this certification [As used in this subdivision (b)(2)(i), the term "principals" means the person(s) in the bidder's organization responsible for determining the prices offered in this bid];

(ii) As an authorized agent, does certify that the principals referenced in subdivision (b)(2)(i) of this certification have not participated, and will not participate, in any action contrary to paragraphs (a)(1) through (a)(3) of this certification; and

(iii) As an agent, has not personally participated, and will not participate, in any action contrary to paragraphs (a)(1) through (a)(3) of this certification.

(c) If the bidder deletes or modifies paragraph (a)(2) of this certification, the bidder must furnish with its offer a signed statement setting forth in detail the circumstances of the disclosure.

**2.3 DRUG FREE WORKPLACE**

By submitting a bid, the Bidder certifies that Bidder will maintain a drug free workplace in accordance with the requirements of Title 44, Chapter 107 of South Carolina Code of Laws, as amended.

**2.4 CERTIFICATION REGARDING DEBARMENT AND OTHER RESPONSIBILITY MATTERS**

(a) (1) By submitting an Bid, Bidder certifies, to the best of its knowledge and belief, that-

- (i) Bidder and/or any of its Principals-

(A) Are not presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any state or federal agency;

(B) Have not, within a three-year period preceding this bid, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of bids; or commission of embezzlement, theft, forgery, bribery, falsification or

destruction of records, making false statements, tax evasion, or receiving stolen property; and

(C) Are not presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in paragraph (a)(1)(i)(B) of this provision.

(ii) Bidder has not, within a three-year period preceding this bid, had one or more contracts terminated for default by any public (Federal, state, or local) entity.

(2) "Principals," for the purposes of this certification, means officers; directors; owners; partners; and, persons having primary management or supervisory responsibilities within a business entity (e.g., general manager; plant manager; head of a subsidiary, division, or business segment, and similar positions).

(b) Bidder shall provide immediate written notice to the Procurement Officer if, at any time prior to contract award, Bidder learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

(c) If Bidder is unable to certify the representations stated in paragraphs (a)(1), Bid must submit a written explanation regarding its inability to make the certification. The certification will be considered in connection with a review of the Bidder's responsibility. Failure of the Bidder to furnish additional information as requested by the Procurement Officer may render the Bidder nonresponsible.

(d) Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by paragraph (a) of this provision. The knowledge and information of an Bidder is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

(e) The certification in paragraph (a) of this provision is a material representation of fact upon which reliance was placed when making award. If it is later determined that the Bidder knowingly or in bad faith rendered an erroneous certification, in addition to other remedies available to the State, the Procurement Officer may terminate the contract resulting from this solicitation for default.

## 2.5 ETHICS CERTIFICATE

By submitting a bid, the bidder certifies that the bidder has and will comply with, and has not, and will not, induce a person to violate Title 8, Chapter 13 of the South Carolina Code of Laws, as amended (ethics act). The following statutes require special attention: Section 8-13-700, regarding use of official position for financial gain; Section 8-13-705, regarding gifts to influence action of public official; Section 8-13-720, regarding offering money for advice or assistance of public official; Sections 8-13-755 and 8-13-760, regarding restrictions on employment by former public official; Section 8-13-775, prohibiting public official with economic interests from acting on contracts; Section 8-13-790, regarding recovery of kickbacks; Section 8-13-1150, regarding statements to be filed by consultants; and Section 8-13-1342, regarding restrictions on contributions by contractor to candidate who participated in awarding of contract. The state may rescind any contract and recover all amounts expended as a result of any action taken in violation of this provision. If contractor participates, directly or indirectly, in the evaluation or award of public contracts, including without limitation, change orders or task orders regarding a public contract, contractor shall, if required by law to file such a statement, provide the statement required by Section 8-13-1150 to the procurement officer at the same time the law requires the statement to be filed.

## 2.6 RESTRICTIONS APPLICABLE TO BIDDERS & GIFTS

Violation of these restrictions may result in disqualification of your bid, suspension or debarment, and may constitute a violation of the state Ethics Act. (a) After issuance of the solicitation, ***bidder agrees not to discuss this procurement activity in any way with the Owner or its employees, agents or officials.*** All communications must be solely with the Procurement Officer. This restriction may be lifted by express written permission from the Procurement Officer. This restriction expires once a contract has been formed. (b) Unless otherwise approved in writing by the Procurement Officer, ***bidder agrees not to give anything to the Owner, any affiliated organizations, or the employees, agents or officials of either, prior to award.*** (c) Bidder acknowledges that the policy of the State is that a governmental body should not accept or solicit a gift, directly or indirectly, from a donor if the governmental body has reason to believe the donor has or is seeking to obtain contractual or other business or financial relationships with the governmental body. Regulation 19-445.2165(C) broadly defines the term donor.

2.7. Delete Section 3.1.1 and substitute the following:



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

**2.8.** *Delete the language of Section 3.1.2 and insert the word "Reserved."*

**2.9.** *In Section 3.1.4, delete the words "and Architect may make" and substitute the words "has made."*

**2.10.** *Insert the following Section 3.1.5*

**3.1.5** All persons obtaining Bidding Documents from the issuing office designated in the Advertisement shall provide that office with Bidder's contact information to include the Bidder's name, telephone number, mailing address, and email address.

**2.11.** *In Section 3.2.2:*

*Delete the words "and Sub-bidders"*

*Delete the word "seven" and substitute the word "ten"*

**2.12.** *In Section 3.2.3:*

*In the first Sentence, insert the word "written" before the word "Addendum."*

*Insert the following at the end of the section:*

As provided in Regulation 19-445.2042(B), nothing stated at the pre-bid conference shall change the Bidding Documents unless a change is made by written Addendum.

**2.13.** *Insert the following at the end of Section 3.3.1:*

Reference in the Bidding Documents to a designated material, product, thing, or service by specific brand or trade name followed by the words "or equal" and "or approved equal" shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition.

**2.14.** *Delete Section 3.3.2 and substitute the following:*

**3.3.2** No request to substitute materials, products, or equipment for materials, products, or equipment described in the Bidding Documents and no request for addition of a manufacturer or supplier to a list of approved manufacturers or suppliers in the Bidding Documents will be considered prior to receipt of Bids unless written request for approval has been received by the Architect at least ten days prior to the date for receipt of Bids established in the Invitation for Bids. Any subsequent extension of the date for receipt of Bids by addendum shall not extend the date for receipt of such requests unless the addendum so specifies. Such requests shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the Work, including changes in the work of other contracts that incorporation of the proposed substitution would require, shall be included. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

**2.15.** *Delete Section 3.4.3 and substitute the following:*

**3.4.3** Addenda will be issued no later than 120 hours prior to the time for receipt of Bids except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

**3.16.** *Insert the following Sections 3.4.5 and 3.4.6:*

**3.4.5** When the date for receipt of Bids is to be postponed and there is insufficient time to issue a written Addendum prior to the original Bid Date, Owner will notify prospective Bidders by telephone or other appropriate means with immediate follow up with a written Addendum. This Addendum will verify the postponement of the original Bid Date and establish a new Bid Date. The new Bid Date will be no earlier than the fifth (5th) calendar day after the date of issuance of the Addendum postponing the original Bid Date.

**3.4.6.** If an emergency or unanticipated event interrupts normal government processes so that bids cannot be received at the government office designated for receipt of bids by the exact time specified in the solicitation, the time specified for receipt of bids will be deemed to be extended to the same time of day specified in the solicitation on the first work day on which normal government processes resume. In lieu of an automatic extension, an Addendum may be issued to reschedule bid opening. If state offices are closed at the time a pre-bid or pre-proposal conference is scheduled, an

Addendum will be issued to reschedule the conference. Useful information may be available at: [http://www.scemd.org/scgovweb/weather\\_alert.html](http://www.scemd.org/scgovweb/weather_alert.html)

**2.17.** *In Section 4.1.1, delete the word "forms" and substitute the words "SE-330 Bid Form."*

**2.18.** *Delete Section 4.1.2 and substitute the following:*

**4.1.2** Any blanks on the bid form to be filled in by the Bidder shall be legibly executed in a non-erasable medium. Bids shall be signed in ink or other indelible media.

**2.19.** *Delete Section 4.1.3 and substitute the following:*

**4.1.3** Sums shall be expressed in figures.

**2.20.** *Insert the following at the end of Section 4.1.4:*

Bidder shall not make stipulations or qualify his bid in any manner not permitted on the bid form. An incomplete Bid or information not requested that is written on or attached to the Bid Form that could be considered a qualification of the Bid, may be cause for rejection of the Bid.

**2.21.** *Delete Section 4.1.5 and substitute the following:*

**4.1.5** All requested Alternates shall be bid. The failure of the bidder to indicate a price for an Alternate shall render the Bid non-responsive. Indicate the change to the Base Bid by entering the dollar amount and marking, as appropriate, the box for "ADD TO" or "DEDUCT FROM". If no change in the Base Bid is required, enter "ZERO" or "No Change." For add alternates to the base bid, Subcontractor(s) listed on page BF-2 of the Bid Form to perform Alternate Work may be used for both Alternates and Base Bid Work if Alternates are accepted.

**2.22.** *Delete Section 4.1.6 and substitute the following:*

**4.1.6** Pursuant to Title 11, Chapter 35, Section 3020(b)(i) of the South Carolina Code of Laws, as amended, Section 7 of the Bid Form sets forth a list of subcontractor specialties for which Bidder is required to list only the subcontractors Bidder will use to perform the work of each listed specialty. Bidder must follow the Instructions in the Bid Form for filling out this section of the Bid Form. Failure to properly fill out Section 7 may result in rejection of Bidder's bid as non-responsive.

**2.23.** *Delete Section 4.1.7 and substitute the following:*

**4.1.7** Each copy of the Bid shall state the legal name of the Bidder and the nature of legal form of the Bidder. Each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

**2.24.** *Delete Section 4.2.1 and substitute the following:*

**4.2.1** If required by the Invitation for Bids, each Bid shall be accompanied by a bid security in an amount of not less than five percent of the Base Bid. The bid security shall be a bid bond or a certified cashier's check. The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and will, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty.

**2.25.** *Delete Section 4.2.2 and substitute the following:*

**4.2.2** If a surety bond is required, it shall be written on AIA Document A310, Bid Bond, and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney. The bid bond shall:

- .1** Be issued by a surety company licensed to do business in South Carolina;
- .2** Be issued by a surety company having, at a minimum, a "Best Rating" of "A" as stated in the most current publication of "Best's Key Rating Guide, Property-Casualty", which company shows a financial strength rating of at least five (5) times the contract price.
- .3** Be enclosed in the bid envelope at the time of Bid Opening, either in paper copy or as an electronic bid bond authorization number provided on the Bid Form and issued by a firm or organization authorized by the surety to receive, authenticate and issue binding electronic bid bonds on behalf the surety.

**2.26.** *Delete Section 4.2.3 and substitute the following:*

**4.2.3** By submitting a bid bond via an electronic bid bond authorization number on the Bid Form and signing the Bid Form, the Bidder certifies that an electronic bid bond has been executed by a Surety meeting the standards required by

the Bidding Documents and the Bidder and Surety are firmly bound unto the State of South Carolina under the conditions provided in this Section 4.2.

**2.27.** *Insert the following Section 4.2.4:*

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

**2.28.** *Delete Section 4.3.1 and substitute the following:*

**4.3.1** All copies of the Bid, the bid security, if any, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall, unless hand delivered by the Bidder, be addressed to the Owner's designated purchasing office as shown in the Invitation for Bids. The envelope shall be identified with the Project name, the Bidder's name and address and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail or special delivery service (UPS, Federal Express, etc.), the envelope should be labeled "BID ENCLOSED" on the face thereof. Bidders hand delivering their Bids shall deliver Bids to the place of the Bid Opening as shown in the Invitation for Bids. Whether or not Bidders attend the Bid Opening, they shall give their Bids to the Owner's procurement officer or his/her designee as shown in the Invitation for Bids prior to the time of the Bid Opening.

**2.29.** *Insert the following Section 4.3.6 and substitute the following:*

**4.3.6** The official time for receipt of Bids will be determined by reference to the clock designated by the Owner's procurement officer or his/her designee. The procurement officer conducting the Bid Opening will determine and announce that the deadline has arrived and no further Bids or bid modifications will be accepted. All Bids and bid modifications in the possession of the procurement officer at the time the announcement is completed will be timely, whether or not the bid envelope has been date/time stamped or otherwise marked by the procurement officer.

**2.30.** *Delete Section 4.4.2 and substitute the following:*

**4.4.2** Prior to the time and date designated for receipt of Bids, a Bid submitted may be withdrawn in person or by written notice to the party receiving Bids at the place designated for receipt of Bids. Withdrawal by written notice shall be in writing over the signature of the Bidder.

**2.31.** *In Section 5.1, delete everything following the caption "OPENING OF BIDS" and substitute the following:*

**5.1.1** Bids received on time will be publicly opened and will be read aloud. Owner will not read aloud Bids that Owner determines, at the time of opening, to be non-responsive. .

**5.1.2** At bid opening, Owner will announce the date and location of the posting of the Notice of Intended Award.

**5.1.3** Owner will send a copy of the final Bid Tabulation to all Bidders within ten (10) working days of the Bid Opening.

**5.1.4** If Owner determines to award the Project, Owner will, after posting a Notice of Intended Award, send a copy of the Notice to all Bidders.

**5.1.5** If only one Bid is received, Owner will open and consider the Bid.

**2.32.** *In Section 5.2, insert the section number "5.2.1" before the words of the "The Owner" at the beginning of the sentence.*

**2.33.** *Insert the following Sections 5.2.2 and 5.2.3:*

**5.2.2** The reasons for which the Owner will reject Bids include, but are not limited to:

- .1** Failure by a Bidder to be represented at a Mandatory Pre-Bid Conference or site visit;
- .2** Failure to deliver the Bid on time;
- .3** Failure to comply with Bid Security requirements, except as expressly allowed by law;
- .4** Listing an invalid electronic Bid Bond authorization number on the bid form;
- .5** Failure to Bid an Alternate, except as expressly allowed by law;
- .6** Failure to list qualified Subcontractors as required by law;
- .7** Showing any material modification(s) or exception(s) qualifying the Bid;
- .8** Faxing a Bid directly to the Owner or their representative; or
- .9** Failure to include a properly executed Power-of-Attorney with the bid bond.

**5.2.3** The Owner may reject a Bid as nonresponsive if the prices bid are materially unbalanced between line items or sub-line items. A bid is materially unbalanced when it is based on prices significantly less than cost for some work and prices which are significantly overstated in relation to cost for other work, and if there is a reasonable doubt that the bid will result in the lowest overall cost to the Owner even though it may be the low evaluated bid, or if it is so unbalanced as to be tantamount to allowing an advance payment.

**2.34.** *Delete Section 6.1 and substitute the following:*

**6.1 CONTRACTOR'S RESPONSIBILITY**

Owner will make a determination of Bidder's responsibility before awarding a contract. Bidder shall provide all information and documentation requested by the Owner to support the Owner's evaluation of responsibility. Failure of Bidder to provide requested information is cause for the Owner, at its option, to determine the Bidder to be non-responsive

**2.35.** *Delete the language of Section 6.2 and insert the word "Reserved."*

**2.36.** *Insert the following Section 6.3:*

**6.3 CLARIFICATION**

Pursuant to Section 11-35-1520(8), the Procurement Officer may elect to communicate with a Bidder after opening for the purpose of clarifying either the Bid or the requirements of the Invitation for Bids. Such communications may be conducted only with Bidders who have submitted a Bid which obviously conforms in all material aspects to the Invitation for Bids and only in accordance with Appendix D (Paragraph A(6)) to the Manual for Planning and Execution of State Permanent Improvement, Part II. Clarification of a Bid must be documented in writing and included with the Bid. Clarifications may not be used to revise a Bid or the Invitation for Bids. [Section 11-35-1520(8); R.19-445.2080]

**2.37.** *Delete the language of Sections 6.3.2, 6.3.3, and 6.3.4 and insert the word "Reserved" after each Section Number.*

**2.38.** *Delete Section 7.1.2 and substitute the following:*

**7.1.2** The performance and payment bonds shall conform to the requirements of Section 11.4 of the General Conditions of the Contract. If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid.

**2.39.** *Delete the language of Section 7.1.3 and insert the word "Reserved."*

**2.40.** *In Section 7.2, insert the words "CONTRACT, CERTIFICATES OF INSURANCE" into the caption after the word "Delivery."*

**2.41.** *Delete Section 7.2.1 and substitute the following:*

**7.2.1** After expiration of the protest period, the Owner will tender a signed Contract for Construction to the Bidder and the Bidder shall return the fully executed Contract for Construction to the Owner within seven days thereafter. The Bidder shall deliver the required bonds and certificate of insurance to the Owner not later than three days following the date of execution of the Contract. Failure to deliver these documents as required shall entitle the Owner to consider the Bidder's failure as a refusal to enter into a contract in accordance with the terms and conditions of the Bidder's Bid and to make claim on the Bid Security for re-procurement cost.

**2.42.** *Delete the language of Section 7.2.2 and insert the word "Reserved."*

**2.43.** *Delete the language of Article 8 and insert the following:*

Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on South Carolina Modified AIA Document A101, 2007, Standard Form of Agreement Between Owner and Contractor as modified by OSE Form 00501 – Standard Modification to Agreement Between Owner and Contractor.

2.44. Insert the following Article 9:

**ARTICLE 9 MISCELLANEOUS**

**9.1 NONRESIDENT TAXPAYER REGISTRATION AFFIDAVIT INCOME TAX WITHHOLDING  
IMPORTANT TAX NOTICE - NONRESIDENTS ONLY**

Withholding Requirements for Payments to Nonresidents: Section 12-8-550 of the South Carolina Code of Laws requires persons hiring or contracting with a nonresident conducting a business or performing personal services of a temporary nature within South Carolina to withhold 2% of each payment made to the nonresident. The withholding requirement does not apply to (1) payments on purchase orders for tangible personal property when the payments are not accompanied by services to be performed in South Carolina, (2) nonresidents who are not conducting business in South Carolina, (3) nonresidents for contracts that do not exceed \$10,000 in a calendar year, or (4) payments to a nonresident who (a) registers with either the S.C. Department of Revenue or the S.C. Secretary of State and (b) submits a Nonresident Taxpayer Registration Affidavit - Income Tax Withholding, Form I-312 to the person letting the contract.

For information about other withholding requirements (e.g., employee withholding), contact the Withholding Section at the South Carolina Department of Revenue at 803-898-5383 or visit the Department's website at: [www.sctax.org](http://www.sctax.org)

This notice is for informational purposes only. This Owner does not administer and has no authority over tax issues. All registration questions should be directed to the License and Registration Section at 803-898-5872 or to the South Carolina Department of Revenue, Registration Unit, Columbia, S.C. 29214-0140. All withholding questions should be directed to the Withholding Section at 803-898- 5383.

PLEASE SEE THE "NONRESIDENT TAXPAYER REGISTRATION AFFIDAVIT INCOME TAX WITHHOLDING" FORM (FORM NUMBER I-312) LOCATED AT:  
<http://www.sctax.org/Forms+and+Instructions/withholding/default.htm>.

**9.2 CONTRACTOR LICENSING**

Contractors and Subcontractors listed in Section 7 of the Bid Form who are required by the South Carolina Code of Laws to be licensed, must be licensed at the time of bidding.

**9.3 SUBMITTING CONFIDENTIAL INFORMATION**

For every document Bidder submits in response to or with regard to this solicitation or request, Bidder must separately mark with the word "CONFIDENTIAL" every page, or portion thereof, that Bidder contends contains information that is exempt from public disclosure because it is either (a) a trade secret as defined in Section 30-4-40(a)(1), or (b) privileged & confidential, as that phrase is used in Section 11-35-410. For every document Bidder submits in response to or with regard to this solicitation or request, Bidder must separately mark with the words "TRADE SECRET" every page, or portion thereof, that Bidder contends contains a trade secret as that term is defined by Section 39-8-20 of the Trade Secrets Act. For every document Bidder submits in response to or with regard to this solicitation or request, Bidder must separately mark with the word "PROTECTED" every page, or portion thereof, that Bidder contends is protected by Section 11-35-1810. All markings must be conspicuous; use color, bold, underlining, or some other method in order to conspicuously distinguish the mark from the other text. Do not mark your entire bid as confidential, trade secret, or protected! If your bid, or any part thereof, is improperly marked as confidential or trade secret or protected, the State may, in its sole discretion, determine it nonresponsive. If only portions of a page are subject to some protection, do not mark the entire page. By submitting a response to this solicitation, Bidder (1) agrees to the public disclosure of every page of every document regarding this solicitation or request that was submitted at any time prior to entering into a contract (including, but not limited to, documents contained in a response, documents submitted to clarify a response, & documents submitted during negotiations), unless the page is conspicuously marked "TRADE SECRET" or "CONFIDENTIAL" or "PROTECTED", (2) agrees that any information not marked, as required by these bidding instructions, as a "Trade Secret" is not a trade secret as defined by the Trade Secrets Act, & (3) agrees that, notwithstanding any claims or markings otherwise, any prices, commissions, discounts, or other financial figures used to determine the award, as well as the final contract amount, are subject to public disclosure. In determining whether to release documents, the State will detrimentally rely on Bidders's marking of documents, as required by these bidding instructions, as being either "Confidential" or "Trade Secret" or "PROTECTED". By submitting a response, Bidder agrees to defend, indemnify & hold harmless the State of South Carolina, its officers & employees, from every claim, demand, loss, expense, cost, damage or injury, including attorney's fees, arising out of or resulting from the State withholding information that Bidder marked as "confidential" or "trade secret" or "PROTECTED".

**9.4 POSTING OF INTENT TO AWARD**

Notice of Intent to Award, SE-370, will be posted at the following location:

**Room or Area of Posting:** Receptionists Area

**Building Where Posted:** Facilities Center

**Address of Building:** 743 Greene Street, Columbia SC 29208

**WEB site address (if applicable):** http://purchasing.sc.edu See Facilities/Construction Solicitations and Awards

**Posting date will be announced at bid opening.** In addition to posting the notice, the Owner will promptly send all responsive bidders a copy of the notice of intent to award and the final bid tabulation

**9.5 PROTEST OF SOLICITATION OR AWARD**

Any prospective bidder, offeror, contractor, or subcontractor who is aggrieved in connection with the solicitation of a contract shall protest within fifteen days of the date of issuance of the applicable solicitation document at issue. Any actual bidder, offeror, contractor, or subcontractor who is aggrieved in connection with the intended award or award of a contract shall protest within ten days of the date notification of intent to award is posted in accordance with Title 11, Chapter 35, Section 4210 of the South Carolina Code of Laws, as amended. A protest shall be in writing, shall set forth the grounds of the protest and the relief requested with enough particularity to give notice of the issues to be decided, and must be received by the State Engineer within the time provided.

Any protest must be addressed to the CPO, Office of State Engineer, and submitted in writing:

(a) by email to [protest-ose@mmo.state.sc.us](mailto:protest-ose@mmo.state.sc.us),

(b) by facsimile at 803-737-0639, or

(c) by post or delivery to 1201 Main Street, Suite 600, Columbia, SC 29201.

By submitting a protest to the foregoing email address, you (and any person acting on your behalf) consent to receive communications regarding your protest (and any related protests) at the e-mail address from which you sent your protest.

**9.6 SOLICITATION INFORMATION FROM SOURCES OTHER THAN OFFICIAL SOURCE**

South Carolina Business Opportunities (SCBO) is the official state government publication for State of South Carolina solicitations. Any information on State agency solicitations obtained from any other source is unofficial and any reliance placed on such information is at the bidder's sole risk and is without recourse under the South Carolina Consolidated Procurement Code.

**9.7 BUILDER'S RISK INSURANCE**

Bidder's are directed to Article 11.3 of the South Carolina Modified AIA Document A201, 2007 Edition, which, unless provided otherwise in the bid documents, requires the contractor to provide builder's risk insurance on the project.

**9.8 TAX CREDIT FOR SUBCONTRACTING WITH MINORITY FIRMS**

Pursuant to Section 12-6-3350, taxpayers, who utilize certified minority subcontractors, may take a tax credit equal to 4% of the payments they make to said subcontractors. The payments claimed must be based on work performed directly for a South Carolina state contract. The credit is capped at \$25,000 per year or the total tax liability; whichever is lesser. The taxpayer is eligible to claim the credit for 6 consecutive taxable years beginning with the taxable year in which the credit is first claimed. There is no carry forward of unused credits. The credit may be claimed on Form TC-2, "Minority Business Credit." A copy of the subcontractor's certificate from the Governor's Office of Small and Minority Business (OSMBA) is to be attached to the contractor's income tax return. Taxpayers must maintain evidence of work performed for a State contract by the minority subcontractor. Questions regarding the tax credit and how to file are to be referred to: SC Department of Revenue, Research and Review, Phone: (803) 898-5786, Fax: (803) 898-5888. The subcontractor must be certified as to the criteria of a "Minority Firm" by the Governor's Office of Small and Minority Business Assistance (OSMBA). Certificates are issued to subcontractors upon successful completion of the certification process. Questions regarding subcontractor certification are to be referred to: Governor's Office of Small and Minority Business Assistance, Phone: (803) 734-0657, Fax: (803) 734-2498. Reference: SC §11-35-5010 – Definition for Minority Subcontractor & SC §11-35-5230 (B) – Regulations for Negotiating with State Minority Firms.

**§ 9.9 OTHER SPECIAL CONDITIONS OF THE WORK**

None

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**END OF DOCUMENT**



**UNIVERSITY OF SOUTH CAROLINA  
ONE WOOD FARM EQUESTRIAN -  
LOCKER ROOM PROJECT  
BLYTHEWOOD, SC**

**STATE PROJECT H27-Z004  
A/E PROJECT #11040.02**

**SECTION 00300 - BID BOND**

FORM OF BID BOND

- 1.01 See AIA Document A310 (2010 Edition) , Bid Bond available at the office of GMK Associates, Inc., 1201 Main Street Suite 2100, Columbia, SC 29201. 803-256-0000 OR,
- A. Copies of this document may be obtained from The American Institute of Architects, 1522 Richland Street., Columbia, SC 29201. 803-252-6050.

**END OF SECTION**



**BID FORM  
SE-330**

2011 Edition

*Bidders shall submit bids on only Bid Form SE-330.*

**BID SUBMITTED BY:** \_\_\_\_\_  
(Bidder's Name)

**BID SUBMITTED TO:** University of South Carolina  
(Owner's Name)

**FOR PROJECT:** H27-Z004 One Wood Farm Equestrian - Locker Room Project  
(Number) (Name)

**OFFER**

§ 1. In response to the Invitation for Construction Bids and in compliance with the Instructions to Bidders for the above-named Project, the undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into a Contract with the Owner on the terms included in the Bidding Documents, and to perform all Work as specified or indicated in the Bidding Documents, for the prices and within the time frames indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

§ 2. Pursuant to Section 11-32-3030(1) of the SC Code of Laws, as amended, Bidder has submitted Bid Security as follows in the amount and form required by the Bidding Documents:

Bid Bond with Power of Attorney     Electronic Bid Bond     Cashier's Check  
(Bidder check one)

§ 3. Bidder acknowledges the receipt of the following Addenda to the Bidding Documents and has incorporated the effects of said Addenda into this Bid:

**ADDENDUM No:** \_\_\_\_\_

§ 4. Bidder accepts all terms and conditions of the Invitation for Bids, including, without limitation, those dealing with the disposition of Bid Security. Bidder agrees that this Bid, including all Bid Alternates, if any, may not be revoked or withdrawn after the opening of bids, and shall remain open for acceptance for a period of 60 Days following the Bid Date, or for such longer period of time that Bidder may agree to in writing upon request of the Owner.

§ 5. Bidder herewith offers to provide all labor, materials, equipment, tools of trades and labor, accessories, appliances, warranties and guarantees, and to pay all royalties, fees, permits, licenses and applicable taxes necessary to complete the following items of construction work:

**§ 6.1 BASE BID WORK (as indicated in the Bidding Documents and generally described as follows):**

A new locker room facility building with associated sitework, plumbing, mechanical and electrical work.

Note: Air handler AHU-1, exhaust fan EF-1, two fly fans AC-1 and AC-2, mini-split AHU-2/HP-2 are OFCI

in the base bid and interior paint and stain not included in base bid \_\_\_\_\_, which sum is hereafter called the Base Bid.

**BID FORM  
SE-330**

2011 Edition

§ 6.2 BID ALTERNATES – as indicated in the Bidding documents and generally described as follows:

**ALTERNATE #1** (*Brief Description*): Contractor furnish the following equipment:  
Air handler AHU-1, exhaust fan EF-1, two fly fans AC-1 and AC-2, mini-split AHU-2/HP-2.

ADD TO or  DEDUCT FROM BASE BID: \_\_\_\_\_

*(Bidder to Mark appropriate box to clearly indicate the price adjustment offered for each alternate)*

**ALTERNATE #2** (*Brief Description*): Add interior paint and stain as per the plans and specifications.

ADD TO or  DEDUCT FROM BASE BID: \_\_\_\_\_

*(Bidder to Mark appropriate box to clearly indicate the price adjustment offered for each alternate)*

**ALTERNATE #3** (*Brief Description*): na

ADD TO or  DEDUCT FROM BASE BID: \_\_\_\_\_

*(Bidder to Mark appropriate box to clearly indicate the price adjustment offered for each alternate)*

**BID FORM  
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2011 Edition

**§ 7. LISTING OF PROPOSED SUBCONTRACTORS PURSUANT TO SECTION 3020(b)(i), CHAPTER 35, TITLE 11 OF THE SOUTH CAROLINA CODE OF LAWS, AS AMENDED – (See Instructions on the following page BF-3A)**

Bidder shall use the below-listed Subcontractors in the performance of the Subcontractor Specialty work listed:

<b>SUBCONTRACTOR SPECIALTY</b> By License Classification and/or Subclassification (Completed by Owner)	<b>SUBCONTRACTOR(S) OR PRIME CONTRACTOR'S NAME</b> ((Must be completed by Bidder) <b>BASE BID</b>	<b>SUBCONTRACTOR'S SC LICENSE NUMBER</b>
no listing required		
no listing required	<b>ALTERNATE # 1</b>	
no listing required	<b>ALTERNATE # 2</b>	
na	<b>ALTERNATE # 3</b>	

If a Bid Alternate is accepted, Subcontractors listed for the Bid Alternate shall be used for the work of both the Alternate and the Base Bid work.

## **INSTRUCTIONS FOR SUBCONTRACTOR LISTING**

1. Section 7 of the Bid Form sets forth a list of subcontractor specialties for which bidder is required to identify by name the subcontractor(s) Bidder will use to perform the work of each listed specialty. Bidder must identify only the subcontractor(s) who will perform the work and no others.
2. For purposes of subcontractor listing, a Subcontractor is an entity who will perform work or render service to the prime contractor to or about the construction site. Material suppliers, manufacturers, and fabricators that will not perform physical work at the site of the project but will only supply materials or equipment to the bidder or proposed subcontractor(s) are not subcontractors and Bidder should not insert their names in the spaces provided on the bid form. Likewise, Bidder should not insert the names of sub-subcontractors in the spaces provided on the bid form but only the names of those entities with which bidder will contract directly.
3. Bidder must only insert the names of subcontractors who are qualified to perform the work of the listed specialties as specified in the Bidding Documents and South Carolina Licensing Laws.
4. If under the terms of the Bidding Documents, Bidder is qualified to perform the work of a specialty listed and Bidder does not intend to subcontract such work but to use Bidder's own employees to perform such work, the Bidder must insert its own name in the space provided for that specialty.
5. If Bidder intends to use multiple subcontractors to perform the work of a single specialty listing, Bidder must insert the name of each subcontractor Bidder will use, preferably separating the name of each by the word **"and"**. If Bidder intends to use both his own employees to perform a part of the work of a single specialty listing and to use one or more subcontractors to perform the remaining work for that specialty listing, bidder must insert his own name and the name of each subcontractor, preferably separating the name of each with the word **"and"**.
6. Bidder may not list subcontractors in the alternative nor in a form that may be reasonably construed at the time of bid opening as a listing in the alternative. A listing that requires subsequent explanation to determine whether or not it is a listing in the alternative is non-responsive. If bidder intends to use multiple entities to perform the work for a single specialty listing, bidder must clearly set forth on the bid form such intent. Bidder may accomplish this by simply inserting the word **"and"** between the name of each entity listed for that specialty. Owner will reject as non-responsive a listing that contains the names of multiple subcontractors separated by a blank space, the word **"or"**, a virgule (that is a /), or any separator that the Owner may reasonably interpret as a listing in the alternative.
7. If Bidder is awarded the contract, bidder must, except with the approval of the owner for good cause shown, use the listed entities to perform the work for which they are listed.
8. If bidder is awarded the contract, bidder will not be allowed to substitute another entity as subcontractor in place of a subcontractor listed in Section 7 of the Bid except for one or more of the reasons allowed by the SC Code of Laws.
9. Bidder's failure to insert a name for each listed specialty subcontractor will render the Bid non-responsive.

**§ 8. LIST OF MANUFACTURERS, MATERIAL SUPPLIERS, AND SUBCONTRACTORS OTHER THAN SUBCONTRACTORS LISTED IN SECTION 7 ABOVE (FOR INFORMATION ONLY):** Pursuant to instructions in the Invitation for Bids, if any, Bidder will provide to Owner upon the Owner's request and within 24 hours of such request, a listing of manufacturers, material suppliers, and subcontractors, other than those listed in Section 7 above, that Bidder intends to use on the project. Bidder acknowledges and agrees that this list is provided for purposes of determining responsibility and not pursuant to the subcontractor listing requirements of SC Code Ann § 11-35-3020(b)(i).

**§ 9. TIME OF CONTRACT PERFORMANCE AND LIQUIDATED DAMAGES**

a. **CONTRACT TIME:** Bidder agrees that the Date of Commencement of the Work shall be established in a Notice to Proceed to be issued by the Owner and Bidder shall substantially complete the Work within 210 calendar days from the Date of Commencement, subject to adjustments as provided in the Contract Documents.

b. **LIQUIDATED DAMAGES:** Bidder further agrees that from the compensation to be paid, the Owner shall retain as Liquidated Damages the sum of \$ 300.00 for each calendar day the actual construction time required to achieve Substantial Completion exceeds the specified or adjusted time for Substantial Completion as provided in the Contract Documents. This sum is intended by the parties as the predetermined measure of compensation for actual damages, not as a penalty for nonperformance.

**§ 10. AGREEMENTS**

- a. Bidder agrees that this bid is subject to the requirements of the law of the State of South Carolina.
- b. Bidder agrees that at any time prior to the issuance of the Notice to Proceed for this Project, this Project may be canceled for the convenience of, and without cost to, the State.
- c. Bidder agrees that neither the State of South Carolina nor any of its agencies, employees or agents shall be responsible for any bid preparation costs, or any costs or charges of any type, should all bids be rejected or the Project canceled for any reason prior to the issuance of the Notice to Proceed.

**§ 11. ELECTRONIC BID BOND**

By signing below, the Principal is affirming that the identified electronic bid bond has been executed and that the Principal and Surety are firmly bound unto the State of South Carolina under the terms and conditions of the AIA Document A310, Bid Bond, included in the Bidding Documents.

---

*(Electronic Bid Bond Number)*

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*(Signature and Title)*

**BID FORM  
SE-330**

2011 Edition

**BIDDER'S TAXPAYER IDENTIFICATION**

FEDERAL EMPLOYER'S IDENTIFICATION NUMBER: \_\_\_\_\_

*OR*

SOCIAL SECURITY NUMBER: \_\_\_\_\_

**CONTRACTOR'S CLASSIFICATIONS AND SUBCLASSIFICATIONS WITH LIMITATIONS**

*Classification(s) & Limits:* \_\_\_\_\_

*Subclassification(s) & Limits:* \_\_\_\_\_

*SC Contractor's License Number(s):* \_\_\_\_\_

BY SIGNING THIS BID, THE PERSON SIGNING REAFFIRMS ALL REPRESENTATIONS AND CERTIFICATIONS MADE BY BOTH THE PERSON SIGNING AND THE BIDDER, INCLUDING WITHOUT LIMITATION, THOSE APPEARING IN ARTICLE 2 OF THE INSTRUCTIONS TO BIDDER. THE INVITATION FOR BIDS, AS DEFINED IN THE INSTRUCTIONS TO BIDDERS, IS EXPRESSLY INCORPORATE BY REFERENCE.

**SIGNATURE**

\_\_\_\_\_  
*(Legal Name of Person, Firm or Corporation Submitting Bid)*

\_\_\_\_\_  
*(Mailing Address for the above)*

BY: \_\_\_\_\_  
*(Signature)*

DATE: \_\_\_\_\_

TITLE: \_\_\_\_\_

TELEPHONE: \_\_\_\_\_

**SECTION 00500 - AGREEMENT**

PART 1 GENERAL

FORM OF AGREEMENT

2.01 RELATED REQUIREMENTS

- A. Section 00700 - General Conditions.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

AIA DOCUMENT A101-2007, STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR, FORMS THE BASIS OF CONTRACT BETWEEN THE OWNER AND CONTRACTOR.

5.01 This document is not bound within the project manual.

- A. Copies of this document may be obtained from The American Institute of Architects, 1522 Richland Street., Columbia, SC 29201. 803-252-6050.
- B. OR it can be viewed at the offices of GMK Associates, Inc., 1201 Main Street Suite 2100 Columbia, SC 29201 (803)256-0000

5.02 Refer to document 00501-OSE 2011 for modifications to this document.

END OF AGREEMENT

# OSE FORM 00501 STANDARD MODIFICATIONS TO AGREEMENT BETWEEN OWNER AND CONTRACTOR

2011 Edition

**OWNER:** University of South Carolina

**PROJECT NUMBER:** H27-Z004

**PROJECT NAME:** One Wood Farm Equestrian - Locker Room Project

## 1. STANDARD MODIFICATIONS TO AIA A101-2007

**1.1.** These Standard Modifications amend or supplement the *Standard Form of Agreement Between Owner and Contractor* (AIA Document A101-2007) and other provisions of Bidding and Contract Documents as indicated below.

**1.2.** All provisions of A101-2007, which are not so amended or supplemented, remain in full force and effect.

## 2. MODIFICATIONS TO A101

**2.1.** *Insert the following at the end of Article 1:*

Any reference in this document to the Agreement between the Owner and Contractor, AIA Document A101, or some abbreviated reference thereof, shall mean the AIA A101, 2007 Edition as modified by OSE Form 00501 – Standard Modification to Agreement Between Owner and Contractor. Any reference in this document to the General Conditions of the Contract for Construction, AIA Document A201, or some abbreviated reference thereof, shall mean the AIA A201, 2007 Edition as modified by OSE Form 00811 – Standard Supplementary Conditions.

**2.2.** *Delete Section 3.1 and substitute the following:*

**3.1** The date of commencement of the Work shall be the date fixed in a notice to proceed issued by the Owner. The Owner shall issue the notice to proceed to the Contractor in writing, no less than seven days prior to the Date of Commencement. Unless otherwise provided elsewhere in the contract documents, and provided the contractor has secured all required insurance and surety bonds, the contractor may commence work immediately after receipt of the Notice to Proceed.

**2.3.** *Delete Section 3.2 and substitute the following:*

**3.2** The Contract Time shall be measured from the date of commencement as provided in Section 9(a) of the Bid Form (SE-330) for this Project. Contractor agrees that if the Contractor fails to achieve Substantial Completion of the Work within the Contract Time, the Owner shall be entitled to withhold or recover from the Contractor liquidated damages in the amounts set forth in Section 9(b) of the Bid Form (SE-330), subject to adjustments of this Contract Time as provided in the Contract Documents.

**2.4.** *In Section 5.1.1, insert the words “and Owner” after the phrase “Payment submitted to the Architect.”*

**2.5.** *Delete Section 5.1.3 and substitute the following:*

**5.1.3** The Owner shall make payment of the certified amount to the Contractor not later than 21 days after receipt of the Application for Payment.

**2.6.** *In Section 5.1.1, Insert the following after the phrase “Subject to other provisions of the Contract Documents”:*

and subject to Title 12, Chapter 8, Section 550 of the South Carolina Code of Laws, as amended (Withholding Requirements for Payments to Non-Residents)

*In the spaces provided in Sub-Sections 1 and 2 for inserting the retainage amount, insert “three and one-half percent (3.5%).”*



**STANDARD MODIFICATIONS TO AGREEMENT BETWEEN OWNER AND CONTRACTOR**

2.7. In Section 5.1.8, delete the word “follows” and the colon and substitute the following:

set forth in S.C. Code Ann. § 11-35-3030(4).

2.8. In Section 5.1.9, delete the words “Except with the Owner’s prior approval, the” before the word “Contractor.”

2.9. In Section 5.2.2, delete the number 30 and substitute the number 21, delete everything following the words “Certificate for Payment” and place a period at the end of the resulting sentence.

2.10. Delete the language of Sections 6.1 and 6.2 and substitute the word “Reserved” for the deleted language of each Section .

2.11. Delete the language of Section 8.2 and substitute the word “Reserved.”

2.12. In Section 8.3, make the word “Representative” in the title plural, delete everything following the title, and substitute the following:

**8.3.1** Owner designates the individual listed below as its Senior Representative (“Owner’s Senior Representative”), which individual has the responsibility for and, subject to Section 7.2.1 of the General Conditions, the authority to resolve disputes under Section 15.6 of the General Conditions:  
*(Name, title, postal address, telephone numbers, and other information)*

Tom Opal, USC Senior Project Manager, 743 Greene Street, Columbia SC 29208 tnoval@fmc.sc.edu  
803-777-7076 +

**8.3.2** Owner designates the individual listed below as its Owner’s Representative, which individual has the authority and responsibility set forth in Section 2.1.1 of the General Conditions: *(Name, title, postal address, telephone numbers, and other information)*

Ann Derrick, USC Project Manager, 743 Greene Street, Columbia SC 29208 ADERRICK@fmc.sc.edu  
(803) 777-5811 +

2.13. In Section 8.4, make the word “Representative” in the title plural, delete everything following the title, and substitute the following:

**8.4.1** Contractor designates the individual listed below as its Senior Representative (“Contractor’s Senior Representative”), which individual has the responsibility for and authority to resolve disputes under Section 15.6 of the General Conditions:  
*(Name, title, postal address, telephone numbers, and other information)*

[Redacted]

**8.4.2** Contractor designates the individual listed below as its Contractor’s Representative, which individual has the authority and responsibility set forth in Section 3.1.1 of the General Conditions: *(Name, title, address, telephone numbers, email address, and other information)*

[Redacted]

**STANDARD MODIFICATIONS TO AGREEMENT BETWEEN  
OWNER AND CONTRACTOR**

**2.14.** *Add the following Section 8.6.1:*

**8.6.1** The Architect's representative:

*(Name, title, postal address, telephone numbers, and other information)*

Tom Weiland, GMK Associates, 1201 Main Street Ste 2100, Columbia SC 29201 803-256-0000

**2.15.** *In Section 9.1.7, Sub-Section 2, list the following documents in the space provided for listing documents:*

Invitation for Construction Bids (SE-310)

Instructions to Bidders (AIA Document A701-1997)

Standard Supplemental Instructions to Bidders (OSE Form 00201)

Contractor's Bid (Completed SE-330)

Intent to Award Notice (Completed SE-370)

Certificate of procurement authority issued by the SC Budget & Control Board

**2.16.** *In Article 10, delete everything after the first sentence.*

**END OF DOCUMENT**

**SECTION 00700 - GENERAL CONDITIONS**

FORM OF GENERAL CONDITIONS

AIA DOCUMENT A201, 2007 EDITION, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, IS THE GENERAL CONDITIONS BETWEEN THE OWNER AND CONTRACTOR.

2.01 This document is not bound within the project manual.

- A. Copies of this document may be obtained from The American Institute of Architects, 1522 Richland Street., Columbia, SC 29201. 803-252-6050.
- B. OR it can be viewed at the offices of GMK Associates, Inc., 1201 Main Street Suite 2100 Columbia, SC 29201 (803)256-0000

SUPPLEMENTARY CONDITIONS

3.01 Refer to Document 00811-OSE 2011 for amendments to these General Conditions.

END OF DOCUMENT 00700

# OSE FORM 00811

## STANDARD SUPPLEMENTARY CONDITIONS

2011 Edition

**OWNER:** University of South Carolina

**PROJECT NUMBER:** H27-Z004

**PROJECT NAME:** One Wood Farm Equestrian - Locker Room Project

### 1 GENERAL CONDITIONS

The *General Conditions of the Contract for Construction*, AIA Document A201, 2007 Edition, Articles 1 through 15 inclusive, is a part of this Contract and is incorporated as fully as if herein set forth. For brevity, AIA Document A201 is also referred to in the Contract Documents collectively as the "General Conditions."

### 2 STANDARD SUPPLEMENTARY CONDITIONS

**2.1** The following supplements modify, delete and/or add to the General Conditions. Where any portion of the General Conditions is modified or any paragraph, Section or clause thereof is modified or deleted by these Supplementary Conditions, the unaltered provisions of the General Conditions shall remain in effect.

**2.2** Unless otherwise stated, the terms used in these Standard Supplementary Conditions which are defined in the General Conditions have the meanings assigned to them in the General Conditions.

### 3 MODIFICATIONS TO A201-1997

**3.1** *Insert the following at the end of Section 1.1.1:*

Any reference in this document to the Agreement between the Owner and Contractor, AIA Document A101, or some abbreviated reference thereof, shall mean the AIA A101, 2007 Edition as modified by OSE Form 00501 – Standard Modification to Agreement Between Owner and Contractor. Any reference in this document to the General Conditions of the Contract for Construction, AIA Document A201, or some abbreviated reference thereof, shall mean the AIA A201, 2007 Edition as modified by OSE Form 00811 – Standard Supplementary Conditions.

**3.2** *Delete the language of Section 1.1.8 and substitute the word "Reserved."*

**3.3** *Add the following Section 1.1.9:*

#### 1.1.9 NOTICE TO PROCEED

Notice to Proceed is a document issued by the Owner to the Contractor, with a copy to the Architect, directing the Contractor to begin prosecution of the Work in accordance with the requirements of the Contract Documents. The Notice to Proceed shall fix the date on which the Contract Time will commence.

**3.4** *Insert the following at the end of Section 1.2.1:*

In the event of patent ambiguities within or between parts of the Contract Documents, the contractor shall 1) provide the better quality or greater quantity of Work, or 2) comply with the more stringent requirement, either or both in accordance with the Architect's interpretation.

**3.5** *Delete Section 1.5.1 and substitute the following:*

**1.5.1** The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as a violation of the Architect's or Architect's consultants' reserved rights.

**3.6** *Delete Section 2.1.1 and substitute the following:*

**2.1.1** The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall

# OSE FORM 00811

## STANDARD SUPPLEMENTARY CONDITIONS

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have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization, except as provided in Section 7.1.2. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's Representative. [Reference § 8.2 of the Agreement.]

**3.7** *Delete Section 2.1.2 and substitute the following:*

**2.1.2** The Owner shall furnish to the Contractor within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to post Notice of Project Commencement pursuant to Title 29, Chapter 5, Section 23 of the South Carolina Code of Laws, as amended..

**3.8** *Delete Section 2.2.3 and substitute the following:*

**2.2.3** The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. Subject to the Contractor's obligations, including those in Section 3.2, the Contractor shall be entitled to rely on the accuracy of information furnished by the Owner pursuant to this Section but shall exercise proper precautions relating to the safe performance of the Work.

**3.9** *Replace the period at the end of the last sentence of Section 2.2.4 with a semicolon and insert the following after the inserted semicolon:*

"however, the Owner does not warrant the accuracy of any such information requested by the Contractor that is not otherwise required of the Owner by the Contract Documents. Neither the Owner nor the Architect shall be required to conduct investigations or to furnish the Contractor with any information concerning subsurface characteristics or other conditions of the area where the Work is to be performed beyond that which is provide in the Contract Documents."

**3.10** *Delete Section 2.2.5 and substitute the following:*

**2.2.5** Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor with ten copies of the Contract Documents. The Contractor may make reproductions of the Contract Documents pursuant to Section 1.5.2. All copies of the drawings and specifications, except the Contractor's record set, shall be returned or suitably accounted for to the Owner, on request, upon completion of the Work.

**3.11** *Add the following Sections 2.2.6 and 2.2.7:*

**2.2.6** The Owner assumes no responsibility for any conclusions or interpretation made by the Contractor based on information made available by the Owner.

**2.2.7** The Owner shall obtain, at its own cost, general building and specialty inspection services as required by the Contract Documents. The Contractor shall be responsible for payment of any charges imposed for reinspections.

**3.12** *Delete Section 2.4 and substitute the following:*

**2.4** If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect, including but not limited to providing necessary resources, with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Directive shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

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## STANDARD SUPPLEMENTARY CONDITIONS

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**3.13** *Insert the following at the end of Section 3.2.1:*

The Contractor acknowledges that it has investigated and satisfied itself as to the general and local conditions which can affect the work or its cost, including but not limited to (1) conditions bearing upon transportation, disposal, handling, and storage of materials; (2) the availability of labor, water, electric power, and roads; (3) uncertainties of weather, river stages, tides, or similar physical conditions at the site; (4) the conformation and conditions of the ground; and (5) the character of equipment and facilities needed preliminary to and during work performance. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by the Owner, as well as from the drawings and specifications made a part of this contract. Any failure of the Contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from responsibility for estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expense to the Owner.

**3.14** *In the third sentence of Section 3.2.4, insert the word “latent” before the word “errors.”*

**3.15** *In the last sentence of Section 3.3.1, insert the words “by the Owner in writing” after the word “instructed.”*

**3.16** *Delete the third and fourth sentences of Section 3.5 and substitute the following sentences:*

Work, materials, or equipment not conforming to these requirements shall be considered defective. Unless caused by the Contractor or a subcontractor at any tier, the Contractor’s warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage.

**3.17** *Insert the following at the end of Section 3.6:*

The Contractor shall comply with the requirements of Title 12, Chapter 9 of the South Carolina Code of Laws, as amended, regarding withholding tax for nonresidents, employees, contractors and subcontractors.

**3.18** *In Section 3.7.1, delete the words “the building permit as well as for other” and insert the following sentence at the end of this section:*

Pursuant to Title 10, Chapter 1, Section 180 of the South Carolina Code of Laws, as amended, no local general or specialty building permits are required for state buildings.

**3.19** *Delete the last sentence of Section 3.7.5 and substitute the following:*

Adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 7.3.3.

**3.20** *Delete the last sentence of Section 3.8.2.3 and substitute the following:*

The amount of the Change Order shall reflect the difference between actual costs under Section 3.8.2.1, as documented by invoices, and the allowance amounts.

**3.21** *In Section 3.9.1, insert a comma after the word “superintendent” in the first sentence and insert the following after the inserted comma:*

acceptable to the Owner,

**3.22** *Delete Section 3.9.2 and substitute the following:*

**3.9.2** The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner the name and qualifications of a proposed superintendent. The Owner may reply within 14 days to the Contractor in

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writing stating (1) whether the Owner has reasonable objection to the proposed superintendent or (2) that the Owner requires additional time to review. Failure of the Owner to reply within the 14-day period shall constitute notice of no reasonable objection.

**3.23** *After the first sentence in Section 3.9.3, insert the following sentence:*

The Contractor shall notify the Owner, in writing, of any proposed change in the superintendent, including the reason therefore, prior to making such change.

**3.24** *Delete Section 3.10.3 and substitute the following:*

**3.10.3** Additional requirements, if any, for the construction schedule are as follows:  
*(Owner initial if applicable to this contract)*

The construction schedule shall be in a detailed precedence-style critical path management (CPM) or primavera-type format satisfactory to the Owner and the Architect that shall also (1) provide a graphic representation of all activities and events that will occur during performance of the work; (2) identify each phase of construction and occupancy; and (3) set forth dates that are critical in ensuring the timely and orderly completion of the Work in accordance with the requirements of the Contract Documents (hereinafter referred to as "Milestone Dates"). Upon review and acceptance by the Owner and the Architect of the Milestone Dates, the construction schedule shall be deemed part of the Contract Documents and attached to the Agreement as Exhibit "A." If not accepted, the construction schedule shall be promptly revised by the Contractor in accordance with the recommendations of the Owner and the Architect and resubmitted for acceptance. The Contractor shall monitor the progress of the Work for conformance with the requirements of the construction schedule and shall promptly advise the Owner of any delays or potential delays. Whenever the approved construction schedule no longer reflects actual conditions and progress of the work or the Contract Time is modified in accordance with the terms of the Contract Documents, the Contractor shall update the accepted construction schedule to reflect such conditions. In the event any progress report indicates any delays, the Contractor shall propose an affirmative plan to correct the delay, including overtime and/or additional labor, if necessary. In no event shall any progress report constitute an adjustment in the Contract Time, any Milestone Date, or the Contract Sum unless any such adjustment is agreed to by the Owner and authorized pursuant to Change Order.

**3.25** *Add the following Section 3.10.4:*

**3.10.4** Owner's review and acceptance of Contractor's schedule is not conducted for the purpose of either determining its accuracy and completeness or approving the construction means, methods, techniques, sequences or procedures. The Owner's approval shall not relieve the Contractor of any obligations. Unless expressly addressed in a Modification, the Owner's approval of a schedule shall not change the Contract Time.

**3.26** *Add the following Section 3.12.5.1:*

**3.12.5.1** The fire sprinkler shop drawings shall be prepared by a licensed fire sprinkler contractor and shall accurately reflect actual conditions affecting the required layout of the fire sprinkler system. The fire sprinkler contractor shall certify the accuracy of his shop drawings prior to submitting them for review and approval. The fire sprinkler shop drawings shall be reviewed and approved by the Architect's engineer of record who, upon approving the sprinkler shop drawings will submit them to the State Fire Marshal or other authorities having jurisdiction for review and approval. The Architect's engineer of record will submit a copy of the State Fire Marshal's approval letter to the Contractor, Architect, and OSE. Unless authorized in writing by OSE, neither the Contractor nor subcontractor at any tier shall submit the fire sprinkler shop drawings directly to the State Fire Marshal or other authorities having jurisdiction for approval.

**3.27** *In the fourth sentence of Section 3.12.10, after the comma following the words "licensed design professional," insert the following:*

who shall comply with reasonable requirements of the Owner regarding qualifications and insurance and

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**3.28** *In Section 3.13, insert the section number “3.13.1” before the opening words “The Contractors shall.”*

**3.29** *Add the following Sections 3.13.2 and 3.13.3:*

**3.13.2** Protection of construction materials and equipment stored at the Project site from weather, theft, vandalism, damage, and all other adversity is solely the responsibility of the Contractor. The Contractor shall perform the work in a manner that affords reasonable access, both vehicular and pedestrian, to the site of the Work and all adjacent areas. The Work shall be performed, to the fullest extent reasonably possible, in such a manner that public areas adjacent to the site of the Work shall be free from all debris, building materials, and equipment likely to cause hazardous conditions.

**3.13.3** The Contractor and any entity for whom the Contractor is responsible shall not erect any sign on the Project site without the prior written consent of the Owner.

**3.30** *In the first sentence of Section 3.18.1, after the parenthetical “...(other than the Work itself),...” and before the word “...but...”, insert the following:*

including loss of use resulting therefrom,

**3.31** *Delete Section 4.1.1 and substitute the following:*

**4.1.1** The Architect is that person or entity identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

**3.32** *Insert the following at the end of Section 4.2.1:*

Any reference in the Contract Documents to the Architect taking action or rendering a decision with a “reasonable time” is understood to mean no more than fourteen days, unless otherwise specified in the Contract Documents or otherwise agreed to by the parties.

**3.33** *Delete the first sentence of Section 4.2.2 and substitute the following:*

The Architect will visit the site as necessary to fulfill its obligation to the Owner for inspection services, if any, and, at a minimum, to assure conformance with the Architect’s design as shown in the Contract Documents and to observe the progress and quality of the various components of the Contractor’s Work, and to determine if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents.

**3.34** *Delete the first sentence of Section 4.2.3 and substitute the following:*

On the basis of the site visits, the Architect will keep the Owner informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work.

**3.35** *In Section 4.2.5, after the word “evaluations of the” and before the word “Contractor’s,” insert the following:*

Work completed and correlated with the

**3.36** *Delete the first sentence of Section 4.2.11 and substitute the following:*

**4.2.11** The Architect will, in the first instance, interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. Upon receipt of such request, the Architect will promptly provide the non-requesting party with a copy of the request.



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**3.37** *Insert the following at the end of Section 4.2.12:*

If either party disputes the Architects interpretation or decision, that party may proceed as provided in Article 15. The Architect's interpretations and decisions may be, but need not be, accorded any deference in any review conducted pursuant to law or the Contract Documents.

**3.38** *Delete Section 4.2.14 and substitute the following:*

The Architect will review and respond to requests for information about the Contract Documents so as to avoid delay to the construction of the Project. The Architect's response to such requests will be made in writing with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information. Any response to a request for information must be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. Unless issued pursuant to a Modification, supplemental Drawings or Specifications will not involve an adjustment to the Contract Sum or Contract Time.

**3.39** *Delete Section 5.2.1 and substitute the following:*

**5.2.1** Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, within fourteen days after posting of the Notice of Intent to Award the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (excluding Listed Subcontractors but including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Owner may reply within 14 days to the Contractor in writing stating (1) whether the Owner has reasonable objection to any such proposed person or entity. Failure of the Owner to reply within the 14 day period shall constitute notice of no reasonable objection.

**3.40** *Delete Section 5.2.2 and substitute the following:*

**5.2.2** The Contractor shall not contract with a proposed person or entity to whom the Owner has made reasonable and timely objection. The Owner shall not direct the Contractor to contract with any specific individual or entity for supplies or services unless such supplies and services are necessary for completion of the Work and the specified individual or entity is the only source of such supply or services.

**3.41** *In the first sentence of Section 5.2.3, delete the words "...or Architect..." in the two places they appear.*

**3.42** *Delete the words "...or Architect..." in the in the first sentence of Section 5.2.4 and insert the following sentence at the end of Section 5.2.4:*

The Contractor's request for substitution must be made to the Owner in writing accompanied by supporting information.

**3.43** *Add the following Section 5.2.5:*

**5.2.5** A Subcontractor identified in the Contractor's Bid in response the specialty subcontractor listing requirements of Section 7 of the Bid Form (SE-330) may only be substituted in accordance with and as permitted by the provisions of Title 11, Chapter 35, Section 3021 of the South Carolina Code of Laws, as amended. A proposed substitute for a Listed Subcontractor shall be subject to the Owner's approval as set forth is Section 5.2.3.

**3.44** *In Section 5.3, delete everything following the heading "SUBCONTRACTUAL RELATIONS" and insert the following Sections 5.3.1, 5.3.2, 5.3.3, and 5.3.4:*

**5.3.1** By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the

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## STANDARD SUPPLEMENTARY CONDITIONS

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Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise herein or in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.3.2 Without limitation on the generality of Section 5.3.1, each Subcontract agreement and each Sub-subcontract agreement shall include, and shall be deemed to include, the following Sections of these General Conditions: 3.2, 3.5, 3.18, 5.3, 5.4, 6.2.2, 7.3.3, 7.5, 7.6, 13.1, 13.12, 14.3, 14.4, and 15.1.6.

§ 5.3.3 Each Subcontract Agreement and each Sub-subcontract agreement shall exclude, and shall be deemed to exclude, Sections 13.2.1 and 13.6 and all of Article 15, except Section 15.1.6, of these General Conditions. In the place of these excluded sections of the General Conditions, each Subcontract Agreement and each Sub-subcontract may include Sections 13.2.1 and 13.6 and all of Article 15, except Section 15.1.6, of AIA Document A201-2007, Conditions of the Contract, as originally issued by the American Institute of Architects.

§ 5.3.4 The Contractor shall assure the Owner that all agreements between the Contractor and its Subcontractor incorporate the provisions of Subparagraph 5.3.1 as necessary to preserve and protect the rights of the Owner and the Architect under the Contract Documents with respect to the work to be performed by Subcontractors so that the subcontracting thereof will not prejudice such rights. The Contractor's assurance shall be in the form of an affidavit or in such other form as the Owner may approve. Upon request, the Contractor shall provide the Owner or Architect with copies of any or all subcontracts or purchase orders.

**3.45** *Delete the last sentence of Section 5.4.1.*

**3.46** *Add the following Sections 5.4.4, 5.4.5 and 5.4.6:*

§ 5.4.4 Each subcontract shall specifically provide that the Owner shall only be responsible to the subcontractor for those obligations of the Contractor that accrue subsequent to the Owner's exercise of any rights under this conditional assignment.

§ 5.4.5 Each subcontract shall specifically provide that the Subcontractor agrees to perform portions of the Work assigned to the Owner in accordance with the Contract Documents.

§ 5.4.6 Nothing in this Section 5.4 shall act to reduce or discharge the Contractor's payment bond surety's obligations to claimants for claims arising prior to the Owner's exercise of any rights under this conditional assignment.

**3.47** *Delete the language of Section 6.1.4 and substitute the word "Reserved."*

**3.48** *Insert the following at the end of Section 7.1.2:*

If the amount of a Modification exceeds the limits of the Owner's Construction Change Order Certification (reference Section 9.1.7.2 of the Agreement), then the Owner's agreement is not effective, and Work may not proceed, until approved in writing by the Office of State Engineer.

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### 3.49 *Delete Section 7.2.1 and substitute the following:*

**7.2.1** A Change Order is a written instrument prepared by the Architect (using State Form SE-480 "Construction Change Order") and signed by the Owner, Contractor and Architect stating their agreement upon all of the following:

- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

### 3.50 *Add the following Sections 7.2.2, 7.2.3, 7.2.4, and 7.2.5:*

**7.2.2** If a Change Order provides for an adjustment to the Contract Sum, the adjustment must be calculated in accordance with Section 7.3.3.

**7.2.3** At the Owner's request, the Contractor shall prepare a proposal to perform the work of a proposed Change Order setting forth the amount of the proposed adjustment, if any, in the Contract Sum; and the extent of the proposed adjustment, if any, in the Contract Time. Any proposed adjustment in the Contract sum shall be prepared in accordance with Section 7.2.2. The Owner's request shall include any revisions to the Drawings or Specifications necessary to define any changes in the Work. Within fifteen days of receiving the request, the Contractor shall submit the proposal to the Owner and Architect along with all documentation required by Section 7.6.

**7.2.4** If the Contractor requests a Change Order, the request shall set forth the proposed change in the Work and shall be prepared in accordance with Section 7.2.3. If the Contractor requests a change to the Work that involves a revision to either the Drawings or Specifications, the Contractor shall reimburse the Owner for any expenditures associated with the Architects' review of the proposed revisions, except to the extent the revisions are accepted by execution of a Change Order.

**7.2.5** Agreement on any Change Order shall constitute a final settlement of all matters relating to the change in the Work that is the subject of the Change Order, including, but not limited to, any adjustments to the Contract Sum or the Contract Time.

### 3.51 *Delete 7.3.3 and substitute the following:*

#### **7.3.3 PRICE ADJUSTMENTS**

**§ 7.3.3.1** If any Modification, including a Construction Change Directive, provides for an adjustment to the Contract Sum, the adjustment shall be based on whichever of the following methods is the most valid approximation of the actual cost to the contractor, with overhead and profit as allowed by Section 7.5:

- .1 Mutual acceptance of a lump sum;
- .2 Unit prices stated in the Contract Documents, except as provided in Section 7.3.4, or subsequently agreed upon;
- .3 Cost attributable to the events or situations under applicable clauses with adjustment of profits or fee, all as specified in the contract, or subsequently agreed upon by the parties, or by some other method as the parties may agree; or
- .4 As provided in Section 7.3.7.

**§ 7.3.3.2** Consistent with Section 7.6, costs must be properly itemized and supported by substantiating data sufficient to permit evaluation before commencement of the pertinent performance or as soon after that as practicable. All costs incurred by the Contractor must be justifiably compared with prevailing industry standards. Except as provided in Section 7.5, all adjustments to the Contract Price shall be limited to job specific costs and shall not include indirect costs, overhead, home office overhead, or profit.

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### 3.52 *Delete Section 7.3.7 and substitute the following:*

**7.3.7** If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall make an initial determination, consistent with Section 7.3.3, of the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in Section 7.5. In such case, and also under Section 7.3.3.1.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

- .1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;
- .2 Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others; and
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work.

### 3.53 *Delete Section 7.3.8 and substitute the following:*

**7.3.8** Using the percentages stated in Section 7.5, any adjustment to the Contract Sum for deleted work shall include any overhead and profit attributable to the cost for the deleted Work.

### 3.54 *Add the following Sections 7.5 and 7.6:*

#### **7.5 AGREED OVERHEAD AND PROFIT RATES**

**7.5.1** For any adjustment to the Contract Sum for which overhead and profit may be recovered, other than those made pursuant to Unit Prices stated in the Contract Documents, the Contractor agrees to charge and accept, as full payment for overhead and profit, the following percentages of costs attributable to the change in the Work. The percentages cited below shall be considered to include all indirect costs including, but not limited to: field and office managers, supervisors and assistants, incidental job burdens, small tools, and general overhead allocations. The allowable percentages for overhead and profit are as follows:

- .1 To the Contractor for work performed by the Contractor's own forces, 17% of the Contractor's actual costs.
- .2 To each Subcontractor for work performed by the Subcontractor's own forces, 17% of the subcontractor's actual costs.
- .3 To the Contractor for work performed by a subcontractor, 10% of the subcontractor's actual costs (not including the subcontractor's overhead and profit).

#### **7.6 PRICING DATA AND AUDIT**

##### **§ 7.6.1 Cost or Pricing Data.**

Upon request of the Owner or Architect, Contractor shall submit cost or pricing data prior to execution of a Modification which exceeds \$500,000. Contractor shall certify that, to the best of its knowledge and belief, the cost or pricing data submitted is accurate, complete, and current as of a mutually determined specified date prior to the date of pricing the Modification. Contractor's price, including profit, shall be adjusted to exclude any significant sums by which such price was increased because Contractor furnished cost or pricing data that was inaccurate, incomplete, or not current as of the date specified by the parties. Notwithstanding Subparagraph 9.10.4, such adjustments may be made after final payment to the Contractor.

**§ 7.6.2** Cost or pricing data means all facts that, as of the date specified by the parties, prudent buyers and sellers would reasonably expect to affect price negotiations significantly. Cost or pricing data are factual, not judgmental; and are verifiable. While they do not indicate the accuracy of the prospective contractor's judgment about estimated

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future costs or projections, they do include the data forming the basis for that judgment. Cost or pricing data are more than historical accounting data; they are all the facts that can be reasonably expected to contribute to the soundness of estimates of future costs and to the validity of determinations of costs already incurred.

**§ 7.6.3 Records Retention.**

As used in Section 7.6, the term "records" means any books or records that relate to cost or pricing data that Contractor is required to submit pursuant to Section 7.6.1. Contractor shall maintain records for three years from the date of final payment, or longer if requested by the chief procurement officer. The Owner may audit Contractor's records at reasonable times and places.

**3.55** *Delete Section 8.2.2 and substitute the following:*

**8.2.2** The Contractor shall not knowingly commence operations on the site or elsewhere prior to the effective date of surety bonds and insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such surety bonds or insurance.

**3.56** *Delete Section 8.3.1 and substitute the following:*

**8.3.1** If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the control of the Contractor and any subcontractor at any tier; or by delay authorized by the Owner pending dispute resolution; or by other causes that the Architect determines may justify delay, then to the extent such delay will prevent the Contractor from achieving Substantial Completion within the Contract Time and provided the delay (1) is not caused by the fault or negligence of the Contractor or a subcontractor at any tier and (2) is not due to unusual delay in the delivery of supplies, machinery, equipment, or services when such supplies, machinery, equipment, or services were obtainable from other sources in sufficient time for the Contractor to meet the required delivery, the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

**3.57** *Insert the following at the end of Section 9.1:*

All changes to the Contract Sum shall be adjusted in accordance with Section 7.3.3.

**3.58** *Delete Section 9.2 and substitute the following:*

**9.2 SCHEDULE OF VALUES**

**9.2.1** The Contractor shall submit to the Architect, within ten days of full execution of the Agreement, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. As requested by the Architect, the Contractor and each Subcontractor shall prepare a trade payment breakdown for the Work for which each is responsible, such breakdown being submitted on a uniform standardized format approved by the Architect and Owner. The breakdown shall be divided in detail, using convenient units, sufficient to accurately determine the value of completed Work during the course of the Project. The Contractor shall update the schedule of values as required by either the Architect or Owner as necessary to reflect:

- .1** the description of Work (listing labor and material separately);
- .2** the total value;
- .3** the percent and value of the Work completed to date;
- .4** the percent and value of previous amounts billed; and
- .5** the current percent completed and amount billed.

**9.2.2** Any schedule of values or trade breakdown that fails to include sufficient detail, is unbalanced, or exhibits "front-loading" of the value of the Work shall be rejected. If a schedule of values or trade breakdown is used as the

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basis for payment and later determined to be inaccurate, sufficient funds shall be withheld from future Applications for Payment to ensure an adequate reserve (exclusive of normal retainage) to complete the Work.

**3.59** *Delete Section 9.3.1 and substitute the following:*

Monthly, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2., for completed portions of the Work. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require (such as copies of requisitions from Subcontractors and material suppliers) and shall reflect retainage and any other adjustments provided in Section 5 of the Agreement. If required by the Owner or Architect, the Application for Payment shall be accompanied by a current construction schedule.

**3.60** *In Section 9.3.2, add the following words to the end of the second sentence:*

provided such materials or equipment will be subsequently incorporated in the Work

*Insert the following at the end of Section 9.3.2:*

The Contractor shall 1) protect such materials from diversion, vandalism, theft, destruction, and damage, 2) mark such materials specifically for use on the Project, and 3) segregate such materials from other materials at the storage facility. The Architect and the Owner shall have the right to make inspections of the storage areas at any time.

**3.61** *In Section 9.4.2, in the first sentence, after the words "Work has progressed to the point indicated," insert the following:*

in both the Application for Payment and, if required to be submitted by the Contractor, the accompanying current construction schedule

*In the last sentence, delete the third item starting with "(3) reviewed copies" and ending with "Contractor's right to payment,"*

**3.62** *In Section 9.5.1, in the first sentence, delete the word "may" after the opening words "The Architect" and substitute the word "shall."*

*In Section 9.5.1, insert the following sentence after the first sentence:*

The Architect shall withhold a Certificate of Payment if the Application for Payment is not accompanied by the current construction schedule required by Section 3.10.1.

**3.63** *In Section 9.6.2, delete the word "The..." at the beginning of the first sentence and substitute the following:*

Pursuant to Chapter 6 of Title 29 of the South Carolina Code of Laws, as amended, the

**3.64** *Delete Section 9.7 and substitute following:*

### **9.7 FAILURE OF PAYMENT**

If the Architect does not issue a Certificate for Payment to the Owner, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the time established in the Contract Documents the amount certified by the Architect or awarded by a final dispute resolution order, then the Contractor may, upon seven additional days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased, in accordance with the provisions of Section 7.3.3, by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, plus interest as provided for in the Contract Documents.

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**3.65** *Insert the following words at the end of the sentence in Section 9.8.1:*

and when all required occupancy permits, if any, have been issued and copies of same have been delivered to the Owner.

**3.66** *In Section 9.8.2, insert the word “written” after the word “comprehensive” and before the word “list.”*

**3.67** *Delete Section 9.8.3 and substitute the following:*

**9.8.3.1** Upon receipt of the Contractor’s list, the Architect, with the Owner and any other person the Architect or the Owner choose, will make an inspection on a date and at a time mutually agreeable to the Architect, Owner, and Contractor, to determine whether the Work or designated portion thereof is substantially complete. The Contractor shall furnish access for the inspection and testing as provided in this Contract. The inspection shall include a demonstration by the Contractor that all equipment, systems and operable components of the Work function properly and in accordance with the Contract Documents. If the Architect’s inspection discloses any item, whether or not included on the Contractor’s list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion. If more than one Substantial Completion inspection is required, the Contractor shall reimburse the Owner for all costs of reinspections or, at the Owner’s option, the costs may be deducted from payments due to the Contractor.

**9.8.3.2** If the Architect and Owner concur in the Contractor’s assessment that the Work or a portion of the Work is safe to occupy, the Owner and Contractor may arrange for a Certificate of Occupancy Inspection by OSE. The Owner, Architect, and Contractor shall be present at OSE’s inspection. Upon verifying that the Work or a portion of the Work is substantially complete and safe to occupy, OSE will issue, as appropriate, a Full or Partial Certificate of Occupancy.

**3.68** *In the second sentence of Section 9.8.5, delete the words “and consent of surety, if any.”*

**3.69** *In the first sentence of Section 9.9.1, delete the words “Section 11.3.1.5” and substitute the words “Section 11.3.1.3.”*

**3.70** *Delete Section 9.10.1 and substitute the following:*

**9.10.1** Unless the parties agree otherwise in the Certificate of Substantial Completion, the Contractor shall achieve Final Completion no later than thirty days after Substantial Completion. Upon receipt of the Contractor’s written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect, with the Owner and any other person the Architect or the Owner choose, will make an inspection on a date and at a time mutually agreeable to the Architect, Owner, and Contractor, and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect’s knowledge, information and belief, and on the basis of the Architect’s on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect’s final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor’s being entitled to final payment have been fulfilled. If more than one Final Completion inspection is required, the Contractor shall reimburse the Owner for all costs of reinspections or, at the Owner’s option, the costs may be deducted from payments due to the Contractor. If the Contractor does not achieve final completion within thirty days after Substantial Completion or the timeframe agreed to by the parties in the Certificate of Substantial Completion, whichever is greater, the Contractor shall be responsible for any additional Architectural fees resulting from the delay.

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**3.71** *Delete the first sentence of Section 9.10.2 and substitute the following:*

Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner, (6) required Training Manuals, (7) equipment Operations and Maintenance Manuals, (8) any certificates of testing, inspection or approval required by the Contract Documents and not previously provided (9) all warranties and guarantees required under or pursuant to the Contract Documents, and (10) one copy of the Documents required by Section 3.11.

**3.72** *Delete the first sentence of Section 9.10.3 and substitute the following:*

If, after Substantial Completion of the Work, final completion thereof is delayed 60 days through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted.

**3.73** *Delete Section 9.10.5 and substitute the following:*

**§9.10.5** Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those specific claims in stated amounts that have been previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

**3.74** Add the following Section 9.10.6:

**9.10.6** If OSE has not previously issued a Certificate of Occupancy for the entire Project, the Parties shall arrange for a representative of OSE to participate in the Final Completion Inspection. Representatives of the State Fire Marshal's Office and other authorities having jurisdiction may be present at the Final Completion Inspection or otherwise inspect the completed Work and advise the Owner whether the Work meets their respective requirements for the Project.

**3.75** *Delete Section 10.3.1 and substitute the following:*

**10.3.1** If the Contractor encounters a hazardous material or substance which was not discoverable as provided in Section 3.2.1 and not required by the Contract Documents, and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons or serious loss to real or personal property resulting from such material or substance encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing. Hazardous materials or substances are those hazardous, toxic, or radioactive materials or substances subject to regulations by applicable governmental authorities having jurisdiction, such as, but not limited to, the S.C. Department of Health and Environmental Control, the U.S. Environmental Protection Agency, and the U.S. Nuclear Regulatory Commission.

**3.76** *Insert the following at the end of Section 10.3.2:*

In the absence of agreement, the Architect will make an interim determination regarding any delay or impact on the Contractor's additional costs. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15. Any adjustment in the Contract Sum shall be determined in accordance with Section 7.3.3.



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**3.77** Delete Section 10.3.3 and substitute the following:

**10.3.3** The Work in the affected area shall be resumed immediately following the occurrence of any one of the following events: (a) the Owner causes remedial work to be performed that results in the absence of hazardous materials or substances; (b) the Owner and the Contractor, by written agreement, decide to resume performance of the Work; or (c) the Work may safely and lawfully proceed, as determined by an appropriate governmental authority or as evidenced by a written report to both the Owner and the Contractor, which is prepared by an environmental engineer reasonably satisfactory to both the Owner and the Contractor.

**3.78** In Section 10.3.5, delete the word "The" at the beginning of the sentence and substitute the following:

In addition to its obligations under Section 3.18, the

**3.79** Delete the language of Section 10.3.6 and substitute the word "Reserved."

**3.80** Insert the following at the end of Section 10.4:

The Contractor shall immediately give the Architect notice of the emergency. This initial notice may be oral followed within five days by a written notice setting forth the nature and scope of the emergency. Within fourteen days of the start of the emergency, the Contractor shall give the Architect a written estimate of the cost and probable effect of delay on the progress of the Work.

**3.81** Delete 11.1.2 and substitute the following:

**11.1.2** The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified below or required by law, whichever coverage is greater. Coverages shall be written on an occurrence basis and shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

**(1) COMMERCIAL GENERAL LIABILITY:**

(a) General Aggregate (per project) .....	<u>\$1,000,000</u>
(b) Products/Completed Operations .....	<u>\$1,000,000</u>
(c) Personal and Advertising Injury .....	<u>\$1,000,000</u>
(d) Each Occurrence .....	<u>\$1,000,000</u>
(e) Fire Damage (Any one fire) .....	<u>\$50,000</u>
(f) Medical Expense (Any one person) .....	<u>\$5,000</u>

**(2) BUSINESS AUTO LIABILITY (including All Owned, Non-owned, and Hired Vehicles):**

(a) Combined Single Limit .....	<u>\$1,000,000</u>
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**(3) WORKER'S COMPENSATION:**

(a) State Statutory	
(b) Employers Liability .....	<u>\$100,000</u> Per Acc.
	<u>\$500,000</u> Disease, Policy Limit
	<u>\$100,000</u> Disease, Each Employee

In lieu of separate insurance policies for Commercial General Liability, Business Auto Liability, and Employers Liability, the Contractor may provide an umbrella policy meeting or exceeding all coverage requirements set forth in this Section 11.1.2. The umbrella policy limits shall not be less than \$3,000,000.

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**3.82** *Delete Section 11.1.3 and substitute the following:*

**11.1.3** Prior to commencement of the Work, and thereafter upon replacement of each required policy of insurance, Contractor shall provide to the Owner a written endorsement to the Contractor's general liability insurance policy that:

- (i) names the Owner as an additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations;
- (ii) provides that no material alteration, cancellation, non-renewal, or expiration of the coverage contained in such policy shall have effect unless all additional insureds have been given at least ten (10) days prior written notice of cancellation for non-payment of premiums and thirty (30) days prior written notice of cancellation for any other reason; and
- (iii) provides that the Contractor's liability insurance policy shall be primary, with any liability insurance of the Owner as secondary and noncontributory.

Prior to commencement of the Work, and thereafter upon renewal or replacement of each required policy of insurance, Contractor shall provide to the Owner a signed, original certificate of liability insurance (ACORD 25). Consistent with this Section 11.1, the certificate shall identify the types of insurance, state the limits of liability for each type of coverage, name the Owner a Consultants as Certificate Holder, provide that the general aggregate limit applies per project, and provide that coverage is written on an occurrence basis. Both the certificates and the endorsements must be received directly from either the Contractor's insurance agent or the insurance company. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, naming the Owner as an additional insured for claims made under the Contractor's completed operations, and otherwise meeting the above requirements, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

**3.83** *Delete Section 11.1.4 and substitute the following:*

**11.1.4** A failure by the Owner either (i) to demand a certificate of insurance or written endorsement required by Section 11.1, or (ii) to reject a certificate or endorsement on the grounds that it fails to comply with Section 11.1 shall not be considered a waiver of Contractor's obligations to obtain the required insurance.

**3.84** *In Section 11.3.1, delete the first sentence and substitute the following:*

Unless otherwise provided in the Contract Documents, the Contractor shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis.

**3.85** *Delete the language of Section 11.3.1.2 and substitute the word "Reserved."*

**3.86** *Delete the language of Section 11.3.1.3 and substitute the word "Reserved."*

**3.87** *Delete Section 11.3.2 and substitute the following:*

**11.3.2 BOILER AND MACHINERY INSURANCE**

The Contractor shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall both be named insureds.

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**3.88** *Delete Section 11.3.3 and substitute the following:*

### **11.3.3 LOSS OF USE INSURANCE**

The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. To the extent any losses are covered and paid for by such insurance, the Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

**3.89** *Delete Section 11.3.4 and substitute the following:*

**11.3.4** If the Owner requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Contractor shall, if possible, include such insurance, and the cost thereof shall be charged to the Owner by appropriate Change Order.

**3.90** *Delete the language of Section 11.3.5 and substitute the word "Reserved."*

**3.91** *Delete Section 11.3.6 and substitute the following:*

**11.3.6** Before an exposure to loss may occur, the Contractor shall file with the Owner a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Owner.

**3.92** *Delete the first sentence of Section 11.3.7 and substitute the following:*

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent the property insurance provided by the Contractor pursuant to this Section 11.3 covers and pays for the damage, except such rights as they have to proceeds of such insurance held by the Contractor as fiduciary.

**3.93** *Delete the first sentence of Section 11.3.8 and substitute the following:*

A loss insured under the Contractor's property insurance shall be adjusted by the Contractor as fiduciary and made payable to the Contractor as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10.

**3.94** *Delete Section 11.3.9 and substitute the following:*

**11.3.9** If required in writing by a party in interest, the Contractor as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Contractor's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Contractor shall deposit in a separate account proceeds so received, which the Contractor shall distribute in accordance with such agreement as the parties in interest may reach. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor.

**3.95** *Delete Section 11.3.10 and substitute the following:*

**11.3.10** The Contractor as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Contractor's exercise of this power; if such objection is made, the dispute shall be resolved in the manner provided in the contract between the parties in dispute as the method of binding dispute resolution. The Contractor as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with a final order or determination issued by the appropriate authority having jurisdiction over the dispute..

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**3.96** *Delete Section 11.4.1 and substitute the following:*

**11.4.1** Before commencing any services hereunder, the Contractor shall provide the Owner with Performance and Payment Bonds, each in an amount not less than the Contract Price set forth in Article 4 of the Agreement. The Surety shall have, at a minimum, a "Best Rating" of "A" as stated in the most current publication of "Best's Key Rating Guide, Property-Casualty". In addition, the Surety shall have a minimum "Best Financial Strength Category" of "Class V", and in no case less than five (5) times the contract amount. The Performance Bond shall be written on Form SE-355, "Performance Bond" and the Payment Bond shall be written on Form SE-357, "Labor and Material Payment Bond", and both shall be made payable to the Owner.

**3.97** *Delete Section 11.4.2 and substitute the following:*

**11.4.2** The Performance and Labor and Material Payment Bonds shall:

- .1** be issued by a surety company licensed to do business in South Carolina;
- .2** be accompanied by a current power of attorney and certified by the attorney-in-fact who executes the bond on the behalf of the surety company; and
- .3** remain in effect for a period not less than one (1) year following the date of Substantial Completion or the time required to resolve any items of incomplete Work and the payment of any disputed amounts, whichever time period is longer.

**3.98** *Add the following Sections 11.4.3 and 11.4.4:*

**11.4.3** Any bonds required by this Contract shall meet the requirements of the South Carolina Code of Laws and Regulations, as amended.

**11.4.4** Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

**3.99** *Delete Section 12.1.1 and substitute the following:*

**12.1.1** If a portion of the Work is covered contrary to the requirements specifically expressed in the Contract Documents, including inspections of work-in-progress required by all authorities having jurisdiction over the Project, it must, upon demand of the Architect or authority having jurisdiction, be uncovered for observation and be replaced at the Contractor's expense without change in the Contract Time.

**3.100** *In Section 12.2.2.1, delete the words "and to make a claim for breach of warranty" at the end of the third sentence.*

**3.101** *In Section 12.2.2.3, add the following to the end of the sentence:*

unless otherwise provided in the Contract Documents.

**3.102** *Insert the following at the end of Section 12.2.4:*

If, prior to the date of Substantial Completion, the Contractor, a Subcontractor, or anyone for whom either is responsible, uses or damages any portion of the Work, including, without limitation, mechanical, electrical, plumbing, and other building systems, machinery, equipment, or other mechanical device, the Contractor shall cause such item to be restored to "like new" condition at no expense to the Owner.

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**3.103** *Delete Section 13.1 and substitute the following:*

### **13.1 GOVERNING LAW**

The Contract, any dispute, claim, or controversy relating to the Contract, and all the rights and obligations of the parties shall, in all respects, be interpreted, construed, enforced and governed by and under the laws of the State of South Carolina, except its choice of law rules.

**3.104** *Delete Section 13.2, including its Sub-Sections 13.2.1 and 13.2.2, and substitute the following:*

### **13.2 SUCCESSORS AND ASSIGNS**

The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to covenants, agreements and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract as a whole, or in part, without written consent of the other and then only in accordance with and as permitted by Regulation 19-445.2180 of the South Carolina Code of Regulations, as amended. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

**3.105** *Delete Section 13.3 and substitute the following:*

### **13.3 WRITTEN NOTICE**

Unless otherwise permitted herein, all notices contemplated by the Contract Documents shall be in writing and shall be deemed given:

- .1** upon actual delivery, if delivery is by hand;
- .2** upon receipt by the transmitting party of confirmation or reply, if delivery is by electronic mail, facsimile, telex or telegram;
- .3** upon receipt, if delivery is by the United States mail.

Notice to Contractor shall be to the address provided in Section 8.3.2 of the Agreement. Notice to Owner shall be to the address provided in Section 8.2.2 of the Agreement. Either party may designate a different address for notice by giving notice in accordance with this paragraph.

**3.106** *In Section 13.4.1, insert the following at the beginning of the sentence:*

Unless expressly provided otherwise,

**3.107** *Add the following Section 13.4.3:*

**13.4.3** Notwithstanding Section 9.10.4, the rights and obligations which, by their nature, would continue beyond the termination, cancellation, rejection, or expiration of this contract shall survive such termination, cancellation, rejection, or expiration, including, but not limited to, the rights and obligations created by the following clauses:

- 1.5** Ownership and Use of Drawings, Specifications and Other Instruments of Service;
- 3.5** Warranty
- 3.17** Royalties, Patents and Copyrights
- 3.18** Indemnification
- 7.6** Cost or Pricing Data
- 11.1** Contractor's Liability Insurance
- 11.4** Performance and Payment Bond
- 15.1.6** Claims for Listed Damages
- 15.1.7** Waiver of Claims Against the Architect
- 15.6** Dispute Resolution
- 15.4** Service of Process

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**3.108** *Delete Section 13.6 and substitute the following:*

### **13.6 INTEREST**

Payments due to the Contractor and unpaid under the Contract Documents shall bear interest only if and to the extent allowed by Title 29, Chapter 6, Article 1 of the South Carolina Code of Laws. . Amounts due to the Owner shall bear interest at the rate of one percent a month or a pro rata fraction thereof on the unpaid balance as may be due.

**3.109** *Delete the language of Section 13.7 and substitute the word "Reserved."*

**3.110** *Add the following Sections 13.8 through 13.16:*

### **13.8 PROCUREMENT OF MATERIALS BY OWNER**

The Contractor accepts assignment of all purchase orders and other agreements for procurement of materials and equipment by the Owner that are identified as part of the Contract Documents. The Contractor shall, upon delivery, be responsible for the storage, protection, proper installation, and preservation of such Owner purchased items, if any, as if the Contractor were the original purchaser. The Contract Sum includes, without limitation, all costs and expenses in connection with delivery, storage, insurance, installation, and testing of items covered in any assigned purchase orders or agreements. Unless the Contract Documents specifically provide otherwise, all Contractor warranty of workmanship and correction of the Work obligations under the Contract Documents shall apply to the Contractor's installation of and modifications to any Owner purchased items,.

### **13.9 INTERPRETATION OF BUILDING CODES**

As required by Title 10, Chapter 1, Section 180 of the South Caroline Code of Laws, as amended, OSE shall determine the enforcement and interpretation of all building codes and referenced standards on state buildings. The Contractor shall refer any questions, comments, or directives from local officials to the Owner and OSE for resolution.

### **13.10 MINORITY BUSINESS ENTERPRISES**

Contractor shall notify Owner of each Minority Business Enterprise (MBE) providing labor, materials, equipment, or supplies to the Project under a contract with the Contractor. Contractor's notification shall be via the first monthly status report submitted to the Owner after execution of the contract with the MBE. For each such MBE, the Contractor shall provide the MBE's name, address, and telephone number, the nature of the work to be performed or materials or equipment to be supplied by the MBE, whether the MBE is certified by the South Carolina Office of Small and Minority Business Assistance, and the value of the contract.

### **13.11 SEVERABILITY**

If any provision or any part of a provision of the Contract Documents shall be finally determined to be superseded, invalid, illegal, or otherwise unenforceable pursuant to any applicable Legal Requirements, such determination shall not impair or otherwise affect the validity, legality, or enforceability of the remaining provision or parts of the provision of the Contract Documents, which shall remain in full force and effect as if the unenforceable provision or part were deleted.

### **13.12 ILLEGAL IMMIGRATION**

Contractor certifies and agrees that it will comply with the applicable requirements of Title 8, Chapter 14 of the South Carolina Code of Laws and agrees to provide to the State upon request any documentation required to establish either: (a) that Title 8, Chapter 14 is inapplicable both to Contractor and its subcontractors or sub-subcontractors; or (b) that Contractor and its subcontractors or sub-subcontractors are in compliance with Title 8, Chapter 14. Pursuant to Section 8-14-60, "A person who knowingly makes or files any false, fictitious, or fraudulent document, statement, or report pursuant to this chapter is guilty of a felony, and, upon conviction, must be fined within the discretion of the court or imprisoned for not more than five years, or both." Contractor agrees to include in any contracts with its subcontractors language requiring its subcontractors to (a) comply with the applicable requirements of Title 8, Chapter 14, and (b) include in their contracts with the sub-subcontractors language requiring the sub-subcontractors to comply with the applicable requirements of Title 8, Chapter 14. (An overview is available at [www.procurement.sc.gov](http://www.procurement.sc.gov))

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### 13.13 SETOFF

The Owner shall have all of its common law, equitable, and statutory rights of set-off.

### 13.14 DRUG-FREE WORKPLACE

The Contractor certifies to the Owner that Contractor will provide a Drug-Free Workplace, as required by Title 44, Chapter 107 of the South Carolina Code of Laws, as amended.

### 13.15 FALSE CLAIMS

According to the S.C. Code of Laws § 16-13-240, "a person who by false pretense or representation obtains the signature of a person to a written instrument or obtains from another person any chattel, money, valuable security, or other property, real or personal, with intent to cheat and defraud a person of that property is guilty" of a crime.

### 13.16 NON-INDEMNIFICATION:

Any term or condition is void to the extent it requires the State to indemnify anyone. It is unlawful for a person charged with disbursements of state funds appropriated by the General Assembly to exceed the amounts and purposes stated in the appropriations. (§ 11-9-20) It is unlawful for an authorized public officer to enter into a contract for a purpose in which the sum is in excess of the amount appropriated for that purpose. It is unlawful for an authorized public officer to divert or appropriate the funds arising from any tax levied and collected for any one fiscal year to the payment of an indebtedness contracted or incurred for a previous year. (§ 11-1-40)

### 3.111 *Delete Section 14.1.1 and substitute the following:*

**14.1.1** The Contractor may terminate the Contract if the Work is stopped for a period of 45 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

- .1** Issuance of an order of a court or other public authority having jurisdiction that requires substantially all Work to be stopped; or
- .2** An act of government, such as a declaration of national emergency that requires substantially all Work to be stopped.
- .3** Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents and the Contractor has stopped work in accordance with Section 9.7

### 3.112 *Insert the following at the end of Section 14.1.3:*

Any adjustment to the Contract Sum pursuant to this Section shall be made in accordance with the requirements of Article 7.

### 3.113 *In Section 14.1.4, replace the word "repeatedly" with the word "persistently."*

### 3.114 *Delete Section 14.2.1 and substitute the following:*

**14.2.1** The Owner may terminate the Contract if the Contractor

- .1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials, or otherwise fails to prosecute the Work, or any separable part of the Work, with the diligence, resources and skill that will ensure its completion within the time specified in the Contract Documents, including any authorized adjustments;
- .2** fails to make payment to Subcontractors for materials or labor in accordance with the Contract Documents and the respective agreements between the Contractor and the Subcontractors;
- .3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4** otherwise is guilty of substantial breach of a provision of the Contract Documents.

### 3.115 *In Section 14.2.2, delete the parenthetical statement " , upon certification by the Initial Decision Maker that*

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*sufficient cause exists to justify such action," immediately following the word "Owner" in the first line.*

**3.116** *In Section 14.2.4, replace the words "Initial Decision Maker" with the word "Architect"*

**3.117** *Add the following Section 14.2.5:*

**14.2.5** If, after termination for cause, it is determined that the Owner lacked justification to terminate under Section 14.2.1, or that the Contractor's default was excusable, the rights and obligations of the parties shall be the same as if the termination had been issued for the convenience of the Owner under Section 14.4.

**3.118** *Delete the second sentence of Section 14.3.2 and substitute the following:*

Any adjustment to the Contract Sum made pursuant to this section shall be made in accordance with the requirements of Article 7.3.3.

**3.119** *Delete Section 14.4.1 and substitute the following:*

**14.4.1** The Owner may, at any time, terminate the Contract, in whole or in part for the Owner's convenience and without cause. The Owner shall give written notice of the termination to the Contractor specifying the part of the Contract terminated and when termination becomes effective.

**3.120** *Delete Section 14.4.2 and substitute the following:*

**14.4.2** Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1** cease operations as directed by the Owner in the notice;
- .2** take actions necessary, or that the Owner may direct, for the protection and preservation of the Work;
- .3** except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders; and
- .4** complete the performance of the Work not terminated, if any.

**3.121** *Delete Section 14.4.3 and substitute the following:*

**14.4.3** In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, costs incurred by reason of such termination, and any other adjustments otherwise allowed by the Contract. Any adjustment to the Contract Sum made pursuant to this Section 14.4 shall be made in accordance with the requirements of Article 7.3.3.

**3.122** *Add the following Sections 14.4.4, 14.4.5, and 14.5:*

**14.4.4** Contractor's failure to include an appropriate termination for convenience clause in any subcontract shall not (i) affect the Owner's right to require the termination of a subcontract, or (ii) increase the obligation of the Owner beyond what it would have been if the subcontract had contained an appropriate clause.

**14.4.5** Upon written consent of the Contractor, the Owner may reinstate the terminated portion of this Contract in whole or in part by amending the notice of termination if it has been determined that:

- .1** the termination was due to withdrawal of funding by the General Assembly, Governor, or Budget and Control Board or the need to divert project funds to respond to an emergency as defined by Regulation 19-445.2110(B) of the South Carolina Code of Regulations, as amended;
- .2** funding for the reinstated portion of the work has been restored;
- .3** circumstances clearly indicate a requirement for the terminated work; and
- .4** reinstatement of the terminated work is advantageous to the Owner.

### **14.5 CANCELLATION AFTER AWARD BUT PRIOR TO PERFORMANCE**

Pursuant to Title 11, Chapter 35 and Regulation 19-445.2085 of the South Carolina Code of Laws and Regulations, as amended, this contract may be canceled after award but prior to performance.



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**3.123** *Insert the following sentence after the second sentence of Section 15.1.1:*

A voucher, invoice, payment application or other routine request for payment that is not in dispute when submitted is not a Claim under this definition.

**3.124** *Delete Section 15.1.2 and substitute the following:*

**15.1.2 NOTICE OF CLAIMS**

Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Architect. Such notice shall include sufficient information to advise the Architect and other party of the circumstances giving rise to the claim, the specific contractual adjustment or relief requested and the basis of such request. Claims by either party arising prior to the date final payment is due must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later except as stated for adverse weather days in Section 15.1.5.2. By failing to give written notice of a Claim within the time required by this Section, a party expressly waives its claim.

**3.125** *Delete Section 15.1.3 and substitute the following:*

**15.1.3 CONTINUING CONTRACT PERFORMANCE**

Pending final resolution of a Claim, including any administrative review allowed under Section 15.6, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents. The Architect will issue Certificates for Payment in accordance with the initial decisions and determinations of the Architect.

**3.126** *Insert the following at the end of Section 15.1.5.1:*

Claims for an increase in the Contract Time shall be based on one additional calendar day for each full calendar day that the Contractor is prevented from working.

**3.127** *Insert the following Sub-Sections at the end of Section 15.1.5.2:*

- .1** Claims for adverse weather shall be based on actual weather conditions at the job site or other place of performance of the Work, as documented in the Contractor's job site log.
- .2** For the purpose of this Contract, a total of five (5) calendar days per calendar month (non-cumulative) shall be anticipated as "adverse weather" at the job site, and such time will not be considered justification for an extension of time. If, in any month, adverse weather develops beyond the five (5) days, the Contractor shall be allowed to claim additional days to compensate for the excess weather delays only to the extent of the impact on the approved construction schedule. The remedy for this condition is for an extension of time only and is exclusive of all other rights and remedies available under the Contract Documents or imposed or available by law.
- .3** The Contractor shall submit monthly with their pay application all claims for adverse weather conditions that occurred during the previous month. The Architect shall review each monthly submittal in accordance with Section 15.5 and inform the Contractor and the Owner promptly of its evaluation. Approved days shall be included in the next Change Order issued by the Architect. Adverse weather conditions not claimed within the time limits of this Subparagraph shall be considered to be waived by the Contractor. Claims will not be allowed for adverse weather days that occur after the scheduled (original or adjusted) date of Substantial Completion.

**3.128** *Delete Section 15.1.6 and substitute the following:*

**15.1.6 CLAIMS FOR LISTED DAMAGES**

Notwithstanding any other provision of the Contract Documents, including Section 1.2.1, but subject to a duty of good faith and fair dealing, the Contractor and Owner waive Claims against each other for listed damages arising out of or relating to this Contract.

**15.1.6.1** For the Owner, listed damages are (i) lost revenue and profit, (ii) losses resulting from injury to business or reputation, (iii) additional or escalated overhead and administration expenses, (iv) additional financing costs, (v) costs suffered by a third party unable to commence work, (vi) attorney's fees, (vii) any interest, except to the extent allowed by Section 13.6 (Interest), (viii) lost revenue and profit for lost use of the property, (ix) costs resulting from lost productivity or efficiency.

**15.1.6.2** For the Contractor, listed damages are (i) lost revenue and profit, (ii) losses resulting from injury to business or reputation, (iii) additional or escalated overhead and administration expenses, (iv) additional financing costs, (v) attorney's fees, (vi) any interest, except to the extent allowed by Section 13.6 (Interest); (vii) unamortized equipment costs; and, (viii) losses incurred by subcontractors for the types of damages the Contractor has waive as against the Owner. Without limitation, this mutual waiver is applicable to all damages due to either party's termination in accordance with Article 14. Nothing contained in this Section shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents. This mutual waiver is not applicable to amounts due or obligations under Section 3.18 (Indemnification).

**3.129** *Add the following Section 15.1.7:*

**15.1.7 WAIVER OF CLAIMS AGAINST THE ARCHITECT**

Notwithstanding any other provision of the Contract Documents, including Section 1.2.1, but subject to a duty of good faith and fair dealing, the Contractor waives all claims against the Architect and any other design professionals who provide design and/or project management services to the Owner, either directly or as independent contractors or subcontractors to the Architect, for listed damages arising out of or relating to this Contract. The listed damages are (i) lost revenue and profit, (ii) losses resulting from injury to business or reputation, (iii) additional or escalated overhead and administration expenses, (iv) additional financing costs, (v) attorney's fees, (vi) any interest; (vii) unamortized equipment costs; and, (viii) losses incurred by subcontractors for the types of damages the Contractor has waive as against the Owner. This mutual waiver is not applicable to amounts due or obligations under Section 3.18 (Indemnification).

**3.130** *Delete the language of Sections 15.2, 15.3, and 15.4, including all Sub-Sections, and substitute the word "Reserved" for the deleted language of each Section and Sub-Section.*

**3.131** *Add the following Sections 15.5 and 15.6 with their sub-sections:*

**15.5 CLAIM AND DISPUTES - DUTY OF COOPERATION, NOTICE, AND ARCHITECTS INITIAL DECISION**

**15.5.1** Contractor and Owner are fully committed to working with each other throughout the Project to avoid or minimize claims. To further this goal, Contractor and Owner agree to communicate regularly with each other and the Architect at all times notifying one another as soon as reasonably possible of any issue that if not addressed may cause loss, delay, and/or disruption of the Work. If claims do arise, Contractor and Owner each commit to resolving such claims in an amicable, professional, and expeditious manner to avoid unnecessary losses, delays, and disruptions to the Work.

**15.5.2** Claims shall first be referred to the Architect for initial decision. An initial decision shall be required as a condition precedent to resolution pursuant to Section 15.6 of any Claim arising prior to the date of final payment, unless 30 days have passed after the Claim has been referred to the Architect with no decision having been rendered, or after all the Architect's requests for additional supporting data have been answered, whichever is later. The Architect will not address claims between the Contractor and persons or entities other than the Owner.

**15.5.3** The Architect will review Claims and within ten days of the receipt of a Claim (1) request additional supporting data from the claimant or a response with supporting data from the other party or (2) render an initial decision in accordance with Section 15.5.5.

**15.5.4** If the Architect requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either (1) provide a response on the requested supporting data, (2) advise the Architect when the response or supporting data will be furnished or (3) advise the Architect that all supporting data has already been provided. Upon receipt of the response or supporting data, the Architect will render an initial decision in accordance with Section 15.5.5.

**15.5.5** The Architect will render an initial decision in writing; (1) stating the reasons therefor; and (2) notifying the parties of any change in the Contract Sum or Contract Time or both. The Architect will deliver the initial decision to the parties within two weeks of receipt of any response or supporting data requested pursuant to Section 16.4, or within such longer period as may be mutually agreeable to the parties. If the parties accept the initial decision, the Architect shall prepare a Change Order with appropriate supporting documentation for the review and approval of the parties and the Office of State Engineer. If either the Contractor, Owner, or both, disagree with the initial decision, the Contractor and Owner shall proceed with dispute resolution in accordance with the provisions of Section 15.6.

**15.5.6** In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

#### **15.6 DISPUTE RESOLUTION**

**15.6.1** If a claim is not resolved pursuant to Section 15.5 to the satisfaction of either party, both parties shall attempt to resolve the dispute at the field level through discussions between Contractor's Representative and Owner's Representative. If a dispute cannot be resolved through Contractor's Representative and Owner's Representative, then the Contractor's Senior Representative and the Owner's Senior Representative, upon the request of either party, shall meet as soon as conveniently possible, but in no case later than twenty-one days after such a request is made, to attempt to resolve such dispute. Prior to any meetings between the Senior Representatives, the parties will exchange relevant information that will assist the parties in resolving their dispute. The meetings required by this Section are a condition precedent to resolution pursuant to Section 15.6.2.

**15.6.2** If after meeting in accordance with the provisions of Section 15.6.1, the Senior Representatives determine that the dispute cannot be resolved on terms satisfactory to both the Contractor and the Owner, then either party may submit the dispute by written request to South Carolina's Chief Procurement Officer for Construction (CPOC). Except as otherwise provided in Article 15, all claims, claims, or controversies relating to the Contract shall be resolved exclusively by the appropriate Chief Procurement Officer in accordance with Title 11, Chapter 35, Article 17 of the South Carolina Code of Laws, or in the absence of jurisdiction, only in the Court of Common Pleas for, or in the absence of jurisdiction a federal court located in, Richland County, State of South Carolina. Contractor agrees that any act by the State regarding the Contract is not a waiver of either the State's sovereign immunity or the State's immunity under the Eleventh Amendment of the United State's Constitution.

**15.6.3** If any party seeks resolution to a dispute pursuant to Section 15.6.2, the parties shall participate in non-binding mediation to resolve the claim. If the claim is governed by Title 11, Chapter 35, Article 17 of the South Carolina Code of Laws as amended and the amount in controversy is \$100,000.00 or less, the CPOC shall appoint a mediator, otherwise, the mediation shall be conducted by an impartial mediator selected by mutual agreement of the parties, or if the parties cannot so agree, a mediator designated by the American Arbitration Association ("AAA") pursuant to its Construction Industry Mediation Rules. The mediation will be governed by and conducted pursuant to a mediation agreement negotiated by the parties or, if the parties cannot so agree, by procedures established by the mediator.

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**15.6.4** Without relieving any party from the other requirements of Sections 15.5 and 15.6, either party may initiate proceedings in the appropriate forum prior to initiating or completing the procedures required by Sections 15.5 and 15.6 if such action is necessary to preserve a claim by avoiding the application of any applicable statutory period of limitation or repose.

**15.6.5 SERVICE OF PROCESS**

Contractor consents that any papers, notices, or process necessary or proper for the initiation or continuation of any claims, claims, or controversies relating to the Contract; for any court action in connection therewith; or for the entry of judgment on any award made, may be served on Contractor by certified mail (return receipt requested) addressed to Contractor at the address provided for the Contractor's Senior Representative or by personal service or by any other manner that is permitted by law, in or outside South Carolina. Notice by certified mail is deemed duly given upon deposit in the United States mail.

**3.132** Add the following Article 16:

**ARTICLE 16 PROJECT-SPECIFIC REQUIREMENTS AND INFORMATION**

**16.1. Inspection Requirements:** *(Indicate the inspection services required by the Contract)*

- Special Inspections are required and are not part of the Contract Sum. *(see section 01400)*
- Building Inspections are required and are not part of the Contract Sum. *(see section 01400)*
- Building Inspections are required and are part of the Contract Sum. The inspections required for this Work are : *(Indicate which services are required and the provider)*

- Civil
- Structural
- Mechanical
- Plumbing
- Electrical
- Gas
- Other *(list)*

**Remarks:** All testing is by the Owner.  
\_\_\_\_\_  
\_\_\_\_\_

**16.1.1** Contractor shall schedule and request inspections in an orderly and efficient manner and shall notify the Owner whenever the Contractor schedules an inspection in accordance with the requirements of Section 16.1. Contractor shall be responsible for the cost of inspections scheduled and conducted without the Owner's knowledge and for any increase in the cost of inspections resulting from the inefficient scheduling of inspections.

**16.2** List Cash Allowances, if any. *(Refer to attachments as needed If none, enter NONE)*

None  
\_\_\_\_\_  
\_\_\_\_\_

**16.3.** Requirements for Record Drawings, if any. *(Refer to attachments as needed. If none, enter NONE)*

Refer to Section 01780.  
\_\_\_\_\_  
\_\_\_\_\_

**16.4.** Requirements for Shop Drawings and other submittals, if any, including number, procedure for submission, list of materials to be submitted, etc. *(Refer to attachments as needed. If none, enter NONE)*

Refer to Section 01300.  
\_\_\_\_\_  
\_\_\_\_\_

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**16.5.** Requirements for signage, on-site office or trailer, utilities, restrooms, etc., in addition to the Contract, if any. *(Refer to attachments as needed. If none, enter NONE)*

Refer to Section 01500.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**16.6.** Requirements for Project Cleanup in addition to the Contract, if any. *(Refer to attachments as needed. If none, enter NONE)*

None.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**16.7.** List all attachments that modify these General Conditions. *(If none, enter NONE)*

None.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**SE-355**  
**Performance Bond**

**KNOW ALL MEN BY THESE PRESENTS**, that *(Insert full name or legal title and address of Contractor)*

Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
\_\_\_\_\_

hereinafter referred to as “Contractor”, and *(Insert full name and address of principal place of business of Surety)*

Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
\_\_\_\_\_

hereinafter called the “surety”, are jointly and severally held and firmly bound unto *(Insert full name and address of Agency)*

Name: University of South Carolina  
Address: 743 Greene Street  
Columbia SC, 29208

hereinafter referred to as “Agency”, or its successors or assigns, the sum of \_\_\_\_\_ (\$ \_\_\_\_\_), being the sum of the Bond to which payment to be well and truly made, the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

**WHEREAS**, Contractor has by written agreement dated \_\_\_\_\_ entered into a contract with Agency to construct

State Project Name: One Wood Farm Equestrian - Locker Room Project  
State Project Number: H27-Z004  
Brief Description of Awarded Work, as found on the SE-330, Bid Form: A new locker room facility building with associated sitework, plumbing, mechanical and electrical work.

in accordance with Drawings and Specifications prepared by *(Insert full name and address of A/E)*

Name: GMK Associates\_  
Address: 1201 Main Street, Suite 2100  
Columbia SC, 29201

which agreement is by reference made a part hereof, and is hereinafter referred to as the Contract.

**IN WITNESS WHEREOF**, Surety and Contractor, intending to be legally bound hereby, subject to the terms stated herein, do each cause this Performance Bond to be duly executed on its behalf by its authorized officer, agent or representative.

DATED this \_\_\_\_\_ day of \_\_\_\_\_, 2\_\_\_\_\_, BOND NUMBER \_\_\_\_\_  
*(shall be no earlier than Date of Contract)*

CONTRACTOR

SURETY

By: \_\_\_\_\_  
(Seal)

By: \_\_\_\_\_  
(Seal)

Print Name: \_\_\_\_\_

Print Name: \_\_\_\_\_

Print Title: \_\_\_\_\_

Print Title: \_\_\_\_\_  
(Attach Power of Attorney)

Witness: \_\_\_\_\_

Witness: \_\_\_\_\_

*(Additional Signatures, if any, appear on attached page)*

---

**Performance Bond**

---

**NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH THAT:**

1. The Contractor and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Agency for the full and faithful performance of the contract, which is incorporated herein by reference

2. If the Contractor performs the contract, the Surety and the Contractor have no obligation under this Bond, except to participate in conferences as provided in paragraph 3.1.

3. The Surety's obligation under this Bond shall arise after:

**3.1** The Agency has notified the Contractor and the Surety at the address described in paragraph 10 below, that the Agency is considering declaring a Contractor Default and has requested and attempted to arrange a conference with the Contractor and the Surety to be held not later than 15 days after receipt of such notice to discuss methods of performing the Contract. If the Agency, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive the Agency's right, if any, subsequently to declare a Contractor Default; or

**3.2** The Agency has declared a Contractor Default and formally terminated the Contractor's right to complete the Contract.

4. The Surety shall, within 15 days after receipt of notice of the Agency's declaration of a Contractor Default, and at the Surety's sole expense, take one of the following actions:

**4.1** Arrange for the Contractor, with consent of the Agency, to perform and complete the Contract; or

**4.2** Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or

**4.3** Obtain bids or negotiated proposals from qualified contractors acceptable to the Agency for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by the Agency and the contractor selected with the Agency's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the Bonds issued on the Contract, and pay to the Agency the amount of damages as described in paragraph 7 in excess of the Balance of the Contract Sum incurred by the Agency resulting from the Contractor Default; or

**4.4** Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and:

**4.4.1** After investigation, determine the amount for which it may be liable to the Agency and, within 60 days of waiving its rights under this paragraph, tender payment thereof to the Agency; or

**4.4.2** Deny liability in whole or in part and notify the Agency, citing the reasons therefore.

5. Provided Surety has proceeded under paragraphs 4.1, 4.2, or 4.3, the Agency shall pay the Balance of the Contract Sum to either:

**5.1** Surety in accordance with the terms of the Contract; or

**5.2** Another contractor selected pursuant to paragraph 4.3 to perform the Contract.

**5.3** The balance of the Contract Sum due either the Surety or another contractor shall be reduced by the amount of damages as described in paragraph 7.

6. If the Surety does not proceed as provided in paragraph 4 with reasonable promptness, the Surety shall be deemed to be in default on this Bond 15 days after receipt of written notice from the Agency to the Surety demanding that the Surety perform its obligations under this Bond, and the Agency shall be entitled to enforce any remedy available to the Agency.

**6.1** If the Surety proceeds as provided in paragraph 4.4, and the Agency refuses the payment tendered or the Surety has denied liability, in whole or in part, then without further notice the Agency shall be entitled to enforce any remedy available to the Agency.

**6.2** Any dispute, suit, action or proceeding arising out of or relating to this Bond shall be governed by the Dispute Resolution process defined in the Contract Documents and the laws of the State of South Carolina.

7. After the Agency has terminated the Contractor's right to complete the Contract, and if the Surety elects to act under paragraph 4.1, 4.2, or 4.3 above, then the responsibilities of the Surety to the Agency shall be those of the Contractor under the Contract, and the responsibilities of the Agency to the Surety shall those of the Agency under the Contract. To a limit of the amount of this Bond, but subject to commitment by the Agency of the Balance of the Contract Sum to mitigation of costs and damages on the Contract, the Surety is obligated to the Agency without duplication for:

**7.1** The responsibilities of the Contractor for correction of defective Work and completion of the Contract; and

**7.2** Additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under paragraph 4; and

**7.3** Damages awarded pursuant to the Dispute Resolution Provisions of the Contract. Surety may join in any Dispute Resolution proceeding brought under the Contract and shall be bound by the results thereof; and

**7.4** Liquidated Damages, or if no Liquidated Damages are specified in the Contract, actual damages caused by delayed performance or non-performance of the Contractor.

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

**9.** The Surety hereby waives notice of any change, including changes of time, to the contract or to related subcontracts, purchase orders and other obligations.

**10.** Notice to the Surety, the Agency or the Contractor shall be mailed or delivered to the address shown on the signature page.

**11. Definitions**

**11.1** Balance of the Contract Sum: The total amount payable by the Agency to the Contractor under the Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts to be received by the Agency in settlement of insurance or other Claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Contract.

**11.2** Contractor Default: Failure of the Contractor, which has neither been remedied nor waived, to perform the Contract or otherwise to comply with the terms of the Contract.

**SE-357**  
**Labor and Material Payment Bond**

**KNOW ALL MEN BY THESE PRESENTS**, that *(Insert full name or legal title and address of Contractor)*

Name: \_\_\_\_\_

Address: \_\_\_\_\_

hereinafter referred to as "Contractor", and *(Insert full name and address of principal place of business of Surety)*

Name: \_\_\_\_\_

Address: \_\_\_\_\_

hereinafter called the "surety", are jointly and severally held and firmly bound unto *(Insert full name and address of Agency)*

Name: **University of South Carolina**

Address: **743 Greene Street  
Columbia SC, 29208**

hereinafter referred to as "Agency", or its successors or assigns, the sum of \_\_\_\_\_ (\$ \_\_\_\_\_), being the sum of the Bond to which payment to be well and truly made, the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

**WHEREAS**, Contractor has by written agreement dated \_\_\_\_\_ entered into a contract with Agency to construct

Project Name: **One Wood Farm Equestrian - Locker Room Project**

Project Number: **H27-Z004**

Brief Description of Awarded Work, as found on the SE-330, Bid Form: **A new locker room facility building with associated sitework, plumbing, mechanical and electrical work.**

in accordance with Drawings and Specifications prepared by *(Insert full name and address of A/E)*

Name: **GMK Associates**

Address: **1201 Main Street, Suite 2100  
Columbia SC, 29201**

which agreement is by reference made a part hereof, and is hereinafter referred to as the Contract.

**IN WITNESS WHEREOF**, Surety and Contractor, intending to be legally bound hereby, subject to the terms stated herein, do each cause this Labor and Material Payment Bond to be duly executed on its behalf by its authorized officer, agent or representative.

DATED this \_\_\_\_\_ day of \_\_\_\_\_, 2\_\_\_\_\_, \_\_\_\_\_ BOND NUMBER \_\_\_\_\_  
*(shall be no earlier than Date of Contract)*

CONTRACTOR

SURETY

By: \_\_\_\_\_  
(Seal)

By: \_\_\_\_\_  
(Seal)

Print Name: \_\_\_\_\_

Print Name: \_\_\_\_\_

Print Title: \_\_\_\_\_

Print Title: \_\_\_\_\_  
(Attach Power of Attorney)

Witness: \_\_\_\_\_

Witness: \_\_\_\_\_

*(Additional Signatures, if any, appear on attached page)*



**SE-357****Labor and Material Payment Bond****NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH THAT:**

1. The Contractor and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Agency to pay for all labor, materials and equipment required for use in the performance of the Contract, which is incorporated herein by reference.
2. With respect to the Agency, this obligation shall be null and void if the Contractor:
  - 2.1 Promptly makes payment, directly or indirectly, for all sums due Claimants; and
  - 2.2 Defends, indemnifies and holds harmless the Agency from all claims, demands, liens or suits by any person or entity who furnished labor, materials or equipment for use in the performance of the Contract.
3. With respect to Claimants, this obligation shall be null and void if the Contractor promptly makes payment, directly or indirectly, for all sums due.
4. With respect to Claimants, and subject to the provisions of Title 29, Chapter 5 and the provisions of §11-35-3030(2)(c) of the SC Code of Laws, as amended, the Surety's obligation under this Bond shall arise as follows:
  - 4.1 Every person who has furnished labor, material or rental equipment to the Contractor or its subcontractors for the work specified in the Contract, and who has not been paid in full therefore before the expiration of a period of ninety (90) days after the date on which the last of the labor was done or performed by him or material or rental equipment was furnished or supplied by him for which such claim is made, shall have the right to sue on the payment bond for the amount, or the balance thereof, unpaid at the time of institution of such suit and to prosecute such action for the sum or sums justly due him.
    - 4.2 A remote claimant shall have a right of action on the payment bond upon giving written notice by certified or registered mail to the Contractor within ninety (90) days from the date on which such person did or performed the last of the labor or furnished or supplied the last of the material or rental equipment upon which such claim is made.
  - 4.3 Every suit instituted upon a payment bond shall be brought in a court of competent jurisdiction for the county or circuit in which the construction contract was to be performed, but no such suit shall be commenced after the expiration of one year after the day on which the last of the labor was performed or material or rental equipment was supplied by the person bringing suit.
5. When the Claimant has satisfied the conditions of paragraph 4, the Surety shall promptly and at the Surety's expense take the following actions:
  - 5.1 Send an answer to the Claimant, with a copy to the Agency, within sixty (60) days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.
  - 5.2 Pay or arrange for payment of any undisputed amounts.
  - 5.3 The Surety's failure to discharge its obligations under this paragraph 5 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a claim. However, if the Surety fails to discharge its obligations under this paragraph 5, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs to recover any sums found to be due and owing to the Claimant.
6. Amounts owed by the Agency to the Contractor under the

Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any Performance Bond. By the Contractor furnishing and the Agency accepting this Bond, they agree that all funds earned by the contractor in the performance of the Contract are dedicated to satisfy obligations of the Contractor and the Surety under this Bond, subject to the Agency's prior right to use the funds for the completion of the Work.

7. The Surety shall not be liable to the Agency, Claimants or others for obligations of the Contractor that are unrelated to the Contract. The Agency shall not be liable for payment of any costs or expenses of any claimant under this bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.

8. The Surety hereby waives notice of any change, including changes of time, to the Contract or to related Subcontracts, purchase orders and other obligations.

9. Notice to the Surety, the Agency or the Contractor shall be mailed or delivered to the addresses shown on the signature page. Actual receipt of notice by Surety, the Agency or the contractor, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.

10. By the Contractor furnishing and the Agency accepting this Bond, they agree that this Bond has been furnished to comply with the statutory requirements of the South Carolina Code of Laws, as amended, and further, that any provision in this Bond conflicting with said statutory requirements shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory Bond and not as a common law bond.

11. Upon request of any person or entity appearing to be a potential beneficiary of this bond, the Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.

12. Any dispute, suit, action or proceeding arising out of or relating to this Bond shall be governed by the laws of the State of South Carolina.

**13. DEFINITIONS**

**13.1 Claimant:** An individual or entity having a direct contract with the Contractor or with a Subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Contract, architectural and engineering services required for performance of the Work of the Contractor and the Contractor's Subcontractors, and all other items for which a mechanic's lien might otherwise be asserted.

**13.2 Remote Claimant:** A person having a direct contractual relationship with a subcontractor of the Contractor or subcontractor, but no contractual relationship expressed or implied with the Contractor.

**13.3 Contract:** The agreement between the Agency and the Contractor identified on the signature page, including all Contract Documents and changes thereto.

## USC SUPPLEMENTAL GENERAL CONDITIONS FOR CONSTRUCTION PROJECTS

1. Contractor's employees shall take all reasonable means not to interrupt the flow of student traffic in building corridors, lobbies and stairs. All necessary and reasonable safety precautions shall be taken to prevent injury to building occupants while transporting materials and equipment through the building to the work area. Providing safe, accessible, plywood pedestrian ways around construction may be required if a suitable alternative route is not available.
2. Fraternalization between Contractor's employees and USC students, faculty or staff is strictly prohibited-zero tolerance!
3. USC will not tolerate rude, abusive or degrading behavior on the job site. Heckling and cat-calling directed toward students, faculty or staff or any other person on USC property is strictly prohibited. Any contractor whose employees violate this requirement will be assessed a fine of up to \$500 per violation.
4. Contractor's employees must adhere to the University's policy of maintaining a drug-free and smoke-free/tobacco free workplace.
5. Contractor must sign a Contractor Key Receipt/Return form before any keys are issued. Keys must be returned immediately upon the completion of the work. The Contractor will bear the cost of any re-keying necessary due to the loss of or failure to return keys.
6. A welding permit must be issued by the University Fire Marshall before any welding can begin inside a building. Project Manager will coordinate.
7. Contractor must notify the University immediately upon the discovery of suspect material such as those potentially containing asbestos or other such hazardous materials. These materials **must not** be disturbed until approved by the USC Project Manager.
8. At the beginning of the project, the USC Project Manager will establish the Contractor's lay-down area. This area will also be used for the Contractor's work vehicles. No personal vehicles will be allowed in this area, or in any areas surrounding the construction site that are not regular or authorized parking lots. Personal vehicles must be parked in the perimeter parking lots. Parking permits can be obtained at the USC Parking Office located in the Pendleton Street parking garage. The lay down area will be clearly identified to the contractor by the PM, with a sketch or drawing provided to Parking. In turn, the contractor will mark off this area with a sign containing the project name, PM name, Contractor name and contact number, and end date. Where this area is subject to foot traffic, protective barriers will be provided as specified by the PM. The area will be maintained in a neat and orderly fashion. Vehicles parked in the lay down area (or designated parking areas) will be clearly marked or display a CPC furnished placard for identification.
9. Contractor will be responsible for providing its own temporary toilet facilities, unless prior arrangements are made with the USC Project Manager.
10. Use of USC communications facilities (telephones, computers, etc.) by the Contractor is prohibited, unless prior arrangements are made with the USC Project Manager.

Updated: July 15, 2011

11. For all projects over \$100,000, including IDC 's, an SE-395, Contractor Performance Evaluation, will be completed by the USC Project Manager and reviewed with the GC at the beginning of the project and a copy given to the GC. At the end of the project the form will be completed and a Construction Performance rating will be established.
12. Contractor is responsible for removal of all debris from the site, and is required to provide the necessary dumpsters which will be emptied at least 1 times per week. Construction waste must not be placed in University dumpsters. **THE CONSTRUCTION SITE MUST BE THOROUGHLY CLEANED WITH ALL TRASH PICKED UP AND PROPERLY DISPOSED OF ON A DAILY BASIS AND THE SITE MUST BE LEFT IN A SAFE AND SANITARY CONDITION EACH DAY. THE UNIVERSITY WILL INSPECT JOB SITES REGULARLY AND WILL FINE ANY CONTRACTOR FOUND TO BE IN VIOLATION OF THIS REQUIREMENT AN AMOUNT OF UP TO \$1,000 PER VIOLATION.**
13. **Contractor must provide all O&M manuals, as-built drawings, and training of USC personnel on new equipment, controls, etc. prior to Substantial Completion. Final payment will not be made until this is completed.**
14. The contractor will comply with all regulations set forth by OSHA and SCDHEC. Contractor must also adhere to USC's internal policies and procedures (available by request). As requested, the contractor will submit all Safety Programs and Certificates of Insurance to the University for review.
15. Tree protection fencing is required to protect existing trees and other landscape features to be preserved within a construction area. The limits of this fence will be evaluated for each situation with the consultant, USC Arborist and USC Project Manager. The tree protection fence shall be 5' high chain link fence unless otherwise approved by USC Project Manager. No entry or materials storage will be allowed inside the tree protection zone. A 4" layer of mulch shall be placed over the tree protection area to maintain moisture in the root zone.
16. Where it is necessary to cross walks, tree root zones (i.e., under canopy) or lawns the following measures shall be taken: For single loads up to 9,000 lbs., a 3/4" minimum plywood base shall be placed over areas impacted. For single loads over 9,000 lbs., two layers of 3/4" plywood is required.
17. For projects requiring heavy loads to cross walks tree root zones or lawns. A construction entry road consisting of 10' X 16' oak logging mates on 12" coarse, chipped, hardwood base. Mulch and logging mats shall be supplemented throughout the project to keep matting structurally functional.
18. Any damage to existing landscaping (including lawn areas) will be remediated before final payment is made.
19. Orange safety fence to be provided by the contractor. (USC Arborist, Kevin Curtis may be contacted at 777-0033 or 315-0319)

## **CAMPUS VEHICLE EXPECTATIONS**

1. All motorized vehicles on the University campus are expected to travel and park on roadways and/or in parking stalls.
2. All motorized vehicle traffic on USC walkways must first receive the Landscape Manager=s authorization. Violators may be subject to fines and penalties.
3. All motorized vehicles that leak or drip liquids are prohibited from traveling or parking on walks or landscaped areas.
4. Contractors, vendors, and delivery personnel are required to obtain prior parking authorization before parking in a designated space. Violators may be subject to fines and/or penalties. See Item 10 below.
5. Drivers of equipment or motor vehicles that damage university hardscape or landscape will be held personally responsible for damages and restoration expense.
6. Vehicle drivers who park on landscape or drives must be able to produce written evidence of need or emergency requiring parking on same.
7. All vehicles parked on landscape, hardscape, or in the process of service delivery, must display adequate safety devices, i.e. flashing lights, cones, signage, etc.
8. All drivers of equipment and vehicles will be respectful of University landscape, equipment, structures, fixtures and signage.
9. All incidents of property damage will be reported to Parking Services or the Work Management Center.
10. Parking on campus is restricted to spaces designated by Parking Services at the beginning of the project. Once the project manager and contractor agree on how many spaces are needed, the project manager will obtain a placard for each vehicle. This placard must be hung from the mirror of the vehicle, otherwise a ticket will be issued and these tickets cannot be “fixed”. Parking spaces are restricted to work vehicles only; no personal vehicles.

Project Name: One Wood Farm Equestrian - Locker Room Project

Project Number: H27-Z004

University of South Carolina

**CONTRACTOR'S ONE YEAR GUARANTEE**

STATE OF \_\_\_\_\_

COUNTY OF \_\_\_\_\_

WE \_\_\_\_\_  
as General Contractor on the above-named project, do hereby guarantee that all work executed under the requirements of the Contract Documents shall be free from defects due to faulty materials and /or workmanship for a period of one (1) year from date of acceptance of the work by the Owner and/or Architect/Engineer; and hereby agree to remedy defects due to faulty materials and/or workmanship, and pay for any damage resulting wherefrom, at no cost to the Owner, provided; however, that the following are excluded from this guarantee;

Defects or failures resulting from abuse by Owner.

Damage caused by fire, tornado, hail, hurricane, acts of God, wars, riots, or civil commotion.

\_\_\_\_\_  
[Name of Contracting Firm]

\*By \_\_\_\_\_

Title \_\_\_\_\_

\*Must be executed by an office of the Contracting Firm.

SWORN TO before me this \_\_\_\_\_ day of \_\_\_\_\_, 2\_\_\_\_ (seal)

\_\_\_\_\_ State

My commission expires \_\_\_\_\_

**SECTION 01066 - INTERIM LIFE SAFETY MEASURES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interim Life Safety Measures

1.02 PROCEDURES

- A. The Interim Life Safety Measures shall:
1. Ensure that exits provide free and unobstructed egress. Personnel shall receive training if alternative exits are designated. Buildings and areas under construction shall have maintained escape facilities for the Contractor's work forces at all times. Means of egress in construction areas shall be inspected daily.
  2. Ensure free and unobstructed access for emergency forces.
  3. Provide additional fire-fighting equipment and use training for personnel.
  4. Prohibit smoking in or adjacent to construction areas.
  5. Develop and enforce storage, housekeeping, and debris removal practices that reduce the flammable and combustible fire load of the building to the lowest level necessary for daily operations.
  6. Increase "hazard surveillance" of buildings, grounds and equipment with special attention to excavations, construction areas, construction storage, and field offices.
  7. Train personnel when structural or compartmentalize features of fire safety are compromised.

**END OF SECTION**

**SECTION 01100 - SUMMARY**

**PART 1 GENERAL**

**1.01 PROJECT**

- A. Project Name: One Wood Farm Equestrian - Locker Room Project.
- B. Owner's Name: University of South Carolina.
- C. Architect's Name: GMK Associates, Inc.
- D. The Project consists of the construction of a new 1,700 sf locker room facility.

**1.02 CONTRACT DESCRIPTION**

- A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00500 - Agreement.

**1.03 WORK BY OWNER**

- A. Items noted NIC (Not in Contract) or Owner Furnished will be supplied and installed by Owner or by the Contractor before Substantial Completion. Some items include:
  - 1. Furnishings.
  - 2. Small equipment.
  - 3. Refer to the notes on the drawings for more information.
  - 4. 2 toilets WC-1 and WC-1A, two sinks at locker area L-2A, SS sink unit as well as SK-1 fittings and trim, janitors sink MSB-1, water cooler EWB-1 and Water Heater WH-1 are owner furnished, contractor installed. Owner purchases those items and supplies to the contractor for installation by contractor as defined on the plans and specifications for a fully functional system. GC coordinate with the owner.
  - 5. Vinyl tile flooring is owner furnished, owner installed.
  - 6. Landscaping and irrigation is owner furnished, owner installed. Contractor to install sleeves required for irrigation lines.
  - 7. All millwork and cabinets are owner furnished, owner installed.
  - 8. Site benches are owner furnished, owner installed.
  - 9. The lockers, saddle racks and toilet partitions are owner furnished, owner installed.
  - 10. Toilet paper dispensers, napkin dispenser, mirrors, paper towel dispensers, shower curtain rods and shower curtains are owner furnished, owner installed.
  - 11. The TV in the lounge is owner furnished, owner installed.
  - 12. The drink cooler in the lounge is owner furnished, owner installed.

**1.04 OWNER OCCUPANCY**

- A. Owner intends to continue to occupy adjacent portions of the existing site during the entire construction period.
- B. Owner intends to occupy the Project upon Substantial Completion.
- C. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- D. Schedule the Work to accommodate Owner occupancy.

**1.05 CONTRACTOR USE OF SITE AND PREMISES**

- A. Construction Operations: Limited to areas noted on Drawings.

**UNIVERSITY OF SOUTH CAROLINA  
ONE WOOD FARM EQUESTRIAN -  
LOCKER ROOM PROJECT  
BLYTHEWOOD, SC**

**STATE PROJECT H27-Z004  
A/E PROJECT #11040.02**

- B. Arrange use of site and premises to allow:
  - 1. Owner occupancy.
  - 2. Work by Others.
  - 3. Work by Owner.
  - 4. Use of site and premises by the public.
- C. Provide access to and from site as required by law and by Owner:
- D. 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.
- E. Do not obstruct roadways, sidewalks, or other public ways without permit.
- F. Utility Outages and Shutdown:
- G. Limit disruption of utility services to hours the building is unoccupied.
  - 1. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
- H. Prevent accidental disruption of utility services to other facilities.

**1.06 WORK SEQUENCE**

- A. Coordinate construction schedule and operations with Owner.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**



**SECTION 01200 - PRICE AND PAYMENT PROCEDURES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Sum and Contract Time.
- C. Coordinate the Schedule of Values and Applications for Payment with the Contractor's Construction Schedule, List of Subcontracts, and Submittal Schedule.
- D. The Contractor's Construction Schedule and Submittal Schedule are included in other sections of Division 1.
- E. See also the payment requirements in Supplementary Conditions.
- F. Change procedures.
- G. Correlation of Contractor submittals based on changes.
- H. Procedures for preparation and submittal of application for final payment.

**1.02 SCHEDULE OF VALUES**

- A. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- B. Forms filled out by hand will not be accepted.
- C. Submit Schedule of Values in duplicate within 30 days after date of Owner-Contractor Agreement.
- D. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification Section. Identify site mobilization and bonds and insurance.
  - 1. Provide minimum of 1% of the Construction Cost for Project Record Drawings.
  - 2. Provide minimum of 1% of the Construction Cost for Operating and Maintenance Data.
  - 3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Break principal subcontract amounts down into several line items.
- E. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:
  - 1. Contractor's construction schedule.
  - 2. Application for Payment form.
  - 3. List of Subcontractors.
  - 4. Schedule of allowances.
  - 5. List of principal suppliers and fabricators.
  - 6. Schedule of submittals.
- F. Sub-Schedules: Where the Work is separated into phases that require separately phased payments, provide sub-schedules showing values correlated with each phase of payment.
- G. Identification: Include the following Project identification on the Schedule of Values:
  - 1. Project name and location.
  - 2. Name of the Architect.

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ONE WOOD FARM EQUESTRIAN -  
LOCKER ROOM PROJECT  
BLYTHEWOOD, SC**

**STATE PROJECT H27-Z004  
A/E PROJECT #11040.02**

3. Contractor's name and address.
4. Date of submittal.
- H. Round amounts off to the nearest whole dollar; the total shall equal the Contract Sum.
- I. Include within each line item, a direct proportional amount of Contractor's overhead and profit.
- J. For each part of the Work where an Application for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
- K. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown as separate line items in the Schedule of Values.
- L. Revise schedule to list approved Change Orders, with each Application For Payment.

**1.03 APPLICATIONS FOR PROGRESS PAYMENTS**

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include the following:
  1. List of Subcontractors.
  2. List of principal suppliers and fabricators.
  3. Schedule of Values.
  4. Contractor's Construction Schedule (preliminary if not final).
  5. Schedule of principal products.
  6. List of Contractor's staff assignments.
  7. List of Contractor's principal consultants.
  8. Copies of building permits.
  9. Copies of authorizations and licenses from governing authorities for performance of the Work.
  10. Initial progress report.
  11. Report of pre-construction meeting.
  12. Certificates of insurance and insurance policies.
  13. Performance and payment bonds (if required).
  14. Data needed to acquire Owner's insurance.
  15. Initial settlement survey and damage report, if required.
- E. For each item, provide a column for listing each of the following:
  1. Item Number.
  2. Description of work.
  3. Scheduled Values.
  4. Previous Applications.
  5. Work in Place and Stored Materials under this Application.
  6. Authorized Change Orders.
  7. Total Completed and Stored to Date of Application.
  8. Percentage of Completion.

**UNIVERSITY OF SOUTH CAROLINA  
ONE WOOD FARM EQUESTRIAN -  
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9. Balance to Finish.
  10. Retainage.
- F. Execute certification by signature of authorized officer.
1. Incomplete applications will be returned without action.
- G. 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.
- H. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of Work.
- I. Submit three copies of each Application for Payment.
- J. Waiver Forms: Submit waivers of lien on forms, and executed in a manner, acceptable to Owner.
- K. Include the following with the application:
1. Transmittal letter as specified for Submittals in Section 01300.
  2. Construction progress schedule, revised and current as specified in Section 01325.
  3. Partial release of liens from major Subcontractors and vendors.
- L. Waiver Delays: Submit each Application for Payment with the Contractor's waiver of mechanics lien for the period of construction covered by the application.
- M. When an application shows completion of an item, submit final or full waivers.
- N. When Architect 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.
- O. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment; this application shall reflect any Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- P. Administrative actions and submittals that shall proceed or coincide with this application include:
1. Occupancy permits and similar approvals.
  2. Warranties (guarantees) and maintenance agreements.
  3. Test/adjust/balance records.
  4. Meter readings.
  5. Start-up performance reports.
  6. Change-over information related to Owner's occupancy, use, operation and maintenance.
  7. Final cleaning.
  8. Application for reduction of retainage, and consent of surety.
  9. Advice on shifting insurance coverages.
- Q. List of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion.
- R. Contractor is required to assemble and complete information required by SC Department of Health and Environmental Control for project close-out. Copies of these regulations and guidelines are available from SCDHEC or will be given to successful bidder upon start of work. Three copies of all information is required.

**1.04 MODIFICATION PROCEDURES**

- A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or subcontractors of changes to the Contract Documents.
- B. For minor changes not involving an adjustment to the Contract Price or Contract Time, Architect will issue instructions directly to Contractor.
- C. For other required changes, Architect will issue a document signed by Owner 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 Sum or Contract Time.
  - 2. Promptly execute the change.
- D. For changes for which advance pricing is desired, Architect 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 14 days.
- E. Contractor may propose a change by submitting a request for change to Architect, 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 Sum 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 01600.
- F. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
  - 1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
  - 2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
  - 3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
  - 4. For change ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.
- G. Substantiation of Costs: Provide full information required for evaluation.
  - 1. Provide following data:
    - a. Quantities of products, labor, and equipment.
    - b. Taxes, insurance, and bonds.
    - c. Overhead and profit.
    - d. Justification for any change in Contract Time.
    - e. Credit for deletions from Contract, similarly documented.
  - 2. Support each claim for additional costs with additional information:
    - a. Origin and date of claim.
    - b. Dates and times work was performed, and by whom.
    - c. Time records and wage rates paid.
    - d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
  - 3. For Time and Material work, submit itemized account and supporting data after completion

of change, within time limits indicated in the Conditions of the Contract.

- H. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- I. 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 Sum.
- J. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- K. Promptly enter changes in Project Record Documents.

#### 1.05 APPLICATION FOR FINAL PAYMENT

- A. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of Work covered by the application who could lawfully be entitled to a lien.
- B. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- C. Final Payment Application: Administrative actions and submittals which must precede or coincide with submittal of the final payment Application for Payment include the following:
  - 1. Completion of Project closeout requirements.
  - 2. Completion of items specified for completion after Substantial Completion.
  - 3. Assurance that unsettled claims will be settled.
  - 4. Assurance that Work not complete and accepted will be completed without undue delay.
  - 5. Transmittal of required Project construction records to Owner.
  - 6. Certified property survey.
  - 7. Proof that taxes, fees and similar obligations have been paid.
  - 8. Removal of temporary facilities and services.
  - 9. Removal of surplus materials, rubbish and similar elements.
  - 10. Change of door locks to Owner's access.
- D. Application for Final Payment will not be considered until the following have been accomplished:
  - 1. All closeout procedures specified in Section 01700.

**END OF SECTION**

**SECTION 01300 - ADMINISTRATIVE REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Preconstruction meeting.
- B. Site mobilization meeting.
- C. Progress meetings.
- D. Submittals for review, information, and project closeout.
- E. Number of copies of submittals.
- F. Submittal procedures.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 PRECONSTRUCTION MEETING**

- A. Architect will schedule a meeting after Notice of Award.
- B. Attendance Required:
  - 1. Owner.
  - 2. Architect.
  - 3. Contractor.
- C. Agenda:
  - 1. Execution of Owner-Contractor Agreement.
  - 2. Submission of executed bonds and insurance certificates.
  - 3. Distribution of Contract Documents.
  - 4. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
  - 5. Designation of personnel representing the parties to Contract, Owner, and Architect.
  - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
  - 7. Scheduling.
- D. Contractor to record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

**3.02 SITE MOBILIZATION MEETING**

- A. Architect will schedule a meeting at the Project site prior to Contractor occupancy.
- B. Attendance Required:
  - 1. Contractor.
  - 2. Owner.
  - 3. Architect.
  - 4. Special Consultants.
  - 5. Contractor's Superintendent.
  - 6. Major Subcontractors.

- C. Agenda:
  - 1. Use of premises by Owner and Contractor.
  - 2. Owner's requirements and occupancy prior to completion.
  - 3. Construction facilities and controls provided by Owner.
  - 4. Temporary utilities provided by Owner.
  - 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.
- D. Contractor to record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

### 3.03 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum weekly intervals on day and time convenient for all parties involved.
- B. Make arrangements for meetings, prepare agenda with copies for participants prior to meetings, preside at meetings.
- C. Attendance Required: Job superintendent, major Subcontractors and suppliers as appropriate to agenda topics for each meeting. The Architect and Owner may attend.
- D. 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. Review of status of Request for Information (RFI).
  - 7. Review of status of Architectural Supplemental Instructions (ASI).
  - 8. Review of status of proposal requests (PR).
  - 9. Review of status of Change Orders (CO).
  - 10. Review of off-site fabrication and delivery schedules.
  - 11. Maintenance of progress schedule.
  - 12. Corrective measures to regain projected schedules.
  - 13. Planned progress during succeeding work period.
  - 14. Coordination of projected progress.
  - 15. Maintenance of quality and work standards.
  - 16. Effect of proposed changes on progress schedule and coordination.
  - 17. Other business relating to Work.
- E. Record minutes and distribute copies within five days after meeting to participants, with three copies to Architect, one copy to Owner, participants, and those affected by decisions made.

### 3.04 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:

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1. Product data.
    - a. When product data submittals are prepared specifically for this project (in the absence of standard printed information) submit such information as shop drawings and not as product data submittals.
    - b. Content:
      - 1) Identify the particular product being submitted; submit only pertinent pages.
      - 2) Show compliance with properties specified.
      - 3) Identify which options and accessories are applicable.
      - 4) Show compliance with the specific standards referenced.
      - 5) Show compliance with specified testing agency listings; show the limitations of their labels or seals, if any.
      - 6) Identify dimensions which have been verified by field measurement.
      - 7) Show special coordination requirements for the product.
  2. Shop drawings.
    - a. Original drawings, prepared by Contractor, Subcontractor, supplier or distributor, which illustrate portion of the work, showing fabrication, layout, setting and erection details.
    - b. Do not reproduce the Contract Drawings for the shop drawing submittals. Electronic media of the Construction Documents are not available for the Contractor's Subcontractor's, or material suppliers use.
    - c. Identify details by reference to drawing sheet number(s) and pertinent detail number(s).
    - d. Shop drawings shall not include the phrase by others, except when relating to materials, products or equipment not included under the total Contract.
  3. Samples.
    - a. Provide samples that are the same as proposed product.
    - b. Where products are to match a sample prepared by other entities, prepare sample to match.
    - c. Preparation:
      - 1) Attach a description to each sample.
      - 2) Attach name of manufacturer or source to each sample.
      - 3) Where compliance with specified properties is required, attach documentation showing compliance.
      - 4) Where selection is required, the first submittal may be a single set of all options; after return of submittal with selection indicated, submit standard number of sets of selected item.
    - d. Keep final sample set(s) at the project site, available for use during progress of the work.
    - e. Contractor shall be responsible for submitting all interior and exterior materials samples that require a color and/or finish selection or is required to be part of a mock up assembly at the same time. The Contractor shall include the color, finish, material selection schedule in the shop drawing submittal schedule. The Architect will provide final color, finish, and material selections only when they have all been submitted by the Contractor.
- B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- C. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01780 - CLOSEOUT



**SUBMITTALS.**

**3.05 SUBMITTALS FOR INFORMATION**

- A. When the following are specified in individual sections, submit them for information:
  - 1. Design data.
  - 2. Certificates.
  - 3. Test reports.
  - 4. Inspection reports.
  - 5. Manufacturer's instructions.
  - 6. Manufacturer's field reports.
  - 7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner. No action will be taken.

**3.06 SUBMITTALS FOR PROJECT CLOSEOUT**

- A. When the following are specified in individual sections, submit them at project closeout:
  - 1. Project record documents.
  - 2. Operation and maintenance data.
  - 3. Warranties.
  - 4. Bonds.
  - 5. Other types as indicated.
- B. Submit for Owner's benefit during and after project completion.

**3.07 NUMBER OF COPIES OF SUBMITTALS**

- A. Documents for Review:
  - 1. Small Size Sheets, Not Larger Than 8-1/2 x 11 inches: Submit the number of copies that Contractor requires, plus two copies that will be retained by Architect.
  - 2. Larger Sheets, Not Larger Than 24x36 inches: Submit the number of opaque reproductions that Contractor requires, plus two copies that will be retained by Architect.
- B. Documents for Information: Submit two copies.
- C. Documents for Project Closeout: Make one reproduction of submittal originally reviewed. Submit one extra of submittals for information.
- D. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
  - 1. After review, produce duplicates.
  - 2. Retained samples will not be returned to Contractor unless specifically so stated.

**3.08 SUBMITTAL PROCEDURES**

- A. Transmit each submittal with AIA Form G810, in duplicate.
  - 1. Submittals received without a transmittal form will be returned without review or action.
  - 2. Fill out a separate transmittal form for each submittal; also include the following:
    - a. Other relevant information.
    - b. Requests for additional information.
  - 3. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

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- B. Identify Project name and numbers, Contractor's, Subcontractor's or supplier's name and address, Architect's name and address, Manufacturer's name ; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- C. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, quantities, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
  - 1. Contractor's responsibility regarding errors and omissions in submittals is not relieved by Architect's review of submittals.
  - 2. Contractor's responsibility regarding deviations in submittals from requirements of Contract Documents is not relieved by Architect's review submittals, unless Architect gives written acceptance of specific deviations as approved by Owner.
  - 3. When work is directly related and involves more than one trade, shop drawings shall be coordinated by the submitting Contractor/Subcontractor with other trades prior submission and related work submitted under one cover.
    - a. After shop drawing has been submitted for review, no changes may be made to that Drawing other than changes resulting from review notes made by the Architect unless such changes are clearly identified and circled before being resubmitted. Any failure to comply with this requirement shall nullify and invalidate the Architect's review.
  - 4. Submittals without Contractor's stamp of review will not be reviewed and will be returned for resubmission.
- D. Submittals will be accepted from the Contractor only. Submittals received from other entities will be returned without review or action.
- E. Do not submit substitute items that have not been approved by means of the procedure specified elsewhere.
- F. Do not include requests for substitution (either direct or indirect) on submittals; comply with procedures for substitutions specified elsewhere.
- G. Deliver submittals to Architect at business address.
- H. Schedule submittals to expedite the Project, and coordinate submission of related items.
  - 1. Prepare and submit, in accordance with the approved Project Construction Schedule, a separate document listing dates by which shop drawings, product data and samples must be submitted for each material, product or equipment item requiring submittal.
  - 2. The schedule shall reflect an orderly sequence so as to cause no delay in the Work.
  - 3. Coordinate submittals and activities that must be performed in sequence, so that the Architect has enough information to properly review the submittals.
  - 4. Coordinate submittals of different types for the same product or system so that the Architect has enough information to properly review each submittal.
  - 5. The dates indicated shall allow reasonable time for the review process of checking, correcting and resubmitting and reasonable time for procurement.
  - 6. No extension of time will be granted to the Contractor/Subcontractor because of failure to expeditiously submit shop drawings and samples in reasonable time to allow for review process.
  - 7. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor. Architect shall review with reasonable promptness.
- I. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.

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- J. Provide space for Contractor and Architect review stamps. Submittals to receive Architect's action marking: Provide blank space on the label or on the submittal itself for action marking; 4 inches wide by 6 inches high.
- K. Do not commence work which requires review of any submittals until receipt of returned submittals with an acceptable action.
  - 1. Stamped Reviewed, no corrections or resubmissions required, fabrication may proceed.
  - 2. Stamped Revise and Resubmit.
    - a. If Contractor/Subcontractor complies with noted corrections, fabrication may proceed.
  - 3. If for any reason the Contractor/Subcontractor cannot comply with the noted corrections, fabrication shall not proceed and Contractor/Subcontractor shall resubmit, following procedures outlined herein before.
  - 4. Stamped Revise and Resubmit or Resubmit.
    - a. Contractor/Subcontractor shall revise and resubmit for review. Fabrication shall not proceed.
- L. When revised for resubmission, identify all changes made since previous submission.
- M. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- N. Submittals not requested will not be recognized or processed.

**END OF SECTION**

**SECTION 01325 - CONSTRUCTION PROGRESS SCHEDULE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Preliminary schedule.
- B. Construction progress schedule, bar chart type.
- C. Reports.

**1.02 SUBMITTALS**

- A. Within 7 days after date established in Notice to Proceed, submit preliminary schedule defining planned operations for the first 45 days of Work, with a general outline for remainder of Work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 3 working days.
- C. Within 10 days after date established in Notice to Proceed, submit draft of proposed complete schedule for review.
  - 1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- D. Within 3 days after Architect's review, submit complete schedule.
- E. Submit Daily Construction Reports every week.
- F. Submit updated schedule and Progress Reports with each Application for Payment.
- G. Submit the number of opaque reproductions that Contractor requires, plus three copies that will be retained by Architect.
- H. Submit under transmittal letter form specified in Section 01300.

**1.03 SCHEDULE FORMAT**

- A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.
- B. Diagram Sheet Size: Maximum 22 x 17 inches or width required.
- C. Sheet Size: Multiples of 8-1/2 x 11 inches.
- D. Scale and Spacing: To allow for notations and revisions.

**1.04 COORDINATION**

- A. In preparation of schedules, take into account the time allowed or required for the Architect's administrative procedures.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 PRELIMINARY SCHEDULE**

- A. Prepare preliminary schedule in the form of a horizontal bar chart.

### 3.02 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by specification section number.
- C. Identify work of separate stages and other logically grouped activities.
- D. Provide sub-schedules to define critical portions of the entire schedule.
- E. Include conferences and meetings in schedule.
- F. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
- G. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, Products identified under Allowances, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.
- H. Indicate delivery dates for owner-furnished products.
- I. Coordinate content with schedule of values specified in Section 01200.
- J. Provide legend for symbols and abbreviations used.
- K. Use the same terminology as that used in the Contract Documents.

### 3.03 BAR CHARTS

- A. Include a separate bar for each major portion of Work or operation.
- B. Identify the first work day of each week.
- C. Coordinate each element on the schedule with other construction activities.
- D. Show activities in proper sequence.
- E. Include cost bar at top of chart, showing estimated and actual costs of work performed at the date of each application for payment.
- F. Use vertical lines to mark the time scale at not more than one week intervals.

### 3.04 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Provide construction schedule in the form of bar charts:
  - 1. Use the same items of work as shown in the schedule of values.
  - 2. Where related activities must be performed in sequence, show relationship graphically.
  - 3. Incorporate the submittal schedule specified elsewhere.
  - 4. Incorporate the quality control activities schedule specified elsewhere.
  - 5. Show dates of:
    - a. Each activity that influences the construction time.
    - b. Preconstruction meeting.
    - c. Ordering dates for products requiring long lead time.
    - d. Completion of demolition.
    - e. Completion of mechanical work.
    - f. Completion of electrical work.
    - g. Dates required for owner supplied equipment.

- h. Instruction of the Owner's personnel in operation and maintenance of equipment and systems.
- i. Substantial and final completion, with time frames for the Architect's completion procedures.
- 6. In developing the schedule take into account:
  - a. Continued occupancy of areas adjacent to the work area as well as throughout the building.
  - b. Interruption of services to occupied facilities
  - c. Site limitations

### 3.05 UPDATING SCHEDULE

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
- C. Annotate diagrams to graphically depict current status of Work.
- D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- E. Indicate changes required to maintain Date of Substantial Completion.
- F. Submit progress reports required to support recommended changes.

### 3.06 DISTRIBUTION OF SCHEDULE

- A. Distribute copies of updated schedules and reports to Contractor's project site file, to Subcontractors, suppliers, Architect, Owner, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

### 3.07 REPORTS

- A. Daily Construction Logs: Every day, record the following information concerning events at the site:
  - 1. Approximate number of persons at the site.
  - 2. Visitors to the site.
  - 3. Losses of material and property.
  - 4. Meetings held and significant decisions made there.
  - 5. Names of Subcontractors at site.
  - 6. Orders and requests of representatives of governing authorities.
  - 7. Unusual events.
  - 8. Utility service disconnections and connections.
- B. Progress Reports: Prepare a narrative report describing the general state of completion of the work and describing in detail the following:
  - 1. Actual and anticipated delays, their impact on the schedule, and corrective actions taken or proposed.
  - 2. Actual and potential problems.
  - 3. Status of change order work.
  - 4. Effect of delays, problems, and changes on the schedules of Subcontractors.
  - 5. Outstanding change proposal requests.

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6. Status of corrective work ordered by the Architect

**END OF SECTION**

**SECTION 01400 - QUALITY REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. References and standards.
- B. Mock-ups.
- C. Control of installation.
- D. Tolerances.
- E. Testing and inspection services.
- F. Manufacturers' field services.

**1.02 REFERENCE STANDARDS**

**1.03 SUBMITTALS**

- A. Testing Agency Qualifications:
  - 1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
  - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
- B. Design Data: Submit for Architect's 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 Owner's information.
- C. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
  - 1. Include:
    - a. Date issued.
    - b. Project title and number.
    - c. Name of inspector.
    - d. Date and time of sampling or inspection.
    - e. Identification of product and specifications section.
    - f. Location in the Project.
    - g. Type of test/inspection.
    - h. Date of test/inspection.
    - i. Results of test/inspection.
    - j. Conformance with Contract Documents.
    - k. When requested by Architect, provide interpretation of results.
- D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
  - 1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the



Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

- F. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
  - 1. Submit report within 10 days of observation to Architect for information.
  - 2. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
- G. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
  - 1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

#### 1.04 REFERENCES AND STANDARDS

- A. 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.
- B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

#### 1.05 TESTING AND INSPECTION AGENCIES

- A. Owner will employ and pay for services of an independent testing agency to perform other specified testing.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

### PART 2 PRODUCTS - NOT USED

### PART 3 EXECUTION

#### 3.01 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

- D. 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.
- E. Have Work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

### 3.02 MOCK-UPS

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

### 3.03 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

### 3.04 TESTING AND INSPECTION

- A. See individual specification sections for testing required.
- B. Testing Agency Duties:
  - 1. Test samples of mixes submitted by Contractor.
  - 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
  - 3. Perform specified sampling and testing of products in accordance with specified standards.
  - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
  - 5. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
  - 6. Perform additional tests and inspections required by Architect.
  - 7. Submit reports of all tests/inspections specified.
- C. 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.
- D. 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:
    - a. To provide access to Work to be tested/inspected.
    - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
    - c. To facilitate tests/inspections.
    - d. To provide storage and curing of test samples.
  4. Notify Architect 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 Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.
- F. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

### 3.05 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

### 3.06 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not conforming to specified requirements.
- B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

**END OF SECTION**

**SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Temporary utilities.
- B. Temporary telecommunications services.
- C. Temporary sanitary facilities.
- D. Temporary Controls: Barriers, enclosures, and fencing.
- E. Security requirements.
- F. Vehicular access and parking.
- G. Waste removal facilities and services.
- H. Field offices.

**1.02 SUBMITTALS**

- A. Implementation and Termination Schedule: Submit a schedule indicating implementation and termination of each temporary utility connection within 10 days of the date established for commencement of the Work.

**1.03 QUALITY ASSURANCE**

- A. Regulations: Comply with industry standards and applicable laws and regulations if authorities having jurisdiction, including but not limited to:
  - 1. Building Code requirements.
  - 2. Health and safety regulations.
  - 3. Utility company regulations.
  - 4. Police, Fire Department and Rescue Squad rules.
  - 5. Environmental protection regulations.
- B. Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library, "Temporary Electrical Facilities."
- C. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with National Electric Code (NFPA 70).
- D. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

**1.04 PROJECT CONDITIONS**

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

**1.05 MATERIALS**

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

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- B. Lumber and Plywood: Comply with requirements in Division-6 Section "Wood Blocking and Curbing"
- C. Gypsum Wallboard: Provide gypsum wallboard complying with requirements of ASTM C 36 on interior walls of temporary offices.
- D. Paint: Comply with requirements of Division-9 Section "Paints and Coatings."
- E. Water: Provide potable water approved by local health authorities.

**1.06 EQUIPMENT**

- A. General: Provide new equipment; if acceptable to the Architect, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.
- B. Water Hoses: Provide 3/4" heavy-duty, abrasion-resistant, flexible rubber hoses 100 ft. long, with pressure rating greater than the maximum pressure of the water distribution system; provide adjustable shut-off nozzles at hose discharge.
- C. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.
- D. Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.
- E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.
- F. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM or another recognized trade association related to the type of fuel being consumed.
- G. Temporary Offices: Locate office within the construction site as directed by Owner.
- H. Temporary Toilet Units: Provide and maintain temporary portable units. Location as directed by owner.
- I. First Aid Supplies: Comply with governing regulations. All accidents or injuries shall be reported to Owner.
- J. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.
- K. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.
- L. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site

**1.07 TEMPORARY UTILITIES**

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- A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.
- B. Existing facilities may not be used.
- C. Use trigger-operated nozzles for water hoses, to avoid waste of water.

**1.08 TELECOMMUNICATIONS SERVICES**

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
  - 1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
  - 2. Email: Account/address reserved for project use.

**1.09 TEMPORARY SANITARY FACILITIES**

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Use of existing facilities is not permitted as directed by Owner.
- C. Maintain daily in clean and sanitary condition.

**1.10 BARRIERS**

- A. 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.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Provide protection for plants designated to remain. Replace damaged plants.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

**1.11 FENCING**

- A. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

**1.12 EXTERIOR ENCLOSURES**

- A. 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.

**1.13 SECURITY**

- A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.
- B. Except for use of permanent fire protection as soon as available, do not change over from use of

temporary security and protection facilities to permanent facilities until Substantial Completion, or longer as requested by the Architect.

- C. Temporary Fire Protection: Until fire protection needs are supplied by permanent facilities, install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers," and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations."
- D. Store combustible materials in containers in fire-safe locations
- E. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities for fighting fires. Prohibit smoking in the building.
- F. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.
- G. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security.
- H. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, might be contaminated or polluted, or that other undesirable effects might result.
- I. Coordinate with Owner's security program.

#### 1.14 VEHICULAR ACCESS AND PARKING

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Designated existing on-site roads may be used for construction traffic.
- F. Existing parking areas may be used for construction parking as directed by Owner.

#### 1.15 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.
- C. 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.

#### 1.16 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.

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- B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing facilities used during construction to original condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

**END OF SECTION**



**SECTION 01600 - PRODUCT REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. General product requirements.
- B. Transportation, handling, storage and protection.
- C. Product option requirements.
- D. Substitution limitations and procedures.
- E. Procedures for Owner-supplied products.
- F. Maintenance materials, including extra materials, spare parts, tools, and software.

**1.02 REFERENCE STANDARDS**

- A. NFPA 70 - National Electrical Code; National Fire Protection Association.

**1.03 SUBMITTALS**

- A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
  - 1. Submit within 15 days after date of Agreement.
  - 2. For products specified only by reference standards, list applicable reference standards.
- B. 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.
- C. 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.
- D. 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**

**2.01 NEW PRODUCTS**

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. Provide interchangeable components of the same manufacture for components being replaced.
- C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Size terminal lugs to NFPA 70, include lugs for terminal box.
- D. Cord and Plug: Provide minimum 6 foot cord and plug including grounding connector for connection to electric wiring system. Cord of longer length is specified in individual specification sections.

**2.02 PRODUCT OPTIONS**

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- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. 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.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

**2.03 MAINTENANCE MATERIALS**

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

**PART 3 EXECUTION**

**3.01 SUBSTITUTION PROCEDURES**

- A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
- B. Substitutions will not be considered when a product becomes unavailable through no fault of the Contractor.
- C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- D. 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 Owner.
  - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
  - 5. Will reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
- E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- F. Substitution Submittal Procedure:
  - 1. Submit three copies 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 Architect will notify Contractor in writing of decision to accept or reject request.
- G. Substitution Request Form:
  - 1. **SUBSTITUTIONS WILL BE CONSIDERED ONLY WHEN THE ATTACHED FORM IS COMPLETED AND INCLUDED WITH THE SUBMITTAL WITH ALL BACK-UP DATA.**

**3.02 OWNER-SUPPLIED PRODUCTS**

- A. See Section 01100 - Summary for identification of Owner-supplied products.
- B. Owner's Responsibilities:
  - 1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
  - 2. Arrange and pay for product delivery to site.
  - 3. On delivery, inspect products jointly with Contractor.
  - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
  - 5. Arrange for manufacturers' warranties, inspections, and service.
- C. Contractor's Responsibilities:
  - 1. Review Owner reviewed shop drawings, product data, and samples.
  - 2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
  - 3. Handle, store, install and finish products.
  - 4. Repair or replace items damaged after receipt.
- D. Owner Furnished - Contractor Installed products: Install as per manufacturers instructions or as per the installation portion of the product specification. Coordinate with owner, provide miscellaneous work and accessories as required for a fully functional system.
- E. Owner Furnished - Owner Installed products: Coordinate with owners product requirements where Work by Contractor interfaces with Work by Owner.

**3.03 TRANSPORTATION AND HANDLING**

- A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- B. Transport and handle products in accordance with manufacturer's instructions.
- C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- D. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.
- F. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

**3.04 STORAGE AND PROTECTION**

- A. 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.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

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- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
- G. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- H. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- I. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- J. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

**END OF SECTION**

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**SECTION 01601 - SUPPLEMENT A - SUBSTITUTION REQUEST FORM**

TO:

GMK Associates, Inc.  
1201 Main Street, Suite 2100  
Columbia, South Carolina 29201  
fax: 803.255.7243

We hereby submit for your consideration the following product instead of the specified item for the above project:

DRAWING NO. \_\_\_\_\_ DRAWING NAME \_\_\_\_\_

SPEC. SECT.	SPEC NAME	PARAGRAPH	SPECIFIED ITEM
_____	_____	_____	_____

Proposed Substitution: \_\_\_\_\_

Attached complete information on changes to Drawings and/or Specifications, which proposed substitution would require for its proper installation.

Submit with request necessary samples and substantiating data to prove equal quality and performance to that which is specified. Clearly mark manufacturer's literature to indicate equality in performance.

The undersigned certifies that the function, appearance and quality are of equal performance and assumes liability for equal performance, equal design and compatibility with adjacent materials.

Submitted By:

\_\_\_\_\_  
Signature Title

\_\_\_\_\_  
Firm

\_\_\_\_\_  
Address

\_\_\_\_\_  
Telephone Date

Signature shall be by person having authority to legally bind his firm to the above terms. Failure to provide legally binding signature will result in retraction of approval.

\_\_\_\_\_  
For use by the Architect: For use by the Owner:

<input type="checkbox"/> Recommended	<input type="checkbox"/> Recommended as noted	<input type="checkbox"/> Approved
<input type="checkbox"/> Not Recommended	<input type="checkbox"/> Received too late	<input type="checkbox"/> Not Approved

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Insufficient data received

Approved as noted

By:

By:

Date:

Date:

---

Fill in Blanks Below:

- A. Does the substitution affect dimensions shown on Drawings: Yes  No  If yes, clearly indicate changes. \_\_\_\_\_
- B. Will the undersigned pay for changes to the building design, including engineering and detailing costs caused by the requested substitution? Yes  No  If no, fully explain: \_\_\_\_\_
- C. What affect does substitution have on other Contracts or other trades?  
\_\_\_\_\_
- D. What affect does substitution have on construction schedule?  
\_\_\_\_\_
- E. Manufacturer's warranties of the proposed and specified items are:  Same  Different (If Different, Explain on Attachment)
- F. Reason for Request: \_\_\_\_\_
- G. Itemized comparison of specified item(s) with the proposed substitution; list significant variations: \_\_\_\_\_  
\_\_\_\_\_
- H. Accurate cost data comparing proposed substitution with product specified:  
\_\_\_\_\_
- I. Designation of maintenance services and sources:  
\_\_\_\_\_

(Attach additional sheets if required.)

**END OF SECTION**

**SECTION 01700 - EXECUTION REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Examination, preparation, and general installation procedures.
- B. Cutting and patching.
- C. Surveying for laying out the work.
- D. Cleaning and protection.
- E. Starting of systems and equipment.
- F. Demonstration and instruction of Owner personnel.
- G. Closeout procedures, except payment procedures.
- H. General requirements for maintenance service.

**1.02 REFERENCE STANDARDS**

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

**1.03 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. 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.
- C. 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.
  - 5. Work of Owner or separate Contractor.
  - 6. Include in request:
    - a. Identification of Project.
    - b. Location and description of affected work.
    - c. Necessity for cutting or alteration.
    - d. Description of proposed work and products to be used.
    - e. Alternatives to cutting and patching.
    - f. Effect on work of Owner or separate Contractor.
    - g. Written permission of affected separate Contractor.
    - h. Date and time work will be executed.
- D. Project Record Documents: Accurately record actual locations of capped and active utilities.

**1.04 QUALIFICATIONS**

- A. For survey work, employ a land surveyor registered in South Carolina and acceptable to Architect. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

#### 1.05 PROJECT CONDITIONS

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- C. Provide methods, means and facilities to prevent water intrusion into new construction and renovations. Eliminate standing water immediately. Remove wet materials and replace with new.
- D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- E. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
- F. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
- G. 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.

#### 1.06 COORDINATION

- A. See Section 01100 for occupancy-related requirements.
- B. 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.
- C. Notify affected utility companies and comply with their requirements.
- D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- G. Coordinate completion and clean-up of work of separate sections.
- H. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.



**PART 2 PRODUCTS**

**2.01 PATCHING MATERIALS**

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01600.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. 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.

**3.02 PREPARATION**

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

**3.03 LAYING OUT THE WORK**

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

- F. Utilize recognized engineering survey practices.
- G. 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.
  - 2. Grid or axis for structures.
  - 3. Building foundation, column locations, ground floor elevations.
- H. Periodically verify layouts by same means.
- I. Maintain a complete and accurate log of control and survey work as it progresses.

### 3.04 GENERAL INSTALLATION REQUIREMENTS

- A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.
- B. 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.
- C. Building shall be enclosed, ventilated and sealed from the exterior prior to installation of interior finish materials.
- D. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- E. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- F. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- G. Make neat transitions between different surfaces, maintaining texture and appearance.

### 3.05 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. 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.
- C. 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.
- D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

- F. Restore work with new products in accordance with requirements of Contract Documents.
- G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07840, to full thickness of the penetrated element.
- I. 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.

### 3.06 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and rubbish from site periodically and dispose off-site.
- E. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.

### 3.07 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. 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.
- G. Prohibit traffic from landscaped areas.
- H. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

**3.08 SYSTEM STARTUP**

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect and owner seven days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

**3.09 ADJUSTING**

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.
- B. Testing, adjusting, and balancing HVAC systems: See Section 15950.

**3.10 FINAL CLEANING**

- A. Employ skilled workmen for final cleaning.
- B. Materials:
  - 1. Use only those cleaning materials which will not create hazards to health or property and which will not damage surfaces.
  - 2. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.
  - 3. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.
  - 4. Sweeping compounds used in cleaning operations shall leave no residue on concrete floor surfaces that may effect installation of finish flooring materials.
- C. Execute final cleaning prior to final project assessment.
  - 1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.
- D. Use cleaning materials that are nonhazardous.
- E. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- F. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- G. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior surfaces.
- H. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the

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surface and material being cleaned.

- I. Dust cabinetwork and remove markings.
- J. Prior to final completion, or Owner occupancy, the Contractor shall conduct an inspection of sight-exposed interior surfaces, and all work areas, to verify that the entire Work is clean
- K. Tunnels and closed off spaces shall be cleaned of packing boxes, wood frame members and other waste materials used in the construction.
- L. The entire system of piping and equipment shall be cleaned internally. The Contractor installing those items shall open all dirt pockets and strainers, completely blowing down as required and clean strainer screens of all accumulated debris.
- M. Tanks, fixtures and pumps shall be drained and proved free of sludge and accumulated matter.
- N. Temporary labels, stickers, etc., shall be removed from fixtures and equipment. (Do not remove permanent name plates, equipment model numbers, ratings, etc.)
- O. Heating and air conditioning equipment, tanks, pumps and traps shall be thoroughly cleaned and new filters or filter media installed.
- P. Before being placed in service, domestic water distribution systems, including those for cold water, drinking water and the hot water system shall be chlorinated. The method to be used shall be at the option of the Contractor installing the systems, and one of the methods set forth in the AWWA Standard specifications, latest edition, including all amendments thereto. The treatment shall consist of a solution of not less than 50 parts per million of available chlorine. The chlorinating material shall be either liquid chlorine or sodium hypochloride. After sterilization the system shall be flushed with clear water until the chlorine residual is not greater than 0.2 per million.
- Q. Clean filters of operating equipment.
- R. Clean debris from roofs, gutters, downspouts, and drainage systems.
- S. Clean site; sweep paved areas, rake clean landscaped surfaces.
- T. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

### 3.11 CLOSEOUT PROCEDURES

- A. Contract requirements shall be met when construction activities have successfully produced, in this order, these three terminal activities:
  - 1. Substantial Completion.
  - 2. Final Completion.
  - 3. Final Payment.
- B. Make submittals that are required by governing or other authorities.
  - 1. Provide copies to Architect and Owner.
- C. Substantial Completion:
  - 1. The date of Substantial Completion of the Work or designated portion thereof is the date certified by the Architect when construction is sufficiently complete, in accordance with the Contract Documents, so the Owner may occupy the Work or designated portion thereof for the use for which it is intended.

2. When the Contractor considers the Work is substantially complete, he shall submit to the Architect:
    - a. A written notice that the Work, or designated portion thereof, is substantially complete.
    - b. A list of items to be completed or corrected, (herein after referred to as Punch List ).
    - c. Request Substantial Completion Observation at a mutually agreeable date.
  3. Within a reasonable time after receipt of such notice, the Architect, the Contractor, and at his option, the Owner, will make an observation to determine the status of completion.
  4. Should the Architect determine that the Work is not substantially complete:
    - a. The Architect will promptly notify the Contractor in writing, giving the reasons thereof.
    - b. The Contractor shall remedy the deficiencies in the Work, and send a second written notice of substantial completion to the Architect.
    - c. The Architect will re-observe the Work and the cost of the Architect's time and reimbursable expenses will be charged to the Contractor.
  5. When the Architect concurs that the Work is substantially complete, he will:
    - a. Prepare a Certificate of Substantial Completion on AIA Form G704, accompanied by the Contractor's Punch List of items to be completed or corrected, as verified and amended by the Architect. (Note: Contract responsibilities are not altered by inclusion or omission of required work from the Punch List.)
    - b. Submit the Certificate to the Owner and the Contractor for their written acceptance of the responsibilities assigned to them in the Certificate.
  6. The Contractor shall complete or correct all items identified on the Punch List and required by the Contract requirements within time limits established by the Certificate.
  7. Owner will occupy portions of the building as specified in Section 01100.
  8. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.
- D. Final Completion:
1. To attain final completion the Contractor shall complete activities pertaining to Substantial Completion, and complete work on punch list items. Only then shall he issue written request to the Architect for Final Observation.
  2. When the Contractor considers the Work is complete, he shall submit written certification that:
    - a. Contract Documents have been reviewed.
    - b. Work has been inspected for compliance with Contract Documents.
    - c. Work has been completed in accordance with Contract Documents.
    - d. Equipment and systems have been tested in the presence of the Owner's representative and are operational.
    - e. Work is completed and ready for final observation.
  3. The Architect, the Contractor and the Owner will make an observation to verify the status of completion with reasonable promptness after receipt of such certification.
  4. Should the Architect consider that the Work is incomplete or defective:
    - a. The Architect will promptly notify the Contractor in writing, listing the incomplete or defective work.
    - b. The Contractor shall take immediate steps to remedy the stated deficiencies, and send a second written certification to the Architect that the Work is complete.
    - c. The Architect will reinspect the Work.
  5. When the Architect finds that the Work is acceptable under the Contract Documents, he shall request the Contractor to make closeout submittals.

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- E. The Contractor's Closeout Submittals to the Architect:
  - 1. Evidence of compliance with requirements of governing authorities:
    - a. Certificate of Occupancy
    - b. Certificates of Inspection
    - c. Mechanical
    - d. Electrical
  - 2. Project Record Documents: To requirements of Section 01780.
  - 3. Operating and Maintenance Data, Instructions to the Owner's Personnel: To requirements of Section 01780.
  - 4. Warranties and Bonds: To requirements of individual sections.
  - 5. Spare Parts and Maintenance Materials: To requirements of individual sections.
  - 6. Evidence of Payment and Release of Liens: To requirements of General and Supplementary Conditions.
- F. Final Adjustment of Accounts:
  - 1. Submit a final statement of accounting to the Architect.
  - 2. Statement shall reflect all adjustments to the Contract Sum:
    - a. The original Contract Sum.
    - b. Additions and deductions resulting from:
      - 1) Previous Change Orders.
      - 2) Deductions for uncorrected Work.
      - 3) Deductions for reinspection payments.
      - 4) Other adjustments.
    - c. Total contract sum, as adjusted.
    - d. Previous payments
    - e. Sum remaining due.
  - 3. Architect will prepare a final Change Order, reflecting adjustments to the Contract Sum which were not previously made by Change Orders.
- G. Final Application for Payment:
  - 1. The Contractor shall submit the final Application and Certificate for Payment in accordance with procedures and requirements stated in the Conditions of the Contract.

**3.12 MAINTENANCE**

- A. Provide service and maintenance of components indicated in specification sections.
- B. 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.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

**END OF SECTION**

**SECTION 01780 - CLOSEOUT SUBMITTALS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Warranties and bonds.

**1.02 SUBMITTALS**

- A. Project Record Documents: Submit documents to Architect prior to claim for final Application for Payment.
- B. Operation and Maintenance Data:
  - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
  - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
  - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
  - 4. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
  - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 15 days after acceptance.
  - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.
  - 3. 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.
  - 4. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the Architect for approval prior to final execution.
  - 5. Refer to individual Sections of Divisions-2 through -16 for specific content requirements, and particular requirements for submittal of special warranties.
  - 6. Form of Submittal: At Final Completion compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
  - 7. Bind warranties and bonds in two (or more) duplicate heavy-duty, commercial quality, durable 3-hole punch tab binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper.
  - 8. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark



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the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.

9. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS," the Project title or name, and the name of the Contractor.
10. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 PROJECT RECORD DOCUMENTS**

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
  1. Drawings.
  2. Specifications.
  3. Addenda.
  4. Change Orders and other modifications to the Contract.
  5. Reviewed shop drawings, product data, and samples.
  6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
  1. Manufacturer's name and product model and number.
  2. Product substitutions or alternates utilized.
  3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
  1. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
  2. Field changes of dimension and detail.
  3. Details not on original Contract drawings.

**3.02 OPERATION AND MAINTENANCE DATA**

- A. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions

for each procedure, incorporating manufacturer's instructions.

- E. Manuals:
  - 1. Purpose:
    - a. Operation and maintenance manuals will be used for training of, and use by, Owner's personnel in operation and maintenance of mechanical and electrical systems and equipment. A separate manual or chapter within a manual shall be prepared for each class of equipment or system.
    - b. For additional requirements refer to various specification sections.

### 3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. 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 custom manufactured products.
- B. 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.
- C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional information as specified in individual product specification sections.
- E. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

### 3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
  - 1. Description of unit or system, and component parts.
  - 2. Identify function, normal operating characteristics, and limiting conditions.
  - 3. Include performance curves, with engineering data and tests.
  - 4. Complete nomenclature and model number of replaceable parts.
- B. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- C. Include color coded wiring diagrams as installed.
- D. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- E. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- F. Provide servicing and lubrication schedule, and list of lubricants required.
- G. Include manufacturer's printed operation and maintenance instructions.
- H. Include sequence of operation by controls manufacturer.
- I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams

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required for maintenance.

- J. Provide control diagrams by controls manufacturer as installed.
- K. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
- L. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- M. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- N. Include test and balancing reports.
- O. Safety instructions.
- P. Additional Requirements: As specified in individual product specification sections.

**3.05 OPERATION AND MAINTENANCE MANUALS**

- A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.
- B. Prepare data in the form of an instructional manual.
- C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder on the front and the spine with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Provide heavy duty paper tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.
- F. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.
- G. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- H. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.
- I. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
  - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
  - 2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
    - a. Significant design criteria.
    - b. List of equipment.
    - c. Parts list for each component.
    - d. Operating instructions.
    - e. Maintenance instructions for equipment and systems.
    - f. Maintenance instructions for special finishes, including recommended cleaning

- methods and materials, and special precautions identifying detrimental agents.
3. Part 3: Project documents and certificates, including the following:
    - a. Shop drawings and product data.
    - b. Air and water balance reports.
    - c. Certificates.
  - J. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.
  - K. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect, Consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

### 3.06 WARRANTIES AND BONDS

- A. 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 Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.
- E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.
- F. Cover: Identify each binder on the front and the spine 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.
- G. 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.
- H. 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.
- I. See all provisions under "3.5 WARRANTY:" in General Conditions.
- J. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- K. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, guarantee the corrected work with a new warranty equal to the original.
- L. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

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- M. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, right and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
- N. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- O. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

**END OF SECTION**

**SECTION 02050 - DEMOLITION AND REMOVAL**

**PART ONE - GENERAL:**

**1.1 Scope**

This work includes the demolition and removal of all items necessary for the completion of the work as shown on the contract documents, including but not limited to, asphalt base and surfacing, concrete paving, and designated vegetation.

**1.2 Quality Assurance**

**1.2.1 Referenced Standards**

Unless otherwise indicated, all referenced standards shall be the latest edition available at the time of bidding. Any requirements of these specifications shall in no way invalidate the minimum requirements of the referenced standards. South Carolina Highway Department Standard Specifications for Highway Construction, 2007 Edition.

**PART TWO - PRODUCTS:** (This section not applicable).

**PART THREE - EXECUTION:**

**3.1 Requirements**

The work includes demolition or removal of all existing materials indicated, specified or required. All materials resulting from demolition work, except as indicated or specified otherwise, shall become the property of the contractor and shall be removed from the limits of the owner's property. Remove all rubbish and debris from the site daily, unless otherwise directed.

**3.1.1 Dust Control**

Take appropriate action to check the spread of dust to avoid the creation of a nuisance in the surrounding area. Comply with all dust regulations imposed by local air pollution agencies.

**3.1.2 Personnel**

Where pedestrian and driver safety is endangered in the area of removal work, use traffic barricades with flashing lights to meet the SCDOT standard for traffic control.

**3.2 – Existing Facilities to be Removed**

**3.2.1 Asphalt**

Remove asphalt concrete, concrete and base materials completely where indicated within the limits as specified for the new work. Exercise extreme care in the demolition procedures to avoid damage to private and public property. The existing roadway materials are indicated on the drawings. This information is not presented as a guarantee of the material to be encountered. Contractors are to make their own determinations as to the work involved.

### 3.2.2 Miscellaneous Removals

Remove completely all lawn and gravel within the limits specified for the new work. Exercise extreme care in the removal procedures to avoid damage to private and public property.

### 3.2.3 Concrete

Where concrete work to be removed abuts concrete to remain, saw concrete along straight lines to a depth of not less than two inches (2"). The remainder of the concrete shall be broken out, provided that the broken area is concealed in the finished work, and the remaining is sound. At locations where the broken face cannot be concealed, it shall be ground smooth or the saw cut shall be made entirely through the concrete.

### 3.2.4 Salvaged Materials

Items to be salvaged and delivered to the City include, any and all signage in the construction limits.

### 3.3 – Clean Up

Remove and transport all debris and rubbish in a manner that will prevent spillage on streets or adjacent areas. Clean up spillage from streets and adjacent areas.

### 3.4 - Regulations

Comply with all Federal, State and local hauling and disposal regulations.

END OF SECTION 02050

**SECTION 02110 - CLEARING AND GRUBBING**

**PART ONE – DESCRIPTION:**

1.1 The clearing work covered by this section consists of cutting, removing and properly disposing of vegetation and debris. Trees specifically identified on the plans to be preserved shall be adequately delineated and flagged by the CONTRACTOR, such that the balance of the work may be performed in a safe and harmless manner in the vicinity of preserved trees. Such tree preservation will be considered part of the work and shall be in conformance with applicable local codes and regulations. Clearing and grubbing shall be performed in areas as called for on the plans, the limits of which shall coincide with the construction limits and in general shall extend five (5) feet beyond top of cut and toe of fill, not to exceed the limits of the Owner's property.

1.2 Related Work

Any reference to standard specifications refers to the most current published date of the following specification unless otherwise noted.

1.2.1 Reference the following specifications for related work:  
02210                      Unclassified Excavation and Grading

1.2.2 Clearing and grubbing activities shall conform to Section 201 of the "Standard Specifications for Highway Construction" dated 2007, published by the South Carolina Department of Transportation, except that grubbing shall be performed on all cleared excavation and embankment areas and shall include the complete removal of all stumps, roots and embedded debris.

1.3 The grubbing work covered by this section consists of removing and properly disposing of all surface vegetation and debris. Where the material being removed is high in organic matter content, such as root mat and other vegetative matter, it shall be considered vegetation and removed as part of the work of grubbing. Where material being removed consists predominantly of soils, such removal will be considered part of the work covered by Section 02210 of these specifications, entitled Unclassified Excavation and Grading.

1.4 The work of clearing and grubbing shall also include the removal and satisfactory disposal of crops, weeds and other annual growth, fences, steps, walls, chimneys, column footings, other footings, foundation slabs, basements, other foundation components, signs, junked vehicles, and other rubble and debris, and the filling of holes and depressions. This work shall also be performed in all non-wooded areas within the construction limits, shown on the project plans upon which seeding and mulching, sprigging or sodding is to be performed.

As a part of the work of clearing and grubbing, the CONTRACTOR will be required to cut off and plug at the right of way or construction limits, as directed by the ENGINEER, any private water or sewer line intercepted during the construction of the project, as well as cut off and remove from the construction area any septic tank or portion thereof during the construction of the project.

1.5 Clearing and grubbing operations shall be completed sufficiently in advance of grading operations as may be necessary to prevent any of the debris from the clearing and grubbing operations from interfering with the excavation or embankment operations.



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1.6 The CONTRACTOR shall obtain, at his own expense, all necessary permits pertaining to clearing and grubbing work not already secured by the ENGINEER. The CONTRACTOR shall then provide a copy of any and all required permits to the ENGINEER.

**PART TWO – MATERIALS:**

Topsoil shall be considered to mean original surface soil, typical of the area, which is capable of supporting native plant growth, and shall be free of large stones, roots, brush, waste construction debris and other undesirable material.

**PART THREE – INSTALLATION:**

3.1 Clearing and grubbing shall be performed in areas as called for on the plans, the limits of which shall coincide with the construction limits and in general shall extend 5 feet beyond top of cut or toe of fill, not to exceed the limits of the OWNER's property. Clearing and grubbing activities shall conform to the "Standard Specifications for Highway Construction" dated 2007, published by the South Carolina Department of Transportation, except that grubbing shall be performed on all cleared excavation and embankment areas and shall include the complete removal of all stumps, roots and embedded debris.

3.2 The CONTRACTOR shall perform all clearing and grubbing operations before construction operations begin.

3.2.1 Where adjacent areas within the site but outside the limits of construction are disturbed as a result of clearing and grubbing activities, the CONTRACTOR shall remove all debris and restore to the original grades and equal or better condition.

3.2.2 The CONTRACTOR shall exercise caution to protect and maintain all existing utilities and underground works which are to remain. Any existing utilities or underground works which are to remain that are disturbed during construction shall be repaired or replaced at the CONTRACTOR's expense.

3.2.3 The CONTRACTOR must comply with all local, state and federal laws, ordinances and regulations in the removal and disposal of clearing and grubbing of all vegetation, timber, waste and all surface debris that must be hauled from the Project Site. No burning of materials will be allowed on site. The CONTRACTOR shall properly dispose of all cleared materials at his expense, in conformance with all applicable local and state laws and ordinances with the exception of any materials to be reused or recycled as directed elsewhere in this contract.

**3.3 Stripping and Storage of Topsoil**

All topsoil suitable for reuse, in the opinion of the ENGINEER, shall be stripped to its full depth, all topsoil to be moved shall be free of large stone, roots, brush, waste construction materials and other undesirable matter.

3.3.1 Topsoil stripping shall be accomplished from all topsoiled areas to be disturbed.

3.3.2 Existing lawn sods may be left to decompose with the topsoil. Heavier stands of weeds and grasses shall be removed as directed by the ENGINEER prior to the stripping operations.

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3.3.3 The topsoil shall be kept separate from other excavated materials and stored in stockpiles, the location of which shall be as directed by the ENGINEER. Topsoil shall be stockpiled so that it shall not be subject to abnormal erosion and loss, and so that it does not impede the flow of drainage runoff. The directed locations of topsoil stockpiles will, when construction sequence permits, be located in areas that have previously been graded to design rough grade.

3.3.4 Any excess topsoil shall be hauled off the OWNER's property by the CONTRACTOR at CONTRACTOR expense.

END OF SECTION 02110

**SECTION 02200 - EARTHWORK**

**PART ONE - DESCRIPTION:**

The Contractor shall furnish all labor, material, equipment, and supplies, and shall perform all earthwork including excavation and backfill, pavement removal, sheathing, bracing, shoring, pumping or bailing, dewatering, restoration and cleanup; all as indicated, specified and/or necessary to complete the work.

1.1 Any reference to SCDOT standard specifications was obtained from the "Standard Specifications for Highway Construction" dated 2007 published by the South Carolina Department of Transportation. Unless otherwise noted, the most current date published applies.

1.2 Related Work: Reference the following specifications for related work:

- 02270 Erosion and Sediment Control
- 02933 Seeding and Mulching

**PART TWO - MATERIALS:**

2.1 Fill Material: Shall be classified as ML-low plasticity silt or better by the Unified Soil Classification System and tabulated below:

	<u>Unified Class</u>	<u>Description</u>
Class I		1/4" - 1-1/2" well graded stone including coral, slag, cinders, crushed stone and crushed shells
Class II	GM	Coarse gravel well graded
	GP	Coarse gravel poorly graded
	SW	Coarse sands well graded
	SP	Coarse sands poorly graded
Class III	GM	Silty-sandy gravel
	GC	Clayey-sandy gravel
	SM	Silty-sands
	SC	Clayey-sands
Class IV	ML	Inorganic silts and fine sands

Fill material shall exhibit a plasticity index of less than 20, and Standard Proctor maximum density at optimum moisture greater than 90 pounds per cubic foot.

2.1.1 The following materials are unacceptable:

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	<u>Unified Class</u>	<u>Description</u>
Class IV	CL	Inorganic clays - low plasticity
	MH	Inorganic elastic silts
	CH	Inorganic clays - high plasticity
Class V	OL	Organic silts
	OH	Organic clays
	PT	Highly organic soil

2.2 Washed Stone: Stone material where indicated shall be crushed stone or gravel of strong, durable nature and shall conform to standard size No. 57 per SCDOT Section 804.

2.3 Class C Concrete: Minimum 28-day compressive strength of 2000 psi.

**PART THREE – CONSTRUCTION:**

**3.1 Existing Facilities:**

3.1.1 Existing Utilities Shown on the Drawings: It shall be the Contractor's responsibility to conduct the work in such a manner as to avoid damage to or interference with any utilities services shown on the drawings. If such damage, interference, or interruption of service shall occur as a result of his work, then it shall be the Contractor's responsibility to promptly notify the Engineer of the occurrence and to repair or correct it immediately, at his own expense, and to the satisfaction of the Engineer and the Owner of the Utility.

3.1.2 Existing Utilities Not Shown on the Drawings: It shall be the Contractor's responsibility to exercise all reasonable precaution in the performance of the work to avoid damage to or interference with any utilities services, even though not shown on the drawings. If such damage, interference, or interruption of service shall occur as the result of this work, then the Contractor's responsibility will be the same as stipulated in Paragraph 2.1 above.

**3.2 Excavation and Backfill - General Requirements:**

3.2.1 Pavement, gutters, sidewalks, aprons and curbs which will be disturbed by excavation shall be removed and disposed of as a part

of ordinary excavation. That which is to be removed shall be cut or sawn along clean straight lines from that which is to remain. Remove enough such that a minimum of twelve inches of undisturbed earth remain between the excavation and that which is to remain.

3.2.2 Where required, and as approved by the Engineer, sheeting and bracing shall be used to prevent injury to persons, caving of trench walls and to conform with all governing laws and ordinances. Sheeting and

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bracing shall be left in place until the trench is refilled to a safe limit. The top portion may then be removed, but the lower portion shall remain undisturbed.

3.2.3 It is the responsibility of the Contractor to provide an adequate dewatering system where required. The system shall be capable of removing any water that accumulates in the excavation and maintaining the excavation in a dry condition while construction is in progress. The surface of the ground shall be sloped away from the excavation or piping provided to prevent surface water from entering the excavation. Disposal of water resulting from the dewatering operation shall be done in a manner that does not interfere with normal drainage, and does not cause damage to any portion of the work or adjacent property. All drains, culverts, storm sewers and inlets subject to the dewatering operation shall be kept clean and open for normal surface drainage. The dewatering system shall be maintained until backfilling is completed or as otherwise directed by the Engineer. All damage resulting from the dewatering operation shall be repaired by the Contractor to the satisfaction of the Engineer and at no cost to the Owner.

3.3 The Contractor shall erect, maintain, and safeguard temporary bridges, walkways, or crossings where it is necessary to maintain traffic. Where trenches are open in the vicinity of pedestrian or vehicular travel lanes, suitable carriers will be constructed and maintained and the work will be further protected from sunset to sunrise with a sufficient number of lights or flares to fully protect the public from accidents on account of construction.

3.4 If the specified depth for foundations proves insufficient to reach firm ground, the Engineer shall be notified and will furnish instructions for proceeding with the work.

3.5 Rock, wherever used as a name for excavation material, shall mean boulders exceeding one-half cubic yard in volume or solid ledge rock, which in the opinion of the Engineer, requires for its removal drilling and blasting, or wedging or sledging and barring. Where rock excavation is necessary, the Contractor shall excavate the same as near the neat lines of the trench as practicable and he shall take all due precautions in the pursuance of the work. He will be held strictly responsible for all injury to life and to public and private property.

3.5.1 Rock shall be removed from the excavation to the following limits:

- a. Trenches - The diameter of the pipe plus 8-inches on each side, extending six inches below the pipe wall and bell.
- b. Structures - 12-inches beyond the vertical plane of the structure on all sides and on the bottom only to the depth necessary for proper installation.

3.6 Blasting: Prior to commencing any blasting operations the Contractor shall notify the Engineer and either the Local Fire Department - Fire Prevention Section or the County Fire Administrator (as applicable) and obtain blasting permits as required. The Contractor must furnish proof (certification) of insurance specifically covering any and all obligations assumed pursuant to the use of explosives.

All blasting operations shall be conducted in strict accordance with any and all decrees, rules, regulations, ordinances, laws as may be imposed by any regulatory body and/or agency having jurisdiction over the work relative to handling, transporting, use and storage of explosives. Blasting shall be done only by competent, and experienced men whose activities shall be conducted in a workmanlike manner.

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Satisfactory information must be provided to the Engineer, that the blaster meets or exceeds the qualifications enumerated in OSHA Regulations Part 1926, Subpart U, Section 1926.901 - Blaster Qualifications.

3.6.1 Overburden: Undisturbed overburden may be deemed adequate in lieu of matting but only after the actual depth of the undisturbed overburden has been determined and adjudged sufficient by the Engineer. Under no circumstances will loose or fill overburden be adequate without the use of weighted mats.

3.6.2 Permission to Blast: The Contractor shall not be allowed to blast before 9 a.m. or after 3 p.m. without approval of the Engineer and Owner. Blasting will not occur within any rights-of-way maintained by any agency (D.O.T., R.R., Gas, Owner, etc.) without specific approval of the controlling agency and only in accordance with their respective requirements (as exceeded herein).

The Contractor shall be held responsible for any and all injury to persons or damage to public or private property.

**PART FOUR – STRUCTURE EXCAVATION AND BACKFILL:**

4.1 Structure Excavation shall be made at the locations shown on the plans and to the exact subgrade required. Bottom of excavations shall be level and in firm, solid material, with soft material or voids treated as specified. Excavated areas shall be kept free of water during the construction period. Where either will stand, footing trenches may be cut to the exact size of the footings; otherwise, forms shall be used. Where necessary, sides of excavations shall be shored and sheathed, or cofferdams built, as required for protection of the work and personnel.

4.1.1 Wherever excavation for a foundation extends below the water table or where specifically indicated on the plans, washed stone shall be placed to a minimum thickness of 12 inches, unless otherwise shown, prior to placing the foundation. The washed stone shall be compacted to 90% of maximum as determined by the Standard Proctor test (ASTM D698).

4.1.2 If the specified depth for foundations proves insufficient to reach firm ground, the Engineer shall be notified for furnishing instructions and proceeding with the work.

4.1.3 An adequate dewatering system shall be provided at all structure excavations and elsewhere as directed by the Engineer. If a well-point system is used, the Contractor shall submit plans to the Engineer for approval. The system shall be capable of removing any water that accumulates in the excavation and maintaining the excavation in a dry condition while construction is in progress. The surface of the ground shall be sloped away from the excavation or piping provided to prevent surface water from entering the excavation. Disposal of water resulting from the dewatering operation shall be done in a manner that does not interfere with normal drainage, and does not cause damage to any portion of the work or adjacent property. All drains, culverts, storm sewers and inlets subject to the dewatering operation shall be kept clean and open for normal surface drainage. The dewatering system shall be maintained until backfilling is complete or as otherwise directed by the Engineer. All damage resulting from the dewatering operation shall be repaired by the Contractor to the satisfaction of the Engineer and at no cost to the Owner.

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4.2 Structure Backfill shall be done with material free from large clods, frozen earth, organic material or any foreign matter, and shall evenly and carefully be placed and tamped in horizontal layers. Compaction equipment specifically designed for these purposes must be present and operational at the job site and shall be utilized throughout to obtain uniform compaction. The degree of compaction and the density shall be determined by the Standard Proctor Test (ASTM D698), with compaction requirements as follows:

<u>Percent of Maximum Density at Optimum Moisture</u>	<u>Location</u>
98	Top 12" of fill pavement or surfacing.
98	Full depth beneath all roads (paved or unpaved), driveways, sidewalks, undercut backfill for structure excavation, and lot fill.
95	All other areas not defined above.

4.2.1 No backfill shall be placed against a structural wall until all connecting structural members are in place. It shall be the Contractor's responsibility to provide compaction to such a degree that subsidence after placing shall not be detrimental to the stability or appearance of the structure, adjacent ground, or paved areas. The Contractor shall provide adequate protection to all structures during backfilling and shall use every precaution to avoid damaging or defacing them in any way. Contractor shall be responsible for the protection of all structures from damage or flotation prior to backfill being placed.

4.2.2 Unless otherwise approved by the Engineer, liquid-retaining structures shall not be backfilled until tested for leakage.

**PART FIVE – UNSTABLE SUBGRADE:**

5.1 Should unstable soil, organic soil, or soil types classified as fine-grained soils (silts and clays) by ASTM D-2487 be encountered in the bottom of pipe trenches or structure excavations, such soils shall be removed to a depth and width determined by the Engineer, properly disposed of and shall be backfilled with crushed stone conforming to the Department of Transportation Specifications, Size 57. Placement shall not exceed 12-inches loose and compacted to 90% of the dry density determined by the Standard Proctor test ASTM D698 (Class C concrete may be substituted in place of #57 stone at the Contractor's option. A 24-hour cure must be given before proceeding with the work).

**PART SIX – SITE GRADING:**

Site grading shall conform to the grades indicated by the finish contours on the plans. Where topsoil, pavement, gravel or crushed stone surfacing and other items are shown, rough grade shall be finished to such depth below finish grade as necessary to accommodate these items. All areas where structures are to be built on fill shall be stripped to such depth as necessary to remove turf, roots, organic matter and other objectionable materials.

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6.1 Excavation shall be made to the exact elevations, slopes and limits shown on the plans.

6.1.1 Material excavated may be used as fill material as long as it meets the material requirements established herein. Acceptable material must be stockpiled neatly onsite and clear of all unsuitable materials to be removed from the site.

6.2 Fill: Shall incorporate only acceptable materials defined herein. It shall not contain organic material, roots, debris or rock larger than 6 inches in diameter.

6.2.1 Where fill is to be placed, all existing vegetation, roots and other organic matter down to 12 inches below grade shall be stripped and disposed of as directed.

6.2.2 After clearing existing vegetation, at the Engineer's discretion, the site may require proof rolling to insure that all unstable material has been removed. Proof rolling shall be done in the Engineer's presence, utilizing a fully loaded pan or tandem axle truck.

6.2.3 Fill shall be placed in successive compacted layers not to exceed 6 inches compacted thickness. Each layer shall be spread evenly and compacted as specified below before the next layer is placed.

6.2.4 Rock shall not be incorporated in fill sections supporting pavement or structures.

6.2.5 Where natural slopes exceed 3:1, horizontal benches shall be cut to receive fill material. Slopes of less than 3:1 and other areas shall be scarified prior to placing fill material.

6.2.6 Borrow material, as required, shall be provided by the Contractor at his own expense. Borrow material on site may be utilized provided it complies with these specifications.

6.3 Compaction: Unless otherwise noted, each layer of fill and backfill and the top 12 inches of existing subgrade material in cuts shall be compacted by approved equipment as specified below. The degree of compaction and the density shall be determined by the Standard Proctor Test (ASTM D698).

	Percent of Max. Dry Density at <u>Optimum Moisture Content</u>
Top 12 inches of fill under pavement or surfacing	98%
Fill under roads, structures, and lots	98%
Fill and backfill in other areas	95%

Material too dry for proper compaction shall be moistened by suitable watering devices, turned and harrowed to distribute moisture, and then properly compacted. When material is too wet for proper compaction, operations shall cease until such material has sufficiently dried.



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**PART SEVEN – COMPACTION TESTS:**

The Owner shall provide compaction tests by an independent testing agency selected by the Owner and approved by the Engineer. The compaction tests shall be taken at appropriate locations and frequency to demonstrate that the backfill (or fill) has been placed to meet the minimum compaction density required. The testing agency shall submit written test records to the Engineer and the Owner for all compaction tests performed. Minimum testing shall be:

1. One test per 250 L.F. of trench cut for every 2 feet of backfill placed.
2. One test per 10,000 square feet of fill placed for every foot of fill thickness.

In the event that the soil compaction is not in compliance with these specifications, then the Contractor shall take corrective action, at no cost to the Owner, to compact the soils within the limits of the specifications. The Engineer and Owner shall be notified within 24 hours of any failing compaction tests. Any retesting of failed areas shall be performed only after corrective measures have been made by the Contractor to bring the compacted soils into compliance. All retesting shall be performed with the Engineer present.

**PART EIGHT – SITE RESTORATION:**

8.1 General: All surfaces disturbed by the Contractor in the work shall be restored to a condition equal to or better than that which existed prior to commencement of the work, except as otherwise specified herein.

8.2 Pipe drains, headwalls, catch basins, curbs and gutters, and all incidental drainage structures shall be restored using like materials and details at no additional cost to the Owner. The Contractor shall maintain drainage during construction.

8.3 All cuts, fills and slopes shall be neatly dressed off to the required grade or subgrade, as indicated on the plans.

8.4 Grassed areas shall be restored at no additional cost to the Owner. Disturbed areas shall be covered with two (2) inches of topsoil, furnished by the Contractor from an approved source and of approved quality, then shall be fertilized, and seeded to match existing adjoining areas. All ditches shall be restored to their existing grade, line and cross section.

8.5 Paved surfaces shall be restored in accordance with the provisions of Section 02575.

END OF SECTION 02200

**SECTION 02210 - UNCLASSIFIED EXCAVATION AND GRADING**

**PART ONE – DESCRIPTION:**

This portion of the project includes the excavation, undercut excavating, grading, earthwork and compaction required as shown on the plans and all other associated miscellaneous items of earthwork construction, as shown on the plans. The CONTRACTOR shall furnish all materials, labor, equipment and incidental items necessary to complete this portion of the work as detailed on the plans and as called for in these Specifications.

1.1. Any reference to standard specifications refers to the most current published date published of the following specification or regulation unless otherwise noted.

All unclassified excavation shall be in accordance with Section 203 and in the event “Borrow Fill” is required, of the latest version of the "Standard Specifications for Highway Construction", published by the South Carolina Department of Transportation, dated 2007, unless otherwise directed herein.

1.2. Any reference to standard specifications refers to the most current published date of the following specification unless otherwise noted:

Reference the following specifications for related work:

- 02110 Clearing and Grubbing
- 02222 Excavating, Backfilling, and Compacting for Utilities
- 02933 Seeding and Mulching
- ASTM D698C
- State Highway Specifications referred to in Section 1.1

1.3. Definitions

Trench Rock: That rock within the trenching limits that must be removed for utility construction.  
Mass Rock: That rock which must be removed by blasting to permit reaching one foot below the design finish grade.

Geotechnical Engineer, also known as the “Project Geotechnical Engineer”: Professional soils engineer hired by the CONTRACTOR and approved by the ENGINEER for this project.

Surveyor: Licensed surveyor hired by the CONTRACTOR and approved by the ENGINEER for this project.

**PART TWO – MATERIALS:**

2.1. Topsoil shall be considered to mean original surface soil, typical of the area, which is capable of supporting native plant growth, and shall be free of large stones, roots, brush, waste, construction debris and other undesirable material or contamination.

2.2. All fill used for site grading operations should consist of a clean (free of organics and debris) low plasticity soil (plasticity index less than 30).

**PART THREE – INSTALLATION:**

3.1. General Requirements

- 3.1.1. In the event a subsurface investigation report has been prepared for this project, all excavation, filling and grading shall be performed in accordance with the recommendations of the subsurface report, and under the direction of the project geotechnical ENGINEER.
- 3.1.2. Construction stakeout will be by a licensed survey firm provided by the CONTRACTOR. Exact locations and grade points are to be staked or fixed by the surveying firm before construction. The CONTRACTOR shall not disturb any benchmarks, reference stakes or property line monuments. In the event it becomes necessary to remove any benchmark, reference stake or property line monument in the performance of the work, the CONTRACTOR shall reference such points in preparation for replacement. If any such points are disturbed or damaged, they shall be replaced by a Registered Land Surveyor in the state where the work is located at the expense of the CONTRACTOR.
- 3.1.3. Existing utility lines (either overhead or underground), sidewalks, fencing, pavement or other structures shown on the drawings, shown to the CONTRACTOR or mentioned in the plans and specifications shall be kept free of damage by the CONTRACTOR's operations. It shall be the responsibility of the CONTRACTOR to verify the existence and location of all underground utilities within the Project Site. The omission from or the inclusion of utility locations on the plans is not to be considered as the non-existence of or a definite location of existing underground utilities. Any existing construction damaged by the CONTRACTOR shall be restored to an equal condition as that existing at the time prior to damage, at the CONTRACTOR's expense. If any existing utility is inadvertently damaged during construction, the CONTRACTOR shall notify the utility, the ENGINEER and the OWNER of said damaged utility at once so that emergency repairs may be made at the CONTRACTOR's expense and to the satisfaction of the party having jurisdiction of the utility.

3.2. Unclassified Excavation

- 3.2.1. Upon completion of the stripping operations, and after all excavation of the site has been completed to the lines and grades shown on the drawings, the exposed subgrade in cut areas should be proofrolled as specified herein for areas to receive fill. Any areas which deflect, rut or pump excessively during the proofrolling or fail to "tighten up" after successive passes should be undercut to suitable soils and replaced with compacted fill.
- 3.2.2. All site excavation shall be unclassified regardless of the nature of the materials encountered with the exception of rock excavation. Only that material which in the opinion of the ENGINEER cannot be removed with a caterpillar D-9 or equal, equipped with a properly fitted single tooth ripper, or removed by a caterpillar 225 backhoe or equal, equipped with rock teeth, will be regarded as rock. The ENGINEER should be notified immediately if rock is encountered. All excavation materials which are not required for fills shall be considered as waste and shall be disposed of off the OWNER's property unless directed otherwise by the OWNER in writing.
- 3.2.3. All site excavation of previously stockpiled or buried construction, clearing or demolition debris or any other refuse shall be properly disposed of offsite at the CONTRACTOR's expense. The CONTRACTOR shall obtain all necessary Federal, State or Local permits for transporting and disposing of such material, at his expense.

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- 3.2.4. Rock in the bottom of roadway cuts shall be excavated to a depth of 1 foot below the roadbed and ditches. Rock in building pad areas shall be excavated to a depth of 1 foot below finished grade or as indicated on the grading plans.
- 3.2.5. The CONTRACTOR shall provide all sheeting, shoring, underpinning and bracing required to hold the sides of the excavation and for the protection of all adjacent structures. The CONTRACTOR shall be held responsible for any damage to any part of the work by failure of excavated sides or bottoms.
- 3.3. Blasting
- 3.3.1. Any and all blasting operations shall be conducted in strict accordance with existing ordinances and regulations relative to storage and use of explosives. Blasting shall be done only by experienced men and extreme caution and care shall be exercised to prevent injury to persons or damage to any pipe, mains, wires, drains, buildings, railroad tracks or other property above or below the surface of the ground. The CONTRACTOR shall use safety nets or other equivalent measures as approved by the ENGINEER to reduce the possibility of flying rock as a result of blasting operations. The CONTRACTOR shall be held strictly responsible for any injury to persons or damage to public or private property.
- 3.3.2. The CONTRACTOR shall submit blasting plans to the ENGINEER for review and shall not proceed with blasting operations until approval has been granted. As directed by the ENGINEER, blasting operations shall be monitored to insure that vibration levels produced by blasting are within tolerable limits.
- 3.3.3. The CONTRACTOR shall obtain at his expense, all Federal, State and Local permits required to perform blasting operations.
- 3.4. Dewatering
- 3.4.1. The CONTRACTOR shall control the grading in all areas so that the surface of the ground will be properly sloped, diked or ditched to prevent water from entering into excavated areas. The CONTRACTOR shall maintain sufficient personnel and equipment to promptly and continuously remove all water, from any source, entering or accumulating in the excavation or other parts of the work. All water pumped or drained from these areas shall be disposed of in a suitable manner without damaging adjacent property or other work under construction.
- 3.5. Embankments, Fills and Backfills
- 3.5.1. Upon completion of the stripping operations, the exposed subgrade in areas to receive fill should be proofrolled with a loaded dumptruck or similar pneumatic-tired vehicle with a minimum loaded weight of 25 tons, under the supervision of the geotechnical ENGINEER. The proofrolling procedure should consist of four complete passes of the exposed areas with two of the passes being in a direction perpendicular to the preceding ones. Any areas that deflect, rut or pump excessively during the proofrolling or fail to "tighten up" after successive passes should be undercut to suitable soils and replaced with compacted fill.
- 3.5.2. Embankments and fills shall be constructed at the locations and to the lines and grades indicated on the drawings. Material shall be placed in horizontal layers not to exceed 8 inches in loose

depth and thoroughly compacted prior to placing each following layer. All fill material shall be free from roots or other organic material, trash, and from all stones having any one dimension greater than 6 inches. Stones larger than 4 inches, maximum dimension, shall not be permitted in the upper 6 inches of fill or embankment. Fill areas shall be kept level with graders or other approved devices.

3.5.3. Embankment and fill compaction shall be accomplished by thoroughly compacting each layer with sheep foot rollers, pneumatic rollers, and mechanical tampers in places inaccessible to rollers, or other equipment. When material has too much moisture, grading operations shall be limited to drying soil by spreading and turning for drying by the sun and aeration. When material is dry, moisture shall be added by sprinkling by approved means.

3.5.4. All embankments and fills shall be compacted to the following percentages of the maximum dry density as determined by the Standard Proctor Density Test, ASTM D-698, Method C.

3.5.5. The following table shall be used unless otherwise specified:

<u>TABLE OF COMPACTION</u>		
Type Fill or Embankment	Zone	Minimum Density %
Structure	All Depths	98
Roadway and	Top 12 Inches	98
Other Areas	Remainder	95

Embankment types are defined as follows:

Structure - beneath concrete slabs of buildings, floors, foundations, etc.

Roadway and Parking - beneath all roads, streets, truck operations, and automobile parking lots

3.5.6. Where backfilling is required after the completion of drainage structures, all forms, trash, and construction debris shall be removed from excavation before backfilling begins. Backfill shall be placed in horizontal layers of 6 inches in loose depth. Compaction shall conform to requirements in the above table. Heavy rollers, crawler equipment, trucks or other heavy equipment shall not be used for compacting backfill within 5 feet of structure walls or other facilities which may be damaged by their weight or operation. No backfilling shall begin until concrete and masonry walls are properly cured.

3.5.7. The CONTRACTOR shall carry the top of embankments, fills, or backfills to the surrounding grade so that upon compaction and subsequent settlement, the grade will be at proper elevation. Should settlement occur during the guarantee period of the contract, the CONTRACTOR shall provide sufficient fill to bring area up to finished grade and shall reseed as required.

3.6. Proofrolling Schedule

3.6.1. Proofrolling under the observation of the geotechnical ENGINEER will be performed using a loaded dumptruck or similar pneumatic-tired vehicle with a minimum loaded weight of 25 tons as specified herein and as follows.

- 3.6.2. Immediately following stripping, all areas to receive fill shall be proofrolled as specified herein.
- 3.6.3. Immediately following the completion of excavation to proposed grades in cut areas, proofrolling shall be performed as specified herein.
- 3.6.4. Immediately prior to stone base course placement in pavement areas and following final floor slab preparation, all subgrade areas will be proofrolled. Any local areas that deflect, rut or pump under the roller shall be undercut and replaced with compacted fill material as specified herein.
- 3.7. Soil Inspection and Tests
- 3.7.1. All excavated and fill material shall be removed, selected, placed and compacted under supervision of a representative of a commercial soils testing laboratory which will be selected by the OWNER and approved by the ENGINEER. A commercial soil testing laboratory shall be any firm properly equipped to perform such compaction tests and who has in their employment a Professional ENGINEER experienced in testing and soil mechanics. The laboratory representative shall have the authority to approve or disapprove the condition of the subgrade on which fill is to be placed, filled material, placement methods, compaction methods, and shall make compaction density tests as necessary to determine that the specified density is obtained. The CONTRACTOR shall notify the laboratory at least three (3) days prior to starting fill operations in order that suitability of material for compaction may be checked and no material shall be used that has not been previously checked and approved by the laboratory. The laboratory shall be notified before any cut is made or fill is placed in order that the laboratory representative may be present during all grading operations. The CONTRACTOR shall remove, replace, recompact and retest all fills failing to meet the density requirements at his own expense.
- 3.7.2. A soil testing laboratory shall be retained by the OWNER and approved by the ENGINEER to supervise fill placement and compaction. Extra time and trips caused by excessive delay, failure of the CONTRACTOR to properly coordinate with the laboratory, or failure of the CONTRACTOR to properly compact fill material shall be the responsibility of the CONTRACTOR.
- 3.7.3. Field density tests shall be performed by the OWNER's testing agency for each one foot of fill material placed at the following frequency: once per day.
- 3.7.4. A minimum of one field density test shall be made for each 5,000 square feet of fill placement in building areas.
- 3.7.5. A minimum of one field density test shall be made for each 10,000 square feet of fill placement in all other areas where pavement is to be placed.
- 3.7.6. Prior to final acceptance, the Soils ENGINEER and Surveyor shall submit certification specifying that the project compaction criteria and subgrading elevations have been satisfactorily obtained. The CONTRACTOR is responsible for the certification statement from the Surveyor. This certification should be in the form of a letter accompanied by a stamped as-built drawing showing spot elevations.
- 3.8. Borrow and Waste Materials

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3.8.1. Borrow

In the event borrow material is required, the borrow material shall be checked for suitability for compaction and approved by the soils testing laboratory. The CONTRACTOR shall notify the laboratory at least three (3) days in advance of beginning borrow operations. Borrow excavation shall be performed in accordance with referenced State Highway construction Specification in which state the project is located except where modified herein.

3.8.2. Waste

Excavated materials not suited for backfill and excavated material in excess of that needed to complete the work shall be wasted on the project site where directed by the ENGINEER or hauled off the OWNER's property at the CONTRACTOR's expense. Waste areas shall be left in a graded and sloped condition to allow natural drainage of surrounding area.

3.9. Residual Soil Areas

If proofrolling indicates that on-site virgin soils supporting any roadway, parking, building or other structural areas are not adequate as determined by the Soils ENGINEER, then these unsuitable areas shall be repaired by the CONTRACTOR. The necessary repair procedure shall be determined by the Soils ENGINEER and may include scarifying, drying and recompaction procedures or undercutting and replacement procedures.

3.10. Final Grading

3.10.1. On completion of all grading, all graded areas (except building pads and pavement areas in rough grading contracts and all cut slopes steeper than 4:1 slope) shall be provided with 4 inches of topsoil and brought to the finished grades shown on the drawings. Areas disturbed by operations of the CONTRACTOR shall be properly returned to their original condition with a topsoil covering of 4 inches.

3.10.2. After the entire graded area has been brought to the finished grades shown on drawings, all areas shall be left smooth and free from erosion, ridges, ditches and evidence of ponding. Final grades shall be free from all roots, debris, rock and soil lumps and left in readiness for seeding.

3.10.3. Prior to acceptance of the entire project, the CONTRACTOR shall correct all embankments and graded areas of all damages due to washes, settlement, erosion, equipment ruts or any other cause at his expense.

3.10.4. Prior to final acceptance, the CONTRACTOR shall provide certification as specified in paragraph 3.7.6 that all grades are + .1 foot of the finished grades shown on project drawings.

3.10.5. The CONTRACTOR shall stabilize all disturbed areas, unless otherwise directed, by seeding and mulching per section 02933 of these specifications or other means of stabilization called for by the contract drawings.

3.11. Clean-Up

Upon completion or termination of the work, and before final payment is made, the CONTRACTOR shall remove from site all equipment, waste materials and rubbish resulting from his operations. In the event of his failure to do so, the same may be done by the OWNER at the expense of the CONTRACTOR.

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END OF SECTION 02210



**SECTION 02222 - EXCAVATING, BACKFILLING & COMPACTING FOR UTILITIES**

**PART ONE – DESCRIPTION:**

The CONTRACTOR shall furnish all labor, material, equipment, and supplies, and shall perform all earthwork including excavation and backfill, pavement removal, sheathing, bracing, shoring, pumping or bailing, dewatering, restoration and cleanup, all as indicated, specified and/or necessary to complete the work.

1.1 Any reference to standard specifications refers to the most current published date of the following specification unless otherwise noted.

1.2 Related Work

Reference the following Specifications Sections for related work:

- 02270 Erosion and Sediment Control
- 02575 Pavement Repair and Resurfacing
- 02933 Seeding and Mulching
- 03300 Cast-in-Place Concrete

Reference the following National Specifications for related work

- D-2487 ASTM Uniform Soil Classification System, 1991 (US Army Corp of Engineers Standard as revised by the US ACE and the Bureau of Reclamation in 1952)
- D-698 ASTM Compaction Testing
- P-1926 OSHA Regulations

1.2. References

1.2.1 Any reference to Standard National or State Specifications and/or Regulations refers to the most current published date of the specification or regulation unless otherwise noted.

The design, manufacture, and installation of these materials shall meet or exceed the applicable provisions and recommendations of the noted National Specifications and/or Regulations or meet the requirements of the latest revision of these specifications or regulations.

1.2.2. Any reference to SCDOT standard specifications was obtained from the “Standard Specifications for Highway Construction” dated 2007, published by the South Carolina Department of Transportation.

**PART TWO – MATERIALS:**

2.1 Fill Material shall be classified as ML-low plasticity silt or better by the Unified Soil Classification System and tabulated below:

	Unified Class	Description
Class I		1/4" - 1-1/2" well graded stone including coral, slag, cinders, crushed stone and crushed shells
Class II	GM	Coarse gravel well graded
	GP	Coarse gravel poorly graded
	SW	Coarse sands well graded
	SP	Coarse sands poorly graded

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Class III	GM	Silty-sandy gravel
	GC	Clayey-sandy gravel
	SM	Silty-sands
	SC	Clayey-sands
Class IV	ML	Inorganic silts and fine sands

Fill material shall exhibit a plasticity index of less than 20 and Standard Proctor maximum density at optimum moisture greater than 90 pounds per cubic foot.

The following materials are unacceptable

	Unified Class	Description
Class IV	CL	Inorganic clays - low plasticity
	MH	Inorganic elastic silts
	CH	Inorganic clays - high plasticity
Class V	OL	Organic silts
	OH	Organic clays
	PT	Highly organic soil

**2.2 Washed Stone**

Stone material where indicated shall be crushed stone or gravel of strong, durable nature and shall conform to standard size No. 57 stone in SCDOT Appendix 6:

1 1/2"	100%
1"	95-100%
1/2"	25-60%
#4	0-10%
#8	0-5%

**2.3 Class C Concrete**

Minimum 28-day compressive strength of 2000 psi.

**PART THREE – CONSTRUCTION:**

**3.1 Existing Facilities**

**3.1.1 Existing Utilities Shown on the Drawings**

It shall be the CONTRACTOR's responsibility to conduct the work in such a manner as to avoid damage to or interference with any utilities services shown on the drawings. If such damage, interference, or interruption of service shall occur as a result of his work, then it shall be the CONTRACTOR's responsibility to promptly notify the ENGINEER of the occurrence and to repair or correct it immediately, at his own expense, and to the satisfaction of the ENGINEER and the OWNER of the Utility.

**3.1.2 Existing Utilities Not Shown on the Drawings**

It shall be the CONTRACTOR's responsibility to exercise all reasonable precaution in the performance of the work to avoid damage to or interference with any utilities services, even though not shown on the drawings. If such damage, interference, or interruption of service shall occur as the result of this work, then the CONTRACTOR's responsibility will be the same as stipulated in Paragraph 3.1.1 above.

**3.2 Excavation and Backfill - General Requirements**

3.2.1 Pavement, gutters, sidewalks, aprons and curbs which will be disturbed by excavation shall be removed and disposed of as a part of ordinary excavation. That which is to be removed shall be cut or sawn along clean straight lines from that which is to remain. Remove enough such that a minimum of twelve inches of undisturbed earth remain between the excavation and that which is to remain.

3.2.2 Where required, and as approved by the ENGINEER, sheeting and bracing shall be used to prevent injury to persons, caving of trench walls and to conform with all governing laws and ordinances. Sheeting and bracing shall be left in place until the trench is refilled to a safe limit. The top portion may then be removed, but the lower portion shall remain undisturbed.

3.2.3 It is the responsibility of the CONTRACTOR to provide an adequate dewatering system where required. The system shall be capable of removing any water that accumulates in the excavation and maintaining the excavation in a dry condition while construction is in progress. The surface of the ground shall be sloped away from the excavation or piping provided to prevent surface water from entering the excavation. Disposal of water resulting from the dewatering operation shall be done in a manner that does not interfere with normal drainage, and does not cause damage to any portion of the work or adjacent property. All drains, culverts, storm sewers and inlets subject to the dewatering operation shall be kept clean and open for normal surface drainage. The dewatering system shall be maintained until backfilling is completed or as otherwise directed by the ENGINEER. All damage resulting from the dewatering operation shall be repaired by the CONTRACTOR to the satisfaction of the ENGINEER and at no cost to the OWNER.

3.3 The CONTRACTOR shall erect, maintain, and safeguard temporary bridges, walkways, or crossings where it is necessary to maintain traffic. Where trenches are open in the vicinity of pedestrian or vehicular travel lanes, suitable carriers will be constructed and maintained and the work will be further protected from sunset to sunrise with a sufficient number of lights or flares to fully protect the public from accidents on account of construction.

3.4 If the specified depth for foundations proves insufficient to reach firm ground, the ENGINEER shall be notified and will furnish instructions for proceeding with the work.

3.5 Rock, wherever used as a name for excavation material, shall mean boulders exceeding one-half cubic yard in volume or solid ledge rock, which in the opinion of the ENGINEER, requires for its removal drilling and blasting, or wedging or sledging and barring. Where rock excavation is necessary, the CONTRACTOR shall excavate the same as near the neat lines of the trench as practicable and he shall take all due precautions in the pursuance of the work. He will be held strictly responsible for all injury to life and to public and private property.

3.5.1 Rock shall be removed from the excavation to the following limits:

3.5.1.1 Trenches - The diameter of the pipe plus 8-inches on each side, extending six inches below the pipe wall and bell.

3.5.1.2 Structures - 12-inches beyond the vertical plane of the structure on all sides and on the bottom only to the depth necessary for proper installation.

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**3.6 Blasting**

Prior to commencing any blasting operations the CONTRACTOR shall notify the ENGINEER, OWNER and either the Local Fire Department - Fire Prevention Section or the County Fire Administrator (as applicable) and obtain blasting permits as required. Blasting must be done by a licensed blaster. Blasting and magazine permits must be obtained from the South Carolina Department of Labor, Licensing, and Regulation. The CONTRACTOR must furnish proof (certification) of insurance specifically covering any and all obligations assumed pursuant to the use of explosives.

All blasting operations shall be conducted in strict accordance with any and all decrees, rules, regulations, ordinances, laws as may be imposed by any regulatory body and/or agency having jurisdiction over the work relative to handling, transporting, use and storage of explosives. Blasting shall be done only by competent and experienced men whose activities shall be conducted in a workmanlike manner. Satisfactory information must be provided to the ENGINEER, that the blaster meets or exceeds the qualifications enumerated in OSHA Regulations Part 1926, Subpart U, Section 1926.901 - Blaster Qualifications.

The CONTRACTOR shall protect all structures from the effects of the blast and repair any resulting damage. If the CONTRACTOR repeatedly uses excessive blasting charges or blasts in an unsafe or improper manner, the ENGINEER may direct the CONTRACTOR to employ an independent blasting consultant to supervise the preparation for each blast and approve the quantity of each charge.

**3.6.1 Overburden**

Undisturbed overburden may be deemed adequate in lieu of matting but only after the actual depth of the undisturbed overburden has been determined and adjudged sufficient by the ENGINEER. Under no circumstances will loose or fill overburden be adequate without the use of weighted mats.

**3.6.2 Permission to Blast**

The CONTRACTOR shall not be allowed to blast before 9 a.m. or after 3 p.m. without approval of the ENGINEER and OWNER. Blasting will not occur within any rights-of-way maintained by any agency (D.O.T., R.R., Gas, OWNER, etc.) without specific approval of the controlling agency and only in accordance with their respective requirements (as exceeded herein). The CONTRACTOR shall be held responsible for any and all injury to persons or damage to public or private property.

**3.6.3** The CONTRACTOR shall not use excavated rock as backfill material. Dispose of rock which is surplus or not suitable for use as rip rap.

**3.6.4 Monitoring**

The CONTRACTOR shall notify the ENGINEER prior to any blasting. Additionally, the CONTRACTOR shall notify the ENGINEER before any charge is set. Following review by the ENGINEER regarding the proximity of permanent structures to the blasting site, the ENGINEER may direct the CONTRACTOR to employ an independent, qualified specialty sub-contractor, approved by the ENGINEER, to monitor the blasting by use of seismograph, identify the areas where light charges must be used, conduct pre-blast and post-blast inspections of structures, including photographs or videos, and maintain a detailed written log.

3.7. Structure Excavation and Backfill

3.7.1 Structure Excavation shall be made at the locations shown on the plans and to the exact subgrade required. Bottom of excavations shall be level and in firm, solid material, with soft material or voids treated as specified. Excavated areas shall be kept free of water during the construction period. Where earth will stand, footing trenches may be cut to the exact size of the footings; otherwise, forms shall be used. Where necessary, sides of excavations shall be shored and sheathed, or cofferdams built, as required for protection of the work and personnel.

3.7.1.1 Wherever excavation for a foundation extends below the water table or where specifically indicated on the plans, washed stone shall be placed to a minimum thickness of 12 inches, unless otherwise shown, prior to placing the foundation. The washed stone shall be compacted to 90% of maximum as determined by the Standard Proctor test (ASTM D698).

3.7.1.2 If the specified depth for foundations proves insufficient to reach firm ground, the ENGINEER shall be notified for furnishing instructions and proceeding with the work.

3.7.1.3 An adequate dewatering system shall be provided at all structure excavations and elsewhere as directed by the ENGINEER. If a well-point system is used, the CONTRACTOR shall submit plans to the ENGINEER for approval. The system shall be capable of removing any water that accumulates in the excavation and maintaining the excavation in a dry condition while construction is in progress. The surface of the ground shall be sloped away from the excavation or piping provided to prevent surface water from entering the excavation. Disposal of water resulting from the dewatering operation shall be done in a manner that does not interfere with normal drainage, and does not cause damage to any portion of the work or adjacent property. All drains, culverts, storm sewers and inlets subject to the dewatering operation shall be kept clean and open for normal surface drainage. The dewatering system shall be maintained until backfilling is complete or as otherwise directed by the ENGINEER. All damage resulting from the dewatering operation shall be repaired by the CONTRACTOR to the satisfaction of the ENGINEER and at no cost to the OWNER.

3.8. Structure Backfill shall be done with material free from large clods, frozen earth, organic material or any foreign matter, and shall evenly and carefully be placed and tamped in horizontal layers. Compaction equipment specifically designed for these purposes must be present and operational at the job site and shall be utilized throughout to obtain uniform compaction. The degree of compaction and the density shall be determined by the Standard Proctor Test (ASTM D698), with compaction requirements as follows:

<u>Percent of Maximum Density at Optimum Moisture</u>	<u>Location</u>
98	Top 12" of fill pavement or surfacing
98	Full depth beneath all roads (paved or unpaved), driveways, sidewalks, undercut backfill for structure excavation, and lots
95	All other areas not defined above

3.8.1 No backfill shall be placed against a structural wall until all connecting structural members are in place. It shall be the CONTRACTOR's responsibility to provide compaction to such a degree that subsidence after placing shall not be detrimental to the stability or appearance of the structure, adjacent

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ground, or paved areas. The CONTRACTOR shall provide adequate protection to all structures during backfilling and shall use every precaution to avoid damaging or defacing them in any way. CONTRACTOR shall be responsible for the protection of all structures from damage or flotation prior to backfill being placed.

3.8.2 Unless otherwise approved by the ENGINEER, liquid-retaining structures shall not be backfilled until tested for leakage.

3.9. Unstable Subgrade

Should unstable soil, organic soil, or soil types classified as fine-grained soils (silts and clays) by ASTM D-2487 be encountered in the bottom of pipe trenches or structure excavations, such soils shall be removed to a depth and width determined by the ENGINEER, properly disposed of and shall be backfilled with crushed stone conforming to the Department of Transportation Specifications, Size 57. Placement shall not exceed 12-inches loose and compacted to 90% of the dry density determined by the Standard Proctor Test ASTM D698 (Class C concrete may be substituted in place of #57 stone at the CONTRACTOR's option. A 24-hour cure must be given before proceeding with the work).

3.10. Site Grading

Site grading shall conform to the grades indicated by the finish contours on the plans. Where topsoil, pavement, gravel or crushed stone surfacing and other items are shown, rough grade shall be finished to such depth below finish grade as necessary to accommodate these items. All areas where structures are to be built on fill shall be stripped to such depth as necessary to remove turf, roots, organic matter and other objectionable materials.

3.10.1 Excavation shall be made to the exact elevations, slopes and limits shown on the plans. Material excavated may be used as fill material as long as it meets the material requirements established herein. Acceptable material must be stockpiled neatly onsite and clear of all unsuitable materials to be removed from the site.

3.10.2 Fill shall incorporate only acceptable materials defined herein. It shall not contain organic material, roots, debris or rock larger than 6 inches in diameter.

3.10.2.1 Where fill is to be placed, all existing vegetation, roots and other organic matter down to 12 inches below grade shall be stripped and disposed of as directed.

3.10.2.2 After clearing existing vegetation, at the ENGINEER's discretion, the site may require proof rolling to insure that all unstable material has been removed. Proof rolling shall be done in the ENGINEER's presence, utilizing a loaded dumptruck or similar pneumatic-tired vehicle with a minimum loaded weight of 25 tons.

3.10.2.3 Fill shall be placed in successive compacted layers not to exceed 6 inches compacted thickness. Each layer shall be spread evenly and compacted as specified below before the next layer is placed.

3.10.2.4 Rock shall not be incorporated in fill sections supporting pavement or structures.

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3.10.2.5 Where natural slopes exceed 3:1, horizontal benches shall be cut to receive fill material. Slopes of less than 3:1 and other areas shall be scarified prior to placing fill material.

3.10.2.6 Borrow material, as required, shall be provided by the CONTRACTOR at his own expense. Borrow material on site may be utilized provided it complies with these specifications.

3.11. Compaction

Unless otherwise noted, each layer of fill and backfill and the top 12 inches of existing subgrade material in cuts shall be compacted by approved equipment as specified below. The degree of compaction and the density shall be determined by the Standard Proctor Test (ASTM D698).

	Percent of Max. Dry Density at Optimum Moisture Content
Top 12 inches of fill under pavement or surface	98%
Fill under roads and structures	95%
Fill and backfill in other areas	90%

Material too dry for proper compaction shall be moistened by suitable watering devices, turned and harrowed to distribute moisture, and then properly compacted. When material is too wet for proper compaction, operations shall cease until such material has sufficiently dried.

3.12. Compaction Tests

The CONTRACTOR shall provide compaction tests by an independent testing agency selected by the CONTRACTOR and approved by the ENGINEER. The compaction tests shall be taken at appropriate locations and frequency to demonstrate that the backfill (or fill) has been placed to meet the minimum compaction density required. The testing agency shall submit written test records to the ENGINEER for all compaction tests performed. Minimum testing shall be one test per 500 CY of material placed at the ENGINEER's option and one test per 10,000 square feet of fill placed for every foot of fill thickness.

In the event that the soil compaction is not in compliance with these specifications, then the CONTRACTOR shall take corrective action, at no cost to the OWNER, to compact the soils within the limits of the specifications. The ENGINEER shall be notified within 24 hours of any failing compaction tests. Any retesting of failed areas shall be performed only after corrective measures have been made by the CONTRACTOR to bring the compacted soils into compliance. All retesting shall be performed with the ENGINEER present.

3.13. Site Restoration

3.13.1 General

All surfaces disturbed by the CONTRACTOR in the work shall be restored to a condition equal to or better than that which existed prior to commencement of the work, except as otherwise specified herein.

3.13.2 Pipe drains, headwalls, catch basins, curbs and gutters, and all incidental drainage structures shall be restored using like materials and details at no additional cost to the OWNER. The CONTRACTOR shall maintain drainage during construction.

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3.13.3 All cuts, fills and slopes shall be neatly dressed off to the required grade or subgrade, as indicated on the plans.

3.13.4 Grassed areas shall be restored at no additional cost to the OWNER. Disturbed areas shall be covered with two (2) inches of topsoil, furnished by the CONTRACTOR from an approved source and of approved quality, then shall be fertilized, and seeded to match existing adjoining areas. All ditches shall be restored to their existing grade, line and cross section.

3.13.5 Paved surfaces shall be restored in accordance with the provisions of Section 02575.

END OF SECTION 02222



**SECTION 02231 - SUBGRADE**

**PART ONE – DESCRIPTION:**

The work covered by this section consists of the preparation, shaping and compaction of either an un-stabilized or stabilized subgrade, suitable for placement of base course, pavement and shoulders or for the placement of structures as called for on the plans. The CONTRACTOR shall furnish all equipment, tools, labor and materials necessary to complete the work in accordance with the plans and specifications.

**1.1 Related Work**

Any reference to standard specifications refers to the most current published date published of the following specification unless otherwise noted.

**1.1.1. Reference the following specifications for related work:**

- 02200 Earthwork
- 02210 Unclassified Excavation and Grading
- ASTM C977
- AASHTO T26
- AASHTO T-99

Subgrade work shall conform to Section 208 of the “Standard Specifications for Roads and Structures” dated 2007, published by the South Carolina Department of Transportation.

**PART TWO – MATERIALS:**

**2.1. Water**

Water shall be clean and free from oil, salt, acid, alkali, organic matter or other substances detrimental to the finished product. Water shall not contain more than 100-PPM chlorides or more than 500 PPM dissolved solids, and shall have a pH in the range of 4.5 to 8.5.

2.1.1. Water from a city water supply may be accepted without being tested. Water from other sources shall be tested in accordance with AASHTO T26, unless the requirement for testing is waived by the ENGINEER. The cost of testing water shall be paid by the CONTRACTOR.

**2.2. Lime**

Quicklime and Hydrated Lime for soil stabilization shall meet the requirements of ASTM C977 except that it shall contain a minimum of 90 percent available calcium oxide (CaO) on an LOI-free basis.

2.2.1. Hydrated Lime shall have a minimum of 85 percent passing a No. 200 sieve.

2.2.2. Quicklime shall meet one of the following gradation requirements.

- | "A" Gradation (% Passing) | "B" Gradation (% Passing) |
|---------------------------|---------------------------|
| 3/4 in. Sieve - 100%      | No. 6 Sieve 100%          |
| 1/8 in. Sieve - 0% to 5%  |                           |

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2.2.3. The CONTRACTOR shall furnish material certifications with each shipment of lime attesting that the lime meets the requirements of the specifications; however, the material shall be subject to inspection, test or rejection by the ENGINEER at any time.

2.3. Stabilizer Aggregate

Stabilizer Aggregate shall consist of crushed stone or gravel or other similar material having hard, strong, durable particles free of adherent coatings.

**STABILIZER AGGREGATE  
GRADATION ACCEPTANCE CRITERIA**

Column A Sieve Size	Column B % Passing
1½"	98 - 100
1"	60 - 100
½"	36 - 84
No. 4	21 - 61
No. 10	10 - 50
No. 40	0 - 34
No. 200	0 - 13
Material Passing No. 40 Sieve	
L.L.	0 - 30
P.I.	0 - 6

**PART THREE – INSTALLATION:**

3.1 General Requirements

All subgrade preparation shall be in conformance with local and state Department of Transportation requirements.

3.1.1 The subgrade for roadways and structures shall be shaped to conform to the lines, grades and typical sections shown on the plans or established by the ENGINEER. All vegetation, organic matter or other deleterious material shall be removed and properly disposed of by the CONTRACTOR. Nor shall the soil contain stone or gravel larger than 2 inches for the full depth of the specified subgrade thickness. In areas where the subgrade is to be stabilized with aggregate, the subgrade surface may be left uniformly below grade to provide for the addition of the stabilizer aggregate.

3.1.2 All material to a depth of 12 inches below the finished surface of the subgrade shall be compacted to a density equal to at least 100 percent maximum density per AASHTO T99.

3.1.3 A tolerance of plus or minus 0.1+ foot from the established grade will be permitted after the subgrade has been graded and compacted to a uniform surface.

3.2 Proof Rolling

The subgrade for roads, parking areas and other locations designated on the plans or by the ENGINEER shall be proofrolled in accordance with local and state Department of Transportation requirements, to test for stability and uniformity of compaction. The subgrade shall be proof rolled in the presence of the

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ENGINEER or his designee using a loaded dumptruck or similar pneumatic-tired vehicle with a minimum loaded weight of 25 tons. Any area of the subgrade which pumps or ruts excessively shall be considered unsatisfactory and shall be windrowed and dried or shall receive lime or aggregate stabilization as directed by the ENGINEER. The subgrade shall then be recompacted and proof rolled at no additional cost to the OWNER, repeating the above-outlined process until a stable, unyielding and uniformly compacted subgrade is provided.

**3.3 Lime Stabilized Subgrade**

Where the existing soil is incapable of providing adequate foundation for roadways or structures or where called for on the plans, the subgrade may be stabilized using lime. The treatment of subgrade soils with lime shall be in conformance with local and state Department of Transportation requirements.

**3.4 Aggregate Stabilized Subgrade**

Where the existing soil is incapable of providing adequate foundation for roadways or structures or where called for on the plans, the subgrade may be stabilized using aggregate. The treatment of subgrade soils with aggregate shall be in conformance with local and state Department of Transportation requirements.

END OF SECTION 02231

**SECTION 02235 - MACADAM BASE COURSE**

**PART ONE – DESCRIPTION:**

The work covered by this section consists of the construction of a base composed of an approved aggregate material delivered, placed, compacted and shaped to conform to the lines, grades, depths and typical sections shown on the plans or established by the ENGINEER.

**1.1. Related Work**

Any reference to standard specifications refers to the most current published date of the following specification unless otherwise noted.

**1.1.1. Reference the following specifications for related work:**

02231	SUBGRADE
AASHTO T-180	COMPACTION

**1.1.2. Aggregate Base Course work shall conform to all of Section 302 of the “Standard Specifications for Highway Construction” dated 2007, published by the South Carolina Department of Transportation.**

**PART TWO – MATERIALS:**

**2.1 General Requirements**

Aggregate base course material shall consist of crushed stone, crushed or uncrushed gravel or other similar material having hard, strong, durable, particle free of adherent coatings.

**PART THREE – INSTALLATION:**

**3.1 General Requirements**

The subgrade shall be prepared as called for on the plans in accordance with Section 02231 of these specifications prior to placement of the base material.

**3.1.1** The aggregate material shall be placed on the subgrade with a mechanical spreader capable of placing the material to a uniform loose depth without segregation except that for areas inaccessible to a mechanical spreader, the aggregate material may be placed by other methods approved by the ENGINEER.

**3.1.2** Where the required compacted thickness of base is 8 inches or less, the base material may be spread and compacted in one layer. Where the required compacted thickness is more than 8 inches, the base material shall be spread and compacted in 2 or more approximately equal layers. The minimum compacted thickness of any one layer shall be approximately 4 inches.

**3.1.3** Each layer of material shall have been sampled, tested, compacted and approved prior to placing succeeding layers of base material or pavement.

**3.1.4** No base material shall be placed on frozen subgrade or base.

3.1.5 Base course which is in place on November 15 shall have been covered with a subsequent layer of pavement structure or with a sand seal. Base course which has been placed between November 16 and March 15, inclusive, shall be covered within 7 calendar days with a subsequent layer of pavement structure or with a sand seal.

3.1.6 Failure of the CONTRACTOR to cover the base course as required above will result in the ENGINEER notifying the CONTRACTOR in writing to cover the base course with a sand seal and to suspend the operations of placing aggregate base course until such cover has been placed. This work shall be performed by the CONTRACTOR at no cost to the OWNER. In the event that the CONTRACTOR fails to apply the sand seal within 72 hours after receipt of such notice, the ENGINEER may proceed to have such work performed with other forces and equipment. The cost of such work performed by the other forces will be deducted from monies due or to become due the CONTRACTOR. The application of the sand seal by the CONTRACTOR or by others will in no way relieve the CONTRACTOR of the responsibility to maintain or repair the damaged base or subgrade, no matter what the cause of damage, at no cost to the OWNER.

3.1.7 No traffic shall be allowed on the completed base course other than necessary local traffic and that developing from the operation of essential construction equipment as may be authorized by the ENGINEER. Any defects that develop in the completed base or any damage caused by local or construction traffic shall be acceptably repaired at no cost to the OWNER.

3.1.8 The CONTRACTOR shall utilize methods of handling, hauling and placing which will minimize segregation and contamination. If segregation occurs, the ENGINEER may require that changes be made in the CONTRACTOR's methods to minimize segregation, and may also require mixing on the road which may be necessary to correct any segregation. No additional compensation will be allowed for the work of road mixing as may be required under this provision. Aggregate which is contaminated with foreign materials to the extent that the base course will not adequately serve its intended use will be removed and replaced by the CONTRACTOR at no additional cost to the OWNER.

### 3.2 Shaping and Compacting

Within 48 hours after beginning the placing of a layer of the base, the CONTRACTOR shall begin machining and compacting of the layer. Each layer shall be maintained to the required cross section during compaction and each layer be compacted to the required density prior to placing the next layer.

3.2.1 Each layer of the base shall be compacted to a density equal to at least 100% of that obtained by compacting a sample of the material in accordance with AASHTO T180.

3.2.2 The base material shall be compacted at a moisture content which is approximately that required to produce a maximum density indicated by the above test method. The CONTRACTOR shall dry or add moisture to the material when required to provide a uniformly compacted and acceptable base.

3.2.3 The final layer of base material shall be shaped to conform to the lines, grades and typical sections shown on the plans or established by the ENGINEER. When completed, the base course shall be smooth, hard, dense, unyielding and well bonded. A broom drag may be used in connection with the final finishing and conditioning of the surface of the base course.

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3.2.4 After final shaping and compacting of the base, the ENGINEER will check the surface of the base for conformance to the grade and typical section and determine the base thickness.

3.2.5 The thickness of the base shall be within a tolerance of plus or minus 0.1 feet of the base thickness required by the plans. The maximum differential between the established grade and the base within any 100 foot section shall be 0.1 feet.

3.2.6 Where the base material is placed in a trench section, the CONTRACTOR shall provide adequate drainage through the shoulders to protect the subgrade and base until such time as the shoulders are completed.

3.2.7 The CONTRACTOR shall maintain the surface of the base by watering, machining, and rolling or dragging when necessary to prevent damage to the base by weather or traffic.

3.2.8 Where the base or subgrade is damaged, the CONTRACTOR shall repair the damaged area; reshape the base to required lines, grades and typical sections, and re-compact the base to the required density at no cost to the OWNER.

END OF SECTION 02235

**SECTION 02270 - EROSION CONTROL**

**PART ONE – DESCRIPTION:**

1.1. Erosion and sedimentation control shall be provided by the CONTRACTOR for all areas of the site denuded or otherwise disturbed during construction. The CONTRACTOR shall be responsible for all installation, materials, labor, and maintenance of erosion and sediment control devices, as well as removal of temporary erosion and sediment control devices shown on the plans or required to protect all downstream properties, natural waterways, streams, lakes, ponds, catch basins, drainage ditches, roads, gutters, natural buffer zones, and man made structures.

1.2. Erosion and sediment control procedures and facilities shall conform to all legally regulated procedures for the control of erosion and sedimentation.

1.3. Related Work

See the following sections for related work.

- 02271 Engineering Fabrics
- 02274 Plain Rip Rap
- 02275 Stone for Erosion Control
- 02277 Silt Fence
- 02933 Seeding and Mulching

1.4 References

Any reference to standard National or State Specifications and/or Regulations refers to the most current published date of the specification or regulation unless noted otherwise.

The design, manufacture, and installation of these materials shall meet or exceed the applicable provisions and recommendations of the noted National Specifications and/or Regulations or meet the requirements of the latest revision of these specifications or regulations.

1.5 Special References

Erosion and sediment control procedures and facilities shall conform to all of Section 815 of the “Standard Specifications for Highway Construction” dated 2007, published by the South Carolina Department of Transportation and South Carolina Stormwater Management and Sediment Control Handbook as published by EQC, Bureau of Water, SC Department of Health and Environmental Control.

**PART TWO – MATERIALS:**

2.1. Washed stone to be used in temporary sediment basins shall be of strong, durable nature, resistant to weathering and shall be graded to conform to local and state Department of Transportation requirements.

2.2. Refer to other sections within these specifications as listed in Item 1.3 above for other material specification required in the installation of erosion and sediment control facilities.

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**PART THREE – INSTALLATION:**

**3.1 General Requirements**

3.1.1 The CONTRACTOR shall follow the erosion control construction sequence schedule as shown on the contract drawings, except that should circumstances dictate that extra precaution be taken to prohibit erosion and sedimentation on the project, the CONTRACTOR will, at his own expense, take preventative measures as needed.

3.1.2 The CONTRACTOR is required to maintain all erosion and sediment control facilities to insure proper performance throughout the construction phase and until such time all disturbed areas are permanently stabilized.

3.1.3 Upon completion of construction or successful permanent stabilization of all areas which were disturbed before or during construction operations or as indicated on the construction drawings, whichever occurs last, the CONTRACTOR shall remove all temporary erosion and sediment control devices and facilities from the project site. The CONTRACTOR shall retain these items for future use or properly dispose of these items offsite.

3.1.4 The CONTRACTOR shall provide temporary or permanent ground cover as called for on the construction plans within thirty (30) working days after disturbance of any areas on the site.

END OF SECTION 02270



**SECTION 02271 - ENGINEERING FABRIC**

**PART ONE – DESCRIPTION:**

The work covered by this Section consists of the installation of an acceptable engineering fabric (filter fabric) appropriate for the application(s) called for on the plans or as required by field conditions. Placement of the fabric shall be an integral function of the construction of shoulder drains, subsurface drainage systems, temporary silt fences and placement of erosion control stone or rip rap facilities. The CONTRACTOR shall furnish all equipment, tools, labor and materials necessary to complete the work in accordance with the plans and specifications.

**1.1. Related Work**

Any reference to standard specifications refers to the most current published date of the following specification unless otherwise noted.

**1.1.1 Reference the following specifications for related work:**

02270	Erosion and Sediment Control
02274	Plain Rip Rap
02275	Stone for Erosion Control
02277	Temporary Silt Fence

**1.1.2.** The filter fabric shall conform to all of Section 815 of the “Standard Specifications for Highway Construction” dated 2007, published by the South Carolina Department of Transportation and the South Carolina Stormwater Management and Sediment Control Handbook as published by EQC, Water Bureau, South Carolina Department of Health and Environmental control.

**PART TWO – MATERIALS:**

Engineering fabric shall have material properties strictly conforming to those specified in Sections of the standard State Department of Transportation specifications. The CONTRACTOR shall provide engineering fabric(s) for various applications which meet or exceed the corresponding criteria for each different fabric utilized per the subject specification.

**PART THREE – INSTALLATION:**

**3.1 General Requirements**

**3.1.1** Engineering fabric installed under erosion control stone or rip rap shall be placed at locations, to the dimensions as shown on the plans or as directed by the ENGINEER.

**3.1.2** Surfaces to receive filter fabric shall be graded to the lines and grades as shown on the plans, unless otherwise directed by the ENGINEER. The surface shall be free of obstructions, debris and pockets of soft or low-density material.

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3.1.3 At the time of installation, the fabric shall be free of defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation or storage.

3.1.4 The filter fabric shall be laid smooth and free from tension, stress, folds, wrinkles, or creases. Horizontal overlaps shall be a minimum of 12 inches with the upper fabric overlapping the lower fabric. Vertical overlaps shall be a minimum of 18 inches with the upstream fabric overlapping the downstream fabric. In the event that the fabric is displaced or damaged during stone placement, the stone shall be removed and the fabric repositioned or replaced prior to replacement of the stone, all at no additional cost to the OWNER.

3.1.5 The placement of the filter fabric and stone shall be performed in a continuous manner as directed by the ENGINEER. The filter fabric shall be protected from damage due to the placement of stone or other materials by limiting the height of drop of the material or by placing a cushioning layer of sand on top of the fabric before dumping the material.

3.1.6 No more than 72 hours shall elapse from the time the fabric is unwrapped to the time the fabric is covered with stone or sand.

3.1.7 Filter fabric installed in association with shoulder drains or other subsurface drainage systems shall be installed in such a manner that all splice joints are provided with a minimum overlap of 2 feet. The overlap of the closure at the top of the trench shall be at least 6 inches and secured with mechanical ties. Where outlet pipe passes through the fabric, a separate piece of fabric shall be wrapped around the outlet pipe, flared against the side of the filled drain, and secured with anchor pins.

3.1.8 Field splices of filter fabric shall be anchored with anchor pins to insure that required overlap is maintained.

3.1.9 At the time of installation, the fabric will be rejected if it has defects, rips, holes, flaws, deterioration, or damage incurred during manufacture, transportation, or storage.

3.1.10 Aggregate placement operations and the pipe installation shall be done so as to prevent damage to the filter fabric. Damaged sections of filter fabric shall be replaced at no cost to the OWNER.

3.1.11 The aggregate shall be compacted to a degree acceptable to the ENGINEER by the use of a vibratory compactor before making the filter fabric closure at the top of the trench.

3.1.12 Filter fabric installed in association with temporary silt fences shall be a water permeable filter type for the purpose of removing suspended particles from the water passing through it. Silt fences shall be constructed in accordance with local and state Department of Transportation requirements in the locations and to the configurations as shown in the plans and as directed by the ENGINEER. Should the requirements of local, regional or state authorities having jurisdiction over the project exceed the requirements of this section or other sections in this specification regarding temporary silt fences, the more stringent shall govern.

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3.2 Physical Properties of Engineering Fabrics

PHYSICAL PROPERTIES OF ENGINEERING FABRICS					
Physical Property	Test Method (Article 1056-2)	Type 1	Type 2	Type 3	
				Class A	Class B
Min. Roll Width	---	---	---	36"	36"
Min. Fabric Weight	1	4.0 oz/yd <sup>2</sup>	---	---	---
Min. Tensile Strength	2	90 lb.	200 lb.	50 lb.	100 lb.
Elongation	2	80% Max.	15% Min.	30% Max.	25% Max.
Min. Burst Strength	3	150 psi	400 psi	100 psi	180 psi
Min. Puncture Strength	4	45 lb.	80 lb.	30 lb.	60 lb.
Apparent Opening Opening Size - Max/Min (U.S. Std. Sieve)	5	60/100	30/130	20/50	20/50
Min. Ultra-Violet Exposure Strength Retention	6	80 lb.	140 lb.	40 lb.	80 lb.
Fungus Resistance	7	No Growth	No Growth	No Growth	No Growth
Min. Permeability (Thickness x Permittivity)	8	0.2 cm/sec.	---	---	---
Min. Flow Rate	8	---	---	10 gal/min/ft <sup>2</sup>	10 gal/min/ft <sup>2</sup>
Typical Application	--	Shoulder Drain	Under Riprap	Temporary Silt Fence	

END OF SECTION 02271

**SECTION 02275 - STONE FOR EROSION CONTROL**

**PART ONE – DESCRIPTION**

The work covered by this section consists of the furnishing, stockpiling if directed, placing and maintaining an approved stone liner placed in or at ditches, swales, pipe inlets, pipe outlets, and at other locations designated on the plans or directed by the ENGINEER. The CONTRACTOR shall furnish all equipment, tools, labor and materials necessary to complete the work in accordance with the plans and specifications.

**1.1. Related Work**

Any reference to standard specifications refers to the most current published date of the following specification unless otherwise noted.

**1.1.1. Reference the following specifications for related work:**

01016	References to National and State Standard Specifications
02270	Erosion control
02274	Plain Rip Rap

1.1.2. The stone for erosion control shall conform to all of Section 815 of the “Standard Specifications for Highway Construction” dated 2007 published by the South Carolina Department of Transportation and South Carolina Stormwater Management and Sediment Control Handbook as published by EQC, Bureau of Water South Carolina Department of Health and Environmental Control.

**1.2. References**

Any reference to standard National or State Specifications and/or Regulations refers to the most current published date of the specification or regulation unless noted otherwise.

The design, manufacture, and installation of these materials shall meet or exceed the applicable provisions and recommendations of the noted National or State Specifications and/or Regulations or meet the requirements of the latest revision of these specifications and regulations.

**PART TWO - MATERIALS**

2.1 Stone for erosion control shall conform to SCDOT Section 800 requirements.

2.2 Stone for erosion control shall be resistant to the action of air and water, be of a hard, durable nature and shall range in size as follows:

<u>Class</u>	<u>Size</u>
A	2" - 6"
B	5" - 15"

2.3 All stone shall meet the approval of the ENGINEER. While no specific gradation is required, the various sizes of stone shall be equally distributed within the required size range. The size of an individual stone particle will be determined by measuring along its long dimension.

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**PART THREE - INSTALLATION**

3.1 Unless otherwise directed by the ENGINEER, the stone shall be placed on slopes less than the angle of repose of the material and to the line, grade and slope as indicated on the plans. The stone shall be placed so that the smaller stones are uniformly distributed throughout the mass. All stone shall be placed in a neat, uniform layer with an even surface meeting the approval of the ENGINEER.

3.2 At locations where stone is required for channel changes and drainage ditches, the stone shall be placed prior to diverting the water into the channel changes and drainage ditches.

3.3 At locations where stone is required at the outlet of pipe culverts, the stone shall be placed immediately after completion of the pipe culvert installation.

**END OF SECTION 02275**

**SECTION 02277 - TEMPORARY SILT FENCE**

**PART ONE – DESCRIPTION:**

The work covered by this Section consists of the furnishing, installing, maintaining, replacing as needed, and removing of temporary silt fence. The CONTRACTOR shall furnish all equipment, tools, labor and materials necessary to complete the work in accordance with the plans and specifications. All materials and procedures shall conform to the latest version of local and state Department of Transportation requirements.

**1.1. Related Work**

Any reference to standard specifications refers to the most current published date published of the following specifications unless otherwise noted.

**1.1.1. Reference the following specifications for related work:**

- 02270 Erosion Control
- 02275 Stone for Erosion Control

All applicable local design manuals, codes and/or ordinances for Erosion and Sedimentation Control. (Where these design manuals, local codes and ordinances are more stringent than the State Department of Transportation, these codes and/or ordinances will control the erosion and sedimentation control procedures to be followed.)

The temporary silt fence shall conform to the “Standard Specifications for Roads and Structures” dated 2007, published by the South Carolina Department of Transportation.

**PART TWO – MATERIALS:**

**2.1. General Requirements**

Temporary silt fence shall be a water permeable filter type fence for the purposes of removing suspended particles from the water passing through it.

**2.2. Posts**

Steel posts must be used. Steel posts shall be at least 5 feet in length, approximately 1-3/8 inches wide measured parallel to the fence, and have a minimum weight of 1.25 lb/ft of length. The post shall be equipped with an anchor plate having a minimum area of 14.0 square inches, and shall have a means of retaining wire and fabric in the desired position without displacement.

**2.3. Woven Wire Fence**

Wire fence fabric shall be at least 32 inches high, and shall have at least 6 horizontal wires. Vertical wires shall be spaced 12 inches apart. The top and bottom wires shall be at least 10 gage. All other wires shall be at least 12-1/2 gage.

**2.4. Silt Fence Filter Fabric**

The filter fabric shall conform to all of Section 815.02 of the “Standard Specifications for Highway Construction” dated 2000, published by the South Carolina Department of Transportation and the South

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Carolina Stormwater Management and Sediment Control Handbook as published by EQC, Water Bureau, South Carolina Department of Health and Environmental control.

Silt fence which incorporates filter fabric meeting the requirements of these State Specifications but which fail to perform in an acceptable manner shall be replaced with silt fences which are capable of acceptable performance. All silt fences shall meet the local governmental requirements as well as the State's requirements.

**PART THREE – INSTALLATION:**

**3.1. General Requirements**

3.1.1. The CONTRACTOR shall install temporary silt fence as shown on the plans or as required by field conditions. The silt fence shall be constructed at the locations shown on the plans and at all other locations necessary to prevent sediment transport, as directed by the ENGINEER.

3.1.2. Class A synthetic filter fabric may be used only in conjunction with woven wire fence fabric backing. Filter fabric shall be attached to the wire fence fabric by wire or other acceptable means.

3.1.3. Class B synthetic filter fabric may be used without the woven wire fence fabric backing, subject to the following conditions:

- Post spacing is reduced to a maximum of 6 feet.
- The proposed fabric has been approved by the ENGINEER as being suitable for use without the woven wire fence fabric backing.
- Fence posts shall be inclined toward the runoff source at an angle of not more than 20° from vertical.
- Posts shall be installed so that no more than 3 feet of the post shall protrude above the ground. Where possible, the filter fabric from a continuous roll cut to the length of the barrier shall be used to avoid joints. When joints are necessary, securely fasten the filter cloth only at a support post with overlap to the next post. At the time of installation, the fabric will be rejected if it has defects, rips, holes, flaws, deterioration, or damage incurred during manufacture, transportation, or storage.

**3.2. Maintenance and Removal**

3.2.1. The CONTRACTOR shall inspect temporary silt fences at least once a week and after each rainfall and shall make any required repairs and remove and dispose of silt accumulation immediately. Should the fabric of the silt fence collapse, tear, decompose or become ineffective, the CONTRACTOR will replace it promptly at his own expense. The CONTRACTOR shall remove sediment deposits as necessary to provide adequate storage volume for the next rain and to reduce pressure on the fence.

3.2.2 The CONTRACTOR shall remove all temporary silt fence and associated appurtenances once all disturbed areas upland of the fence are properly and satisfactorily stabilized as called for on the plans.

END OF SECTION 02277

**SECTION 02441 - UNDERGROUND IRRIGATION SYSTEM**

**PART ONE - GENERAL:**

**1.01 - SCOPE**

This section covers the furnishing, installation, testing and adjustment of an underground sprinkler system. The irrigation system shall be installed by a contractor who specializes in irrigation installation. The contractor shall furnish a unit price for each type of head, fitting, pipe, etc. furnished, installed, guaranteed, etc. for the purpose of increasing or decreasing quantities.

**1.02 - LINES AND GRADES**

The contractor shall provide his own lines and grades for this work, and he shall have someone on the site during installation that is familiar with all aspects of irrigation systems.

**1.03 - SAFETY CODES AND STANDARDS**

Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction. No water from the irrigation system shall cover or land on any walkway, hardscape surface or roadway.

**1.04 - EXISTING UTILITIES**

Locate existing underground utilities by careful hand excavation. Utilities are to remain in place; provide protection from damage during ditching operations. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the owner immediately for direction as how to proceed. Cooperate with the utility company in keeping respective service and facilities in operation. Repair damaged facilities to the satisfaction of the utility company.

**1.05 - PROTECTION OF PERSONS AND PROPERTY**

Barricade open excavation and post with warning lights for safety of persons. Operate warning lights during hours from dusk to dawn each day. Protect structures, utilities, driveways, pavements, and other facilities immediately adjacent to excavation from damage caused by settlement, lateral movement, undermining, washout or other hazards. Take precautions and provide necessary bracing and shoring to guard against movement or settlement of existing improvements. The contractor is entirely responsible for the strength and adequacy of bracing and shoring and for the safety and support of construction from damage or injury caused by the lack thereof or by movement or settlement.



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**1.06 - MATERIALS STORAGE**

Stockpile materials where directed. Locate and retain materials away from edge of excavations, even though such excavations may be sheeted and braced, to prevent such material from falling or sliding into excavation to prevent cave-ins.

**PART TWO - PRODUCTS:**

**2.01 - MATERIALS STORAGE**

This section covers the furnishings and installation of heads, fittings, pipes, backflow preventers and all other materials shown on the plans or their equivalent. All material shall be new and free of defects.

**2.02 - SURPLUS MATERIALS**

Remove and dispose of surplus materials from the site at no additional cost to the owner.

**PART THREE - EXECUTION:**

**3.01 - COORDINATION**

Coordinate work with the owner and any other trades on the project to avoid possible conflicts. Before installation is started, the ground shall be within approximately two inches, plus or minus, (2"±) of finished grade.

**3.02 - LAYOUT**

The arrangement of the system shall be designed by the Contractor and submitted to the owner for approval before proceeding with installation.

**3.03 - INSTALLATION OF PIPE**

Install pipe in straight runs, without sags and graded for drainage according to applicable code. Cut pipe ends straight, cleanse of dirt before assembly. Lay pipes in trenches, bottoms tamped hard without soft spots.

**3.04 - TEST AND INSPECTIONS**

Upon completion of tests and inspections, backfill with materials free of rocks and debris; trenches backfilled in six inch (6") layers with each layer tamped firmly. Remove excess earth from the site.

END OF SECTION 02441

**SECTION 02485 - GRASSING**

**PART ONE - GENERAL:**

**1.01 - LIMITS OF WORK**

All areas disturbed by grading and construction operations except as covered by surface construction or where noted on the plans, including the areas where surplus material is stockpiled, shall be put into perennial vegetation by seeding or sodding as directed on the plans. If not directly noted on the plans then revegetation shall be by seeding.

**1.02 - SCOPE**

The type of work required includes the following: Fine grading and preparation of grass areas, seeding, and sodding.

**1.03 - LINES AND GRADES**

The contractor shall provide his own lines and grades for the work required.

**1.04 - STANDARDS AND SPECIFICATIONS**

Generally, materials and methods shall conform to the South Carolina State Highway Department Standard Specifications for Highway Construction, 1986 Edition, Section 810, and as specified herein.

**1.05 - SUBMITTALS**

Submit five (5) copies of type written instructions recommending procedures to be followed by the owner for proper maintenance and care of grasses. Submit proof that all materials meet the requirements of this section. Bag tag figures will be evidence of purity and germination of seed. No seed will be accepted with a date of test of more than nine (9) months prior to date of use. Where fertilizer is furnished from bulk storage, the contractor shall furnish a supplier's certification of weight and analysis.

**PART TWO - PRODUCTS:**

**2.01 - GRASS SEED**

Provide fresh, clean, new crop seed complying with the tolerance for purity and germination established by the Official Seed Analysis of North America and certified by the Seed Certification Department of Clemson University, as follows:

- A. PENNISETUM GLAUCUM (Browntop Millet)

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Testing ninety-eight percent (98%) purity and eighty-five percent (85%) germination.

- B. CYNODON DACTYLON (Bermudagrass)

Testing ninety-eight percent (98%) purity and eighty-five percent (85%) germination.

- C. LOLIUM MULTIFLORUM (Domestic Italian Rye)

Testing ninety-eight percent (98%) purity and ninety percent (90%) germination.

- D. EREMOCHLOA OPHIUROIDES (Centipede)

Germination varies.

- E. EREMUCHLOA OPHIUROIDES (Centipede Sod)

Centipede sod shall be weed free, moist, freshly dug and actively growing.

## 2.02 - OTHER PLANTING MATERIALS

Provide the following materials, all meeting or exceeding regulations of the South Carolina State Department of Agriculture, as follows:

- A. Fertilizer: 15-15-15 (50% organic) with trace elements.  
B. Basic Slag: Standard Grade.  
C. Agricultural Sulfur: Standard Grade.

## 2.03 - SPECIAL REQUIREMENTS

Where construction activities are stopped in an area for over twenty-one (21) days, the entire area must be vegetated within fourteen (14) days from ceasing construction activities. This shall be in accordance with the requirements as outlined in the "NPDES General Permit for Stormwater Discharge From Construction Activities that are Classified as Associates with Industrial Activity" by EPA Regulations Permit No. SCR100000. This is in addition to the requirements for a permanent grass cover and shall be at no additional cost to the owner. The contractor shall make every effort to complete permanent grassing operations at the earliest practical date in order to complete a grass cover sufficient to protect the site from wind and water erosion.

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**PART THREE - EXECUTION:**

**3.01 - PLANTING SEASONS**

Summer dates are:

3/15 to 9/1 for hulled Bermuda and unhulled Bermuda  
5/15 to 9/1 for Browntop Millet

Winter dates are:

9/1 to 3/15 for unhulled Bermuda.  
9/1 to 5/15 for Common Rye.

Year round seeding for centipede, except for September.

**3.02 - GENERAL REQUIREMENTS**

**A. Equipment**

Equipment required for proper execution of these operations shall be present on the job site and in good working order.

**B. Maintain Grades**

Maintain grades in a true and even condition, including necessary repairs to previous grades and topsoiled areas.

**3.03 - SOIL PREPARATION**

Limit preparation to areas which will be planted in the near future.

**A. Fine Grading**

Fine grade all areas to receive grassing. Care shall be taken not to disturb existing trees. Perform this work only during period of favorable weather.

**B. After Fine Grading**

After fine grading, clean surface of all stones and other objects larger than one inch (1") in any direction. Also, remove roots, sticks, grade stakes and other extraneous matter.

**C. Aerate and Disc**

Aerate and disc to a depth of three inches (3") to four inches (4") to promote acceptance and

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germination of seeds.

**3.04 - pH READING**

Test pH reading. If reading is below 6.0, adjust to that level with an application of slag; if reading is above 6.5, adjust to that level with an application of sulfur. The testing laboratory shall be by Clemson University Soil Testing Laboratory or a laboratory approved by the Extension Service.

**3.05 - INITIAL APPLICATION OF FERTILIZER**

**A. Flat Areas**

Apply at rate of eight pounds (8lbs.) per 1,000 square feet. Distribute fertilizer and slag or sulfur uniformly over areas incorporating into soil to a depth of two inches (2") by means of hand raking, harrowing, or other approved method. At the contractors option, this operation may be combined with topsoil spreading specified above. NOTE: No pure nitrogen shall be applied.

**B. Slopes and Swales**

Combine with grassing operations as specified below. Correct any surface irregularities resulting from this operation by hand raking if necessary, and perform any other required "clean up" work before planting is begun.

**3.06 - PLANTING**

**A. Temporary Lawn Seed (per 1,000 square feet)**

Eight pounds (8 lbs.) of fertilizer, 15-15-15; five pounds (5 lbs.) rye grass seed; nine ounces (9 oz.) unhulled bermudagrass seed, thirty-five pounds (35 lbs) of wood fiber, one gallon (1 gal.) tac material mixed with water.

**B. Permanent Lawn Seed (per 1,000 square feet)**

**1. Centipede Seed Mix**

Summer

6-8 oz. Commercial Centipede  
1-1/2 lbs. Hulled & Unhulled  
& 6 oz. Browntop Millet  
8 lbs. Fertilizer

Winter

Same  
Bermuda 1-1/2 lbs. Unhulled Bermuda  
3 lbs. Common Rye  
Same

**C. Sodding**

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Sod shall be viable, weed free and recently harvested. Sod shall be placed on the prepared topsoil. The surface on which sod is to be laid shall be firm and free of footprints. Begin by placing sod along a straight edge and work outward. Sod of the next course shall be matched against the edge of the first line in such a way that the joints between the individual sod pieces do not coincide. Successive courses are matched against the last line laid, in the same manner. The joints shall be closely laid, filled with topsoil and rolled lightly. Surface sod shall be smooth and free of depressions.

D. Establish Lawns

It is the responsibility of the contractor to establish a complete vegetative cover with viable healthy plants.

E. Hydroseeding (Temporary or Permanent Lawn per 1,000 square feet)

To the mixtures stated above, add thirty-five pounds (35 lbs.) of wood fiber, one gallon (1 gal.) tac material mixed with the manufacturer's recommended rate of water.

F. Seeding for Temporary Erosion Control Only (per 1,000 square feet)

August 1 to April 1: Three pounds (3lbs.) of rye grass seed and four pounds (4lbs.) of fertilizer.

April 1 to August 1: One-half pound (1/2lb.) browntop millet seed and four pounds (4lbs.) of fertilizer.

3.07 - MAINTENANCE

A. Begin maintenance immediately after any lawn area is planted and continue until the completion of the project.

B. Maintain Lawns

Maintain lawns by weeding, cultivating, mowing at least twice, trimming, hydroseeding, seeding, or re-sodding and other operations such as re-grading and re-planting as required to establish an acceptable stand of grass.

C. Provide Adequate Protection

Provide adequate protection at all times for all grass areas. Lay or place planks over grass for the movement of heavy materials or equipment.

D. Repair or Replace

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Repair or replace, at no additional cost to the owner, any portion of grassed areas not in good viable condition if so determined by the owner before or on the date of completion for work done prior to that time.

**3.08 - ACCEPTANCE**

Lawns will be acceptable provided all requirements, including maintenance, have been complied with, and a healthy, uniform stand of specified grass is established, free of weeds, bare spots and surface irregularities. A full stand of grass is not required where irrigation has not been installed.

END OF SECTION 02485

**SECTION 02601 - MANHOLES, DROP CONNECTIONS AND CONFLICT MANHOLES**

**PART ONE – DESCRIPTION:**

The CONTRACTOR shall furnish all labor, materials, equipment and supplies and shall perform all work necessary for the construction of all manhole drop connections and conflict manholes complete and ready for use. The manhole drop connections and conflict manholes shall be constructed at the locations and grades shown or established by the ENGINEER and shall conform to the details shown on the Plans.

1.1. Related Work

See the following sections for related work:

- 01016 References to National and State Standard Specifications and Regulations
- 02730, Force Mains and Gravity Sewers for related specifications.

1.2. References

Any reference to Standard National or State Specifications and/or Regulations refers to the most current published date of the specifications and/or regulations listed in Section 01016 unless noted otherwise.

The design, manufacture, and installation of these materials shall meet or exceed the applicable provisions and recommendations of the noted National Specifications and/or Regulations or meet the requirements of the latest revision of these specifications and regulations.

1.2.1. Any reference to SCDOT standard specifications was obtained from the “Standard Specifications for Roads and Structures”, dated 2007 published by the South Carolina Department of Transportation.

**PART TWO – MATERIALS:**

Materials for manholes shall be new and furnished by the CONTRACTOR in accordance with the following requirements.

2.1. Manholes shall be pre-cast reinforced concrete sections conforming to ASTM C-478 and to the following.

2.1.1. Tops shall be eccentric cone where cover permits unless shown otherwise on the drawings and flat slab tops otherwise. Bottoms shall be integrally cast unless the CONTRACTOR proposes to use specialty bases ("Dog-House") at points of connection to existing sewer mains. Any special bases or riser used must be detailed in shop drawings and submitted for approval. Manhole wall and base dimensions shall conform to C-478 or to the minimum dimensions shown on the drawings.

2.1.2. Manhole supplier shall design manhole sections to resist earth loads and to resist uplift resulting from buoyant forces calculated with ground water table at the ground surface. Wall and/or base dimensions shall be increased accordingly.

2.1.3. Pipe connection shall consist of an approved continuous boot of 3/8 inch minimum thickness neoprene as shown on the drawings conforming to ASTM C-923. Boots shall be either cast into



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the manhole wall or installed into a cored opening using internal compression rings. Installed boot shall result in a water-tight connection meeting the performance requirements of ASTM C-443.

2.2. Frames and Covers shall be of domestic manufacture good quality cast iron of uniform grain, conforming to ASTM A48, Class 30 or better, constructed in accordance with details shown on the Plans.

2.3. Manhole Steps shall be of aluminum or composite plastic-steel construction. Aluminum steps shall be of aluminum alloy 6061T6. Composite plastic-steel steps shall consist of a 1/2 inch deformed steel reinforcing rod encapsulated in a co-polymer polypropylene plastic; reinforcing rods shall conform to ASTM A615, Grade 60; and polypropylene plastic shall conform to ASTM D2146, Type II, Grade 16906. Minimum design live load of steps shall be a single concentrated load of 300 pounds. Steps shall be nine inches in depth and at least twelve inches in width. Steps shall have non-skid top surfaces. All parts of aluminum steps to be embedded in concrete or masonry shall be coated with bituminous paint or zinc chromate primer.

2.3.1. Steps shall be uniformly spaced not more than sixteen inches (16") on center, including the spacing between the top step and the manhole cover. Steps shall be embedded in the wall a minimum distance of 4 inches in either cast or drilled holes. Steps shall not be driven or vibrated into fresh concrete and shall withstand a pullout resistance of 2000 lbs. when tested in accordance with ASTM C 497. Each step shall project a minimum of 5 inches from the wall measured from the point of embedment.

2.4. Concrete (poured in place)

Air entrained Portland Cement Concrete having minimum twenty-eight (28) day compressive strength of 3000 psi.

2.5. Joint Sealant

Butyl Rubber based conforming to AASHTO M-198, type B - butyl rubber, suitable for application temperatures between 10 and 100 degrees F

2.6. O-Ring or Gasket (CONTRACTORs Option)

ASTM C-443

2.7. Sand Cement

- Portland Cement: ASTM C50, Type I
- Sand: Clear, sharp, graded from fine to coarse, ASTM C-144
- Water: Clean and potable
- Mixture: One (1) part cement, two (2) parts sand

2.8. Pipe and Fittings: Same as sewer pipe

2.9. Precast Grade Rings shall be no less than 4" in height and conform to ASTM C 478.

2.10. Washed Stone

Stone material, crushed stone or gravel shall be strong, durable and conform to standard size No. 57 per SCDOT Appendix 6.

**PART THREE – CONSTRUCTION:**

3.1. Excavation for all sanitary manholes shall be carried to a depth such as to provide a minimum of 6 inches of washed stone bedding material below the bottom of structures and extend to a minimum width of 8 inches beyond each side of structures.

3.2. Should unstable soil, organic soil, or soil types classified as fine-grained soils (silts and clays) by ASTM D-2487 be encountered at the bottom of excavations, such soils shall be removed to a depth and width determined by the ENGINEER and properly disposed of. The resulting undercut shall be backfilled with washed stone. Placement and compaction shall conform to applicable earthwork specifications.

3.3. Manholes shall be constructed of precast reinforced concrete with cast iron frames and covers in accordance with details shown on the Plans.

3.4. Invert channels shall be smooth and accurately shaped to semi-circular bottom conforming to the inside of the adjacent sewer sections. Inverts shall be formed of concrete, and no laying pipe through manholes will be permitted. Changes in size and grade shall be made gradually and evenly. The minimum bending radius of the trough centerline shall be 1.5 times the pipe I.D. A minimum ½" radius shall be provided at the intersection of 2 or more channels. Depressions, high spots, voids, chips or fractures over ¼" in diameter or depth shall be filled with sand cement and finished to a texture reasonable consistent with that of the formed surface.

3.5. Pre-cast concrete bottom sections, risers, and top sections shall be fabricated such that when assembled, they provide a manhole conforming to the depth required. The CONTRACTOR shall be responsible for the furnishing and constructing manholes such that the completed assembly is flush (0.1 foot above) finished grade or at other elevations as may be shown on the drawings. No manhole assembly will be accepted or paid for that will allow surface water inflow to occur through the cover due to poor attention to construction grades.

3.6. Sections are to be assembled so as to provide a plum structure with uniform bearing at all joints and at the base slab. Joints shall be thoroughly cleaned to remove dirt and foreign material. The butyl rope sealant shall be unrolled directly against the base of the spigot. Leave the protective paper in place until the sealant is fully in place. Overlap rope from side to side, not top to bottom. Joints to be plastered smooth inside and outside of manhole with a cement grout. Joints shall be water-tight.

3.7. Pipes shall project into the manhole 2-inches and shall be mechanically sealed with a molded neoprene boot.

3.8. Manhole frames and covers shall be set flush (0.1 foot above) with the finished grade or as otherwise shown on the drawings. Pre-cast adjustment (grade) rings shall be used as required. No more than 8 vertical inches of grade ring will be allowed per manhole. Seal frame to adjustment ring, or cone section with butyl sealing rope and completely grout the ring to the top manhole section.

3.9. Drop connections shall be constructed in accordance with details shown on the Plans.

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3.10. Conflict Manholes and Manhole Alternates shall be constructed in accordance with details shown on the plans.

**PART FOUR – TESTING:**

All manholes shall be tested in accordance with the Infiltration/Exfiltration Test in Section 02730, unless otherwise directed by the ENGINEER.

**END OF SECTION 02601**

**SECTION 02614 - BRICK WORK**

PART ONE - DESCRIPTION

1.1 Related Documents

1.1.1 Requirements of the General Provisions apply to all Work in this Section. Provide all labor, materials, equipment and services indicated on the Drawings, or specified herein, or reasonably necessary for or incidental to a complete job.

1.2 Description of Work

1.2.1 The Work includes furnishing all labor, equipment, and materials and performing all the operations required for the installation of all brick pavers in roadways, sidewalks, driveways, borders, and row-lock paving on a prepared subgrade and concrete base as indicated on the Drawings. Work also includes providing the brick planters as indicated. All brick work shall be constructed to the lines, grades and cross-sections indicated on the Drawings.

1.3 Related Work Specified Elsewhere

Excavation and Backfill	Section 02220
Cast-In-Place Concrete	Section 03300

1.4 Quality Assurance

1.4.1 Installer: The Contractor or subcontractor performing the masonry paving work must have at least 5 years of successful experience in the required types of paving application.

1.4.2 Product Handling: Protect brick paving materials during storage and construction against wetting by rain, snow or ground water and against soilage or intermixture with earth or other types of materials.

1.4.2.1 Protect grout and mortar materials from deterioration by moisture and temperature. Store in a dry location or in waterproof container.

1.4.3 Hot Weather Requirements: Protect brick work in hot weather to prevent excessive evaporation of setting beds and grout. Provide artificial shade, wind breaks and use cooled materials, as required.

1.5 Submittals

1.5.1 Brick: For a brick to be considered as an approved equivalent to the existing pavers, the Contractor shall submit a sample panel showing consistent brick color to the following address no later than 1 month from notice to proceed.

The LandPlan Group South, Inc.  
1621 Pickens Street  
Columbia, SC 29201  
ATTN: Charles Howell

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1.5.2. Sample Panels: The Contractor shall construct a sample with full range of brick and mortar colors for the pavement prior to the start of any paving. The work will be inspected by the Owner and Engineer. If the original sample panel is not acceptable, the Contractor shall provide additional samples at no cost to the Owner. Accepted sample shall become the standards for the entire job, and shall remain undisturbed until completion of all paving and walk work. All work must have full range of previous colors approved in sample.

1.5.3 The following sample panel shall be constructed separate and distinct from the final paving. Panel size indicated will be the minimum size accepted

1.5.3.1 A 4' x 4' panel of brick paving with the granite curb border in accordance with the drawing details for the work.

**PART TWO - PRODUCTS**

2.1 Brick/Paver Rowlock: Supply a solid brick that is 4"x 8" x 2-1/4" in size. The paver shall be Olde Towne as manufactured by Pine Hall with textured edges and antique colors. Contractor shall assure match to existing pavers along Main Street in Sumter, SC. The paver must conform to meet ASTM C902, Class SX, Type 1 for traffic.

2.2 All brick shall be supplied by the same manufacturer. The brick shall conform to ASTM 216 and/or ASTM C902, as applicable.

2.3 Mortar: Mortar shall conform to Section 719 of the South Carolina Highway Department Standard Specifications.

2.4 Joint Filler: Preformed expansion joint fillers shall be non-extruding resilient, non-bituminous type, conforming to AASHTO M153, Type II, and South Carolina State Highway Department Standard Section 501.07.

2.4.1 Unless otherwise indicated on the Drawings, joint filler shall be 1/2inch.

2.5 Sand: Sand shall be a clean aggregate with less than 10% fines.

**PART THREE - EXECUTION**

3.1 Repair, Pointing and Cleaning

3.1.1 Removal of Units: Remove masonry units which are loose, chipped, broken, stained, or otherwise damaged, or if units do not match adjoining units and install in fresh mortar, pointed to eliminate evidence of replacement.

3.1.2 Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point-up all joints at corners, openings, and adjacent work to provide a neat, uniform appearance, properly prepared for application of sealant compounds.

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3.1.2.1 At completion of masonry work, point holes in exposed masonry, and cut out defective joints and tuck point solidly with mortar which has been retempered one or two hours after original mixing.

3.1.3 Cleaning: During construction, keep the exposed faces clean of mortar and other stains. When mortar joints reach thumbprint hardness and are tooled, brush the exposed work with a soft fiber brush to remove adhering mortar, and use a wood paddle to remove more tenacious material. Protect bases of walls from splash stains by covering the adjacent ground with sand, sawdust, or polyethylene.

3.1.3.1 Clean exposed brick masonry surfaces as recommended by BIA Technical Note 20 "Cleaning Clay Products Masonry".

3.1.4 Protection: Advise the Engineer of proper procedures required to protect the masonry work from deterioration, discoloration or damage during subsequent construction operations.

3.1.5 Sand-and-Swept Joints: After placement of brick paving, coarse, clean sand shall be swept into the joints for the full depth of the bricks. The Contractor shall be responsible for reapplication as necessary to achieve the full depth of sand.

END OF SECTION 02614

**SECTION 02665 - WATER LINES, VALVES, AND APPURTENANCES**

**PART ONE – DESCRIPTION:**

The Contractor shall furnish all labor, materials, equipment and supplies and shall perform all work necessary for the construction of water lines, valves and appurtenances; complete, disinfected, tested and ready for use. The water lines and valves shall be constructed of the size and at the locations shown on the plans.

**1.2 Related Work: See the following Sections for related specifications:**

02222 Excavating, Backfilling & Compacting for Utilities  
02933 Seeding & Mulching

**1.3 References**

The design, manufacture, and installation of these materials shall meet or exceed the applicable provisions and recommendations of the following National Specifications or meet the requirements of the latest revision of these specifications:

ANSI/AWWA C110/A21.03  
ANSI/AWWA C104/A21.4-03  
ANSI/AWWA C111-A21.11-00  
ANSI/AWWA C150/A21.50-02  
ANSI/AWWA C151/A21.51.02  
ANSI/AWWA C153/A21.53-  
ANSI/AWWA C500-02  
ANSI/AWWA C504-00  
ANSI/AWWA C550.05  
ANSI/AWWA C509-01  
ANSI/AWWA C600-05  
ANSI/AWWA C651-  
ANSI/AWWA C900-97  
ANSI/AWWA C906-99  
ASTM A48M-03  
ASTM A53M-06  
ASTM C478-06b  
ASTM D1785-06  
ASTM D2241-05  
ASTM D2487-06  
ASTM D3139-98(2005)  
ASTM F477-02 el

As a guide, the following definitions apply to the above specifications:

ANSI – American National Standard Institute  
AWA – American Water Works Association  
ASTM – Formerly “American Society for and Testing Materials” now “ASTM International”  
NFPA – National Fire Protection Association

**PART TWO – MATERIALS:**

**WATER LINES, VALVES AND APPURTENANCES**

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All materials for water line shall be new and shall be furnished by the Contractor in accordance with the following requirements unless shown otherwise on the plans. All pipe, fittings, packing, jointing materials, valves and fire hydrants shall conform to Section C of the AWWA standards, ANSI/NSF Standard 61, and/or manufacturer's recommended installation procedures. All materials/products must be third party certified as meeting the specifications of ANSI/NSF 61. The certifying party shall be accredited by the ANSI. Natural rubber or other material which will support microbiological growth may not be used for any gaskets, O-rings, and other products used for jointing pipes, setting meters or valves, or other appurtenances which will expose the material to the water. Vegetable shortening shall not be permitted as a lubricant. No lubricants which will support microbiological growth shall be used. All pipe material, solder, flux shall be lead free (less than 0.2% lead in solder and flux and less than 8.0% lead in pipes and fittings).

**2.1. Water Lines, 2 Inch Through 16 Inch:**

**2.1.1. Ductile Iron Pipe, 3 Inch and 4 Inch:**

- Pipe: AWWA C150 & C151 "Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds, for Water and Other Liquids." Thickness Class 51 unless shown otherwise on the drawings.
- Fittings: AWWA C110, grey or ductile iron; or AWWA C153, ductile iron compact fittings.
- Joints: AWWA C111 push-on or mechanical for general buried service; flanged for exposed service unless shown otherwise.
- Linings: AWWA C104 cement lining, standard thickness, bituminous exterior seal coat.

**2.1.2. Ductile Iron Pipe, 6 Inch Through 16 Inch:**

- Pipe: AWWA C150 & C151 "Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds, for Water and Other Liquids." Thickness Class 50 unless shown otherwise on the drawings.
- Fittings: AWWA C110, grey or ductile iron; or AWWA C153, ductile iron compact fittings.
- Joints: AWWA C111 push-on or mechanical for general buried service; flanged for exposed service unless shown otherwise.
- Linings: AWWA C104 cement lining, standard thickness, bituminous exterior seal coat.

**2.1.3. PVC Pipe, 2 Inch and 3 Inch:**

- Pipe: ASTM D-2241 "Polyvinyl Chloride (PVC) Pressure Water Pipe". Pipe provided shall be iron pipe size. Pipe shall be pressure rating 200 (SDR 21) unless otherwise shown on the drawings. All PVC pipe shall bear the National Sanitation Foundation (NSF) potable water logo.
- Fittings: Cement lined, gray-iron or ductile iron conforming to AWWA C104 and C110 for fittings size 4-inch through 12-inch. Fittings less than 4-inch shall be PVC, Class 200, IPS with bells conforming to ASTM D3139 and gaskets conforming to ASTM F477.
- Joints: Pipe; elastomeric gasket, push-on joints, conforming to ASTM F477 and ASTM 3139. Joints may be either integral bell and spigot or couplings.



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**2.1.4. PVC Pipe, 4 Inch Through 12 Inch:**

- Pipe:** AWWA C900 "Polyvinyl Chloride (PVC) Pressure Pipe for Water." Pipe provided shall be cast iron pipe equivalent O.D. Pipe shall be working pressure rated Class 200 (DR21) unless shown otherwise on the drawings. All PVC pressure pipe shall bear the National Sanitation Foundation Seal (NFS). The use of solvent weld PVC pipe in water mains 4" and larger is prohibited.
- Fittings:** Cement lined, cast or ductile iron fittings conforming to AWWA C110. The use of solvent weld PVC fittings in water mains 4" and larger is prohibited.
- Joints:** Pipe; elastomeric gasket, push-on joints, conforming to AWWA C900 and C111. Joints may be either integral bell and spigot or couplings.

**2.2 Valves:**

**2.2.1 GATE VALVES - 2" through 12":** shall be resilient-seated, cast iron body, conforming to AWWA C509, latest revision. Sealing mechanism shall provide zero leakage at the water working pressure against the line flow from either direction and be designed such that no exposed metal seams, edges, screws, etc. are within the waterway in the closed position. The gate shall not be wedged into a pocket nor slide across the seating surface to obtain tight closure. All internal and external ferrous surfaces of the valve, including the interior of the gate, shall be coated with a protective coating conforming to AWWA C550, latest revision. Coating shall be applied to castings prior to assembly to assure all exposed areas will be covered. Valves shall be rated at 200 psi working pressure. Unless otherwise noted, underground valves shall have an operating nut and exposed valves shall have a hand wheel operator. Valves for use in Fire Service applications shall be UL Listed for Fire Service use.

**2.2.2 GATE VALVES GREATER THAN 12":** shall be double-disk, parallel seat, cast iron body, bronze mounted, bottom-wedge type conforming to AWWA C500, latest revision. Valves 16" and larger, for working pressures greater than 50 psi shall be provided with a spur or bevel gear operator and a bypass. Bypass valves shall be the same design as the parent valve. Gear ratios and bypasses shall conform to AWWA C500. Valves shall be rated at 150 psi working pressure.

**2.2.3 Tapping Sleeves and Valves** shall be the type designed for making connections to existing water lines without loss of water or interruption of service. Sleeves shall be the cast iron split repair type suitable for 200 psi working pressure. Joints shall be suitable for the intended use. Valves shall be the same construction as standard AWWA gate valves, complete with operating nut and suitable for 200 psi working pressure less than 12" and 150 psig for valves 12" and greater.

**2.2.4 Butterfly Valves (12" and Larger):** All valves on water mains 12-inches in diameter and larger, except tapping valves, shall be direct bury butterfly valves with mechanical joint ends conforming to all requirements of AWWA C504. Unless otherwise shown on the construction plans, all butterfly valves shall be Class 150B.

Each butterfly valve shall be furnished with a manual operator equipped with a 2" square operating nut. The operator shall open the valve when the operating nut is turned to the right or clockwise. The valve and operator shall be assembled for installation in a horizontal line with the main valve shaft horizontal and the operator shaft and operating nut aligned vertically to accept a valve key operated from the surface.

Butterfly valves shall be shop painted for buried service in accordance with AWWA C504. Valves shall be manufactured by Mueller Co., or approved equal.

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2.2.5 Indicator posts shall have a cast-iron body, 1-1/4" square operating nut, lockable operating wrench, with "OPEN" and "SHUT" targets appearing in full view when the valve is fully open or closed. Base shall be flanged and shall bolt onto the indicator post flange provided on top of the valve. The indicator post shall be fully compatible with the approved valve, capable of accepting a tamper switch, and the bury depth shall govern post dimensions. The Indicator posts shall be UL listed in accordance with NFPA 24 and FM approved. Indicator Posts shall be Mueller, No. A-20806, Kennedy Style 2945 or 2945A, or approved equal.

2.2.6 Valve Boxes:

(a) Each valve buried in the ground shall be provided with an approved type of valve box and cover. The boxes shall be adjustable slip-joint or screw type.

(b) The valve boxes shall be made of close-grained gray cast iron, in three pieces, comprising the lower or base pieces which shall be belled at the bottom to fit around the stuffing box gland and rest on the valve bonnet, the upper part of which shall be flared on the lower end to telescope on a socket to receive the cap or cover. The cap or cover shall have the word "Water" cast on the upper surface in raised letters. All castings shall be thoroughly cleaned and heavily coated with asphalt or coal-tar varnish.

(c) The valve boxes shall be made of close-grained gray cast iron, in two pieces, comprising the base piece which shall be flanged on the lower end and grooved at the upper end to receive the cap or cover. The cap or cover shall have the word "Water" cast on the upper surface in raised letters. All castings shall be thoroughly cleaned and heavily coated with asphalt or coal-tar varnish. Valve box shall be Poe 107, AccuCast Item # VBX-126, or Equal.

(d) Each valve box shall be provided with a concrete valve marker/protector as detailed on the plan.

(e) Each valve box shall be fitted with an extension stem for use with the buried service non-rising stem valves. The stem shall be of metal and used to extend the position of the 2" operating nut within 6 inches of grade. Each stem shall be fitted with a self-centering disk below the operating nut to keep the stem aligned in the valve box and minimize the amount of grit that can enter the valve box.

(f) Survey coordinates for each curb box shall be secured following final placement with the project surveyor.

2.2.7 Air Valves for water lines shall be APCO Air Release Valve, Crispin Pressure Valve, Golden Anderson or equal. The valve shall be designed for a minimum of 200 psi pressure and sized as shown on the plans.

2.2.8 Air Valve Manholes shall be 4 feet in diameter precast concrete sections conforming to ASTM C-478. Tops shall be eccentric cone where cover permits unless otherwise shown. Frame and cover shall be good quality domestic manufacture conforming to ASTM A48, Class 30 or better. Cover shall be a solid heavy duty casting with the word "Water" cast in the lid.

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2.3 Fire Hydrants:

2.3.1 Fire Hydrants shall conform to the standard specifications of the American Water Works Association (C502-80) and shall be of the three (3) way type. The hydrant valve opening shall not be less than four and one-half - (4-½) inches. Each hydrant shall be equipped with two (2) two and one-half - (2-½) inch hose connections. The hydrants shall be fitted with bell ends to accommodate the spigot end of six (6) inch ductile iron Pipe and have the standard one and one-half inch pentagon operating nut.

2.3.2 The barrel of the hydrant shall be of proper length to permit a Four (4) foot bury. The valve shall be designed to close against the pressure of the distribution system and remain closed in the event of the upper part of the barrel being broken.

2.3.3 A flange shall be provided, above ground level, to permit adjusting the facing of the hydrant. The hydrant shall be so designed and constructed as to permit replacement of the upper portion of the barrel without digging.

2.3.4 Each nozzle shall have a cast iron cap, suitably attached to the hydrant barrel by means of a chain. Nozzle caps shall be provided with leather gaskets.

2.3.5 Hose nipples shall be of the removable type and shall conform to the existing hose nipples in use by the Owner. On a new system they shall have National Standard Threads on the hose connection side unless otherwise directed by the Engineer.

2.3.6 Two standard hydrant wrenches shall be furnished.

2.3.7 All fire hydrants furnished for this project shall be of the type known as "breakable" in order that the hydrant barrel may be broken without damaging the lower portion of the hydrant in case of an accident.

2.3.8 All fire hydrants furnished for this project shall be equal in every respect to Mueller "Centurion" or OWNER approved equal.

2.4 Steel Encasing Pipe shall be smooth wall, meeting or exceeding ASTM A-139 Grade B 35,000 psi minimum yield strength with minimum wall thickness as defined below:

Steel Encasing Pipe Size O.D.	Wall Thickness (Inches)	For Use with Carrier Pipes of the Following Diameters
12"	0.250	4"
16"	0.250	6"
20"	0.250	8"
24"	0.250	12" (& 10")
30"	0.312	16" & 18"

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2.5 Carrier Pipe Supports Within Steel Casing: Shall be steel plate, cold formed structural collar with flanges and a minimum of four support legs welded to the collar. Each support leg shall have a foot or skid welded on the end extending beyond the front and back edge of the collar. The front and rear of each foot shall be angled inwardly towards the collar to serve as a stable, effective skid during installation of the carrier pipe. The carrier support shall be securely fastened to the carrier pipe with a heavy duty ½" grade 5 bolt and locking nut passing between the flanges, compressing the collar against the carrier pipe. The support device shall be a "Spider" or approved equal.

2.6 Bedding Material: shall consist of washed coarse gravel. Gravel material shall be crushed stone or gravel of strong durable nature and shall conform to the standard size No. 57 per "Standard Specifications for Highway Construction, 2000" published by the South Carolina Department of Transportation. A continuous and uniform bedding shall be provided in the trench for all buried pipe. Back-fill material shall be tamped in layers around the pipe and to a sufficient height above the pipe to adequately support and protect the pipe. Stones, other than crushed bedding, shall not come into contact with the pipe and shall not be within six (6) inches of the pipe.

**PART THREE - TRENCH EXCAVATION AND BACKFILL:**

3.1 Excavation shall conform to the lines and grades shown on the drawings. No trench shall be opened more than four hundred (400) feet in advance of the completed pipe work without the written permission of the Engineer. The lines of excavation of trenches shall be made so there will be a clearance of at least eight (8) inches on each side of the barrel of the pipe. The depth of the trench shall be such that the top of the pipe shall not be less than four (4) feet below finished grade. Excavation shall not be carried below the established grades and any excavation below the required level shall be backfilled and thoroughly tamped as directed by the Engineer, at the Contractor's expense. Bell holes shall be excavated accurately by hand as required by manufacturer's specifications.

3.2 During excavation, the Contractor shall separate materials suitable for backfill from those which are not as defined in Paragraph 3.5 of this section. Suitable material shall be stockpiled near the trench for use as backfill. Unsuitable material shall be removed immediately or shall be stockpiled separately for dewatering or drying or for later removal.

3.3. Should unstable soil, organic soil, or soil types classified as inorganic clays or inorganic silts (Class IV, Unified soil classification CL or lower) be encountered at the bottom of pipe trenches or structure excavations, such soils shall be removed to a depth and width determined by the Engineer and properly disposed of offsite. The resulting undercut shall be backfilled and compacted with sandy soils which meet or exceeds the requirements of Class I or Class II soils, Unified Class SP or better. Placement and compaction shall conform to specifications herein.

3.4 All necessary dewatering pumping, and bailing shall be performed in such a manner as to keep the trench in a satisfactory condition for pipe laying.

3.5 Do not use the following materials for pipe foundation or trench backfill within the zones indicated below:

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- All zones: material classified as peat (PT) or organic (OL)(OH) under the Unified Soil Classification (USC) System, ASTM D2487 or material too wet or too dry to achieve minimum compacted density requirements,
- Six inches beneath pipe: soft or unstable material and rock,
- Beside pipe: any material containing more than 75% fines passing #200 sieve.

Where no excavated material is suitable for backfill, furnish suitable material from borrow sites at no additional cost to the Owner.

3.6 Backfilling shall be done with material free from large clods, frozen earth, organic material or any foreign matter.

3.6.1 Around the pipe and to a depth of 12 inches above the pipe the backfill shall be carefully placed and compacted in layers not to exceed 6-inches compacted thickness. The backfill material shall be select and free of rock. Do not place backfill material on either side of the water main that is finer than the material upon it is placed. Backfill with coarser material to the top of the pipe.

3.6.2 Twelve (12) inches above the crown of the pipe the backfill may contain rock but less than 6 inches in diameter. Backfill layers shall be horizontal and not exceed 12 inches loose thickness or 8 inches compacted.

3.6.3 Compaction shall be performed with suitable pneumatic compactors or approved equal. Compaction equipment specifically designed for trench compaction shall be present and operational at the jobsite and shall be utilized throughout the length and depth of the trench to achieve uniform compaction density.

3.6.4 Compaction Density shall be determined by the Standard Proctor Test (ASTM D698) and shall meet the minimum standards in Section 02222, Excavating, Backfilling & Compacting for Utilities.

3.6.5 Surplus material shall be disposed of by the Contractor at his expense.

3.6.6 Clean shoulders and pavement of excess material immediately after backfilling is complete.

3.6.7 Backfilling fire service piping joints may be performed following successful completion of hydrostatic testing.

**PART FOUR - LAYING WATER MAINS, HYDRANTS AND SPECIALS:**

Proper and suitable tools for the safe and convenient handling and laying of pipe shall be used, and great care shall be taken to prevent the pipe coating from being damaged, particularly on the inside of the pipes.

4.1 All pipe shall be carefully examined for cracks and other defects and no pipe or castings shall be laid which is known to be defective. If any pipe or other casting is discovered to be cracked, broken or defective, after being laid, it shall be removed and replaced by sound pipe, without further charge.

4.2 Before laying the inside of the bell, the outside of the spigot of the pipe shall be thoroughly cleaned.

4.3 Pipe shall be laid to conform accurately to the lines and grades established by the Engineer. All pipes must have a minimum cover of four (4) feet, unless the pipe material is concrete, DIP, or other approved material, and insulated to prevent freezing. The pipe shall be properly bedded as shown on the plans and per manufacturers recommendations.

4.4. Lateral Separation of Sewers and Water Mains: Water mains shall be laid at least 10 feet laterally (horizontally) from the existing or proposed sewers measured from the edge of the pipe to edge of pipe, unless local conditions or barriers prevent a 10-foot lateral separation-in which case:

4.4.1 The water main is laid in a separate trench, with the elevation of the bottom edge of the water main at least 18 inches above the top edge of the sewer; or

4.4.2 The water main is laid in the same trench as the sewer with the water main located at one side on a bench of undisturbed earth, and with the elevation of the bottom of the water main at least 18 inches above the top of the sewer.

4.4.3 When impossible to obtain the distances specified in R.61-58.4.D(12)(a) and (b) SCDHEC may allow an alternative design. Any alternative design shall 1) maximize the distances between the water main and the sewer line and the joints of each. 2) use materials which meet the requirements of R.61-58.4.D(1) for the sewer line; and, 3) allow enough distance to make repairs to one of the lines without damaging the other.

4.5 Crossing a Water Main Over a Sewer: Whenever possible the water main shall be located above the sewer line. Whenever it is necessary for a water main to cross over a sewer, the water main shall be constructed of ferrous materials and be laid at such an elevation that the bottom edge of the water main is at least 18 inches above the top edge of the sewer. Where a new water main crosses a new sewer line, a full length of pipe shall be used for both the water main and sewer main and the crossing shall be arranged so that the joints of each line will be as far as possible from the point of crossing each other. Where a new water main crosses an existing sewer line, one full length of water pipe shall be located so both joints will be as far from the sewer line as possible.

4.6 Crossing a Water Main Under a Sewer: Whenever possible the water main shall be located below the sewer line. Whenever it is necessary for a water main to cross under a sewer, the water main shall be constructed of ferrous materials and be laid at such an elevation that the bottom edge of the water main is at least 18 inches above the top edge of the sewer. Where a new water main crosses a new sewer line, a full length of pipe shall be used for both the water main and sewer main and the crossing shall be arranged so that the joints of each line will be as far as possible from the point of crossing each other. Where a new water main crosses an existing sewer line, one full length of water pipe shall be located so both joints will be as far from the sewer line as possible. Where a water main crosses under a sewer line, adequate support shall be provided for the sewer line to prevent damage to the water main.

4.7 No water pipe shall pass through or come into contact with any part of a sewer manhole. Water lines may come in contact with storm sewers or catch basins if there is no other practical alternative, provided that ductile iron pipe is used, no joints of the water line are within the storm sewer or catch basin and the joints are located as far as possible from the storm sewer or catch basin.

4.8 Concrete Blocking: All bends, tees and plugs, shall be blocked with 3000 psi concrete from the pipe to undisturbed ground to the dimensions shown on the plans. Plant mix concrete is preferred although field mix concrete (Sacrete or equal) may be used as long as it is properly mixed in clean containers with potable water. The concrete shall receive a 24-hour cure before being backfilled. The concrete placed against a plug shall contain a weakness plane (using heavy paper to make this joint), so that when struck with a hammer, it will separate and allow the plug to be removed. If the ground is soft, restrained joint fittings shall be used as directed by the Engineer.

4.9 Valves, Specials and All Other Appurtenances are to be placed as shown on the drawings or at the location and in the manner designated by the Engineer. Any omissions of any of these appurtenances shall be corrected by the Contractor and the same set as originally planned without expense to the Owner. Over each valve a valve box is to be firmly set. Each valve box shall be provided with a standard concrete valve box protector/marker as shown on the plans and fitted with a operating nut extension, as required.

4.10 Hydrants: Shall be set true to grade, with the standpipe plumb. The base of the hydrant shall rest upon a slab of stone or concrete not less than 4 inches thick and 12 inches square.

Beneath and around the base of the hydrant and to a point one foot above drip, at least a quarter of a yard of clean, crushed stone shall be placed, and the trench filled with earth. All other construction requirements shall be according to the detail on the plans.

4.11 Boring and Jacking: Where required, smooth wall steel pipe shall be jacked through dry bores slightly larger than the pipe, bored progressively ahead of the leading edge of the advancing pipe. As the boring and jacking operation progresses, each new section of the encasement pipe shall be butt-welded to the section previously jacked in place.

4.11.1 Unacceptable bores are those with excessive deflection or deflections in the bore resulting in less than four (4) feet of soil cover above the casing, where upon the direction of the Engineer, shall require the bore to be abandoned. The abandonment procedure will be at the Contractor's expense and will consist of cutting off the excess pipe, capping the remaining pipe in place, then filling the abandoned pipe with Portland cement grout (1:3 parts cement to sand) at sufficient pressure to fill all voids before moving to a new location.

4.11.2 The carrier pipe shall be fully supported along its entire length within the casing pipe. Support may be accomplished by securely fastening pressure treated lumber to the carrier pipe or by using "spiders". Either method shall be first submitted to the Engineer for approval, detailing the means of fastening the support devices and spacing of supports.

4.11.3 Length of encasements shall be determined as follows:

Cut sections - Ditch line to ditch line.

Fill sections - 5 feet beyond toe of slope.

Curb sections - 3 feet beyond curb.

Future highway or railroad R/W - Extend full width of R/W or unless otherwise advised.

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4.11.4 Materials and workmanship shall also be governed by the requirements set for by the agency issuing the encroachment (Railroad, Department of Transportation, Pipeline Co., etc.). Any specific conditions other than listed herein pertaining to the encroachment are listed in the Special Conditions.

4.12 All mains shall be detectable within three (3) feet with electronic locating equipment. Nonmetallic pipes shall be installed with utility line marking tape which shall be acid and alkali resistant polyethylene film two inches wide and 4 mil thick. The tape shall be manufactured with integral wires for backing or other means to enable detection by a metal detector when the tape is buried up to three feet. The metallic core of the tape shall be encased in a protective jacket or by other means to prevent corrosion. The tape shall bear a continuous printed marking describing the specific utility, i.e. "water".

4.13 Install No. 4/0 copper wire bonding jumper w/Thermite welded junction (or approved alternate) across all joint fittings.

**PART FIVE – TESTS:**

5.1 Pressure/leakage tests must be conducted in accordance with Standard AWWA C600 for installation of ductile iron water mains and appurtenances and Standard AWWA C605 for underground installation of polyvinyl chloride (PVC) pressure pipe and fittings for water. The allowable leakage shall not exceed that determined by the following formula:

PVC

$$L = \frac{ND(P^{1/2})}{7,400}$$

L = Allowable leakage in gallons per hour  
N = Number of joints in pipeline being tested  
D = Nominal diameter of pipe, in inches  
P = Average test pressure, in psig

DIP

$$L = \frac{SD(P^{1/2})}{133,200}$$

L = Allowable leakage in gallons per hour  
S = Length of line tested in feet  
D = Nominal diameter of pipe, in inches  
P = Average test pressure, in psig

5.1.A Pressure test must be conducted in accordance with AWWA Standards C600. The test pressure shall be 1.5 times the maximum working pressure. The test shall be a minimum of two hours.

5.1.B Pressure testing for Fire Service piping shall be performed and documented in accordance with NFPA24.

5.2 Where practicable, pipe lines shall be tested in lengths between line-valves or plugs of no more than 2,000 feet.



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5.3 Pipe lines shall be tested before backfilling at joints, except where otherwise required by necessity, local ordinance or public convenience.

5.4 Duration of test shall be not less than 2 hours where joints are exposed, and not less than 24 hours where joints are covered, unless directed by the Engineer.

5.5 All visible leaks at exposed joints, and all leaks evident on the surface where joints are covered, shall be repaired and leakage minimized, regardless of total leakage as shown by test.

5.6 All pipe, fittings, and other material found to be defective under test shall be removed and replaced at the Contractor's expense.

5.7 Lines which fail to meet tests shall be repaired and retested as necessary, until test requirements are complied with.

5.8 Pipe lines with resilient gasket materials should be held under normal operating pressure at least 3 days before testing.

**PART SIX - DISINFECTION:**

Before being placed in service, all new mains and repaired portions of, or existing mains shall be thoroughly flushed then chlorinated according to AWWA Standard C651 Section 5.2, Continuous-Feed Method. This method shall be followed as outlined below with the exception that the lines shall be disinfected by the addition and thorough distribution of a chlorine solution in concentration sufficient to produce a chlorine residual of at least 50 milligrams per litre (or ppm), in accordance to Section .2203 of the "Rules Governing Public Water Supplies". All samples must be analyzed by a State certified laboratory.

6.1 Preliminary Flushing for fire water and potable water lines. Before being chlorinated, the main shall be filled to eliminate air pockets and shall be flushed to remove particulates. The flushing velocity in the main shall not be less than 2.5 ft/s unless the owner's engineer or job superintendent determines that conditions do not permit the required flow to be discharged to waste. Table 1 shows the rates of flow required to produce a velocity of 2.5 ft/s in pipes of various sizes. Note that flushing is no substitute for preventive measures during construction. Certain contaminants, such as caked deposits, resist flushing at any feasible velocity. No flushing device shall be directly connected to any sewer.

Table 1. Required Flow and Openings to Flush Pipelines (40 psi Residual Pressure in Water Main).

Pipe Diameter In.	Flow Required to Produce 2.5 ft/s (approx.) Velocity in Main gpm
4	100
6	220
8	400

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10	612
12	900
16	1600

6.2.1 Water from the existing distribution system or other approved source of supply shall be made to flow at a constant, measured rate into the newly laid water main. In the absence of a meter, the rate may be approximated by methods such as placing a Pitot gauge in the discharge or measuring the time to fill a container of known volume.

6.2.2 At a point not more than 10 ft downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will have not less than 25 mg/L chlorine residual. To assure that this concentration is provided, measure the chlorine concentration at regular intervals using appropriate chlorine test kits.

6.2.3 During the application of chlorine, valves shall be positioned so that the strong chlorine solution in the main being treated will not flow into water mains in active service. Chlorine application shall not cease until the entire main is filled with heavily chlorinated water. The chlorinated water shall be retained in the main for at least 24-h, during which time all valves and hydrants in the treated section shall be operated to ensure disinfection of the appurtenances.

6.2.4 Direct-feed chlorinators, which operate solely from gas pressure in the chlorine cylinder, shall not be used for application of liquid chlorine. The preferred equipment for applying liquid chlorine is a solution-feed, vacuum-operated chlorinator and a booster pump. The vacuum-operated chlorinator mixes the chlorine gas in solution water; the booster pump injects the chlorine-gas solution into the main to be disinfected. Hypochlorite solutions may be applied to the water main with a gasoline or electrically powered chemical-feed pump designed for feeding chlorine solutions. Feed lines shall be of such material and strength as to safely withstand the corrosion caused by the concentrated chlorine solutions and the maximum pressures that may be created by the pumps. All connections shall be checked for tightness before the solution is applied to the main.

6.2.5 The highly chlorinated water should remain in the line until the chlorine residual drops below 5 ppm or a minimum of 96 hours, whichever is first. After this period, the water will be wasted by pumping into the air to dissipate the remaining chlorine residual. Pumping shall be at a rate not to exceed 25 GPM. Pressure and nozzle size shall be such as to produce an 8 foot (vertical) spray.

The system should then be flushed with potable water and the sampling program started. The number of sampling sites depends on the amount of new construction but must include all dead-end lines and be representative of the water in the newly constructed mains. Sampling shall consist of taking two representative samples every 1200 feet and at each blow-off taken at least 24 hours apart. Also at each site, chlorine residual at time of sampling must be measured and reported. If the membrane filter method of coliform analysis is used, non-coliform growth must also be reported. If the non-coliform growth is greater than 80 colonies per 100 millimeters, the sample result is invalid and must be repeated. The samples shall then be tested by a state approved laboratory for indication of bacteriologically satisfactory water. Three (3) copies of this laboratory test shall be submitted to the Engineer.

END OF SECTION 02665

**SECTION 02721 - DRAINAGE STRUCTURES AND INLETS**

**PART ONE – DESCRIPTION:**

The work covered by this section consists of the construction of cast-in-place or precast concrete, brick masonry or block masonry, catch basins, inlets, junction boxes, spring boxes, manholes or other minor drainage structures, excluding endwalls together with all necessary metal grates, covers, frames, steps and other hardware. The CONTRACTOR shall furnish all equipment, tools, labor, and materials necessary to complete the work in accordance with the plans and specifications.

**1.1. Related Work**

Any reference to standard specifications refers to the most current published date of the following specifications unless otherwise noted.

**1.1.1. Reference the following specifications for related work:**

- AASHTO – T99 Foundation Compaction
- ASTM A48 Grey iron Casting

All drainage structures and inlets shall conform to all of Section 719 of the “Standard Specifications for Highway Construction” dated 2007, published by the South Carolina Department of Transportation.

**PART TWO – MATERIALS:**

2.1. The CONTRACTOR may, at his option, use either cast-in-place concrete, brick masonry, block masonry, or precast concrete construction, provided that the type of construction he wishes to use is permitted by the plans, and is constructed in conformance with the local and state Department of Transportation requirements.

2.2. Shop drawings consisting of catalog cuts or fabricator drawings showing the structure, reinforcing alignment of all wall penetrations and frames, grates, or covers shall be submitted by the CONTRACTOR to the ENGINEER for approval.

**2.3 . Iron Castings**

2.3.1. Iron castings shall be boldly filleted at angles, and the arrises shall be sharp and perfect. No sharp, unfilleted angles or corners will be permitted. They shall be true to pattern in form and dimensions, free from pouring faults, sponginess, cracks, blow holes, and other defects affecting their strength and value for the service intended. All castings shall be sand blasted or otherwise effectively cleaned of scale and sand so as to present a smooth, clean, and uniform surface.

2.3.2. Gray iron castings shall meet the requirements of ASTM A48 for Class 30 iron.

2.3.3. Steps for minor drainage structures shall be fabricated from deformed reinforcing bars, or shall be gray iron castings or shall be of composite plastic-steel construction as shown on the plans, or as referenced above.

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2.4. Precast Drainage Structures

2.4.1. Precast drainage structures shall have no more than 4 holes cast or drilled in each unit for the purpose of handling or placing unless otherwise approved by the ENGINEER. All lift holes and handling devices shall be located in accordance with plan and design requirements. Units damaged while being handled or transported will be rejected or shall be repaired in a manner approved by the ENGINEER.

2.4.2. Precast units shall not be transported away from the casting yard until the concrete has reached the minimum required 28 day compressive strength and a period of at least 5 days has elapsed since casting, unless otherwise permitted by the ENGINEER.

2.4.3. Steps for precast drainage structures shall meet the requirements of AASHTO M199 for design, materials, and dimensions. Steps shall be incorporated in all drainage structures over 3'-6" in height. The lowest step shall be no more than 16" from the bottom.

2.4.4. The following information shall be clearly shown on each precast member.

- Date of manufacture
- Name of manufacturer

**PART THREE – INSTALLATION:**

3.1. The CONTRACTOR shall take the necessary precautions to insure that all excavations for drainage structures are maintained in a dry condition to allow proper compaction beneath the structure and backfill once the structure has been completed.

3.2. Where the foundation material is found to be of poor supporting value or of rock, the ENGINEER may make minor adjustment in the location of the structure to provide a more suitable foundation. Where this is not practical, the foundation shall be conditioned by removing the existing foundation material by undercutting to the depth as directed by the ENGINEER and backfilling with either a suitable local material secured from unclassified excavation or borrow excavation at the nearest accessible location along the project, or foundation conditioning material consisting of crushed stone or gravel or a combination of sand and crushed stone or gravel approved by the ENGINEER as being suitable for the purpose intended. The selection of the type of backfill material to be used for foundation conditioning will be made by the ENGINEER.

3.3. The CONTRACTOR shall install poured concrete foundations or precast concrete bases for all drainage structures.

3.4. Where precast foundation slabs are used, the slab shall be set to within plus or minus ½ inch of grade on a bed of size 57 crushed stone measuring 6 inches in thickness minimum after being compacted to 98% maximum density in accordance with AASHTO T99.

3.5. Precast Structures

Joints on precast concrete sections shall be completely filled with bituminous mastic jointing compound or joints shall be made with cement mortar with inside pointing and outside rubber wrap.

3.6. Masonry Structures

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3.6.1. No masonry drainage structure shall be placed until the foundation has been approved by the ENGINEER.

3.6.2. Brick shall be wet when laid. Lay brick or concrete masonry units in mortar so as to form full bed, with end and side joints in one operation, with joints not more than 3/8" wide except when bricks or concrete masonry units are laid radially, in which case narrowest part of joint shall not exceed 1/4". Lay in true line and whenever practical joints shall be carefully struck and pointed on inside.

3.6.3. Protect fresh masonry work from freezing, from drying effects of sun and wind, and for such time as directed by ENGINEER. In freezing weather, heat materials sufficiently to remove ice and frost.

3.6.4. The outside surfaces of brick or concrete masonry portion of drainage structures shall be plastered and troweled smooth with 1/2" layers of cement mortar.

3.7. Backfilling around all drainage structures and inlets shall be done in such a manner so as not to damage either the structure or pipes connecting to the structure. Compaction of backfilled material shall be accomplished in 6 inch lifts (loose) to 98% maximum density in accordance with AASHTO T99.

END OF SECTION 02721

**SECTION 02722 - DRAINAGE PIPE AND CULVERTS**

**PART ONE – DESCRIPTION:**

The work covered by this section consists of all excavation, bedding, laying pipe, jointing and coupling pipe sections, and backfilling necessary to install the various types of pipes, pipe culverts and fittings required to complete the project. The CONTRACTOR shall furnish all equipment, tools, labor and materials necessary to complete the work in accordance with the plans and specifications.

**1.1 Related Work**

Any reference to standard specifications refers to the most current published date of the following specification unless otherwise noted.

**1.2. Reference the following specifications for related work:**

02721	Drainage Structures and Inlets
ASTM C76	Concrete Pipe
ASTM C507	Reinforced concrete Elliptical Pipe

1.2.1. All drainage structures and inlets shall conform to Section 714 and installed in conformance with Division 3 of the “Standard Specifications for Highway Construction” dated 2007, published by the South Carolina Department of Transportation.

1.3. The CONTRACTOR shall furnish all equipment, tools, labor, and materials necessary to complete the work in accordance with the plans and specifications.

**PART TWO – MATERIALS:**

2.1. Drainage pipe and culverts shall conform to local and state Department of Transportation requirements.

2.2. Shop drawings consisting of catalog cuts and related data shall be submitted by the CONTRACTOR to the ENGINEER for approval.

2.3. All reinforced concrete pipe, flared end sections, tees and elbows shall be clearly marked showing the pipe class, type of wall and date of manufacture.

2.4. Reinforced concrete drainage pipe shall conform to ASTM C76, Class III, wall thickness B. Joints shall be tongue and groove.

2.5. Concrete flared end sections shall be reinforced. Concrete used in flared end sections shall attain a compressive strength of 3500 psi at 28 days.

2.6. Reinforced concrete elliptical drainage pipe shall conform to ASTM C507, Class HE-II. Joints shall be tongue and groove.

**PART THREE – INSTALLATION:**

**DRAINAGE PIPES & CULVERTS**

3.1. General Requirements

3.1.1. Drainage pipes and culverts of the type and quantity and in the locations as called for on the plans or as directed by the ENGINEER shall be installed in conformance with local and state Department of Transportation requirements.

3.1.2. Where proposed culverts are to be installed under existing roadways, the construction shall be performed in such a way that half the roadway will be maintained and available to traffic or as directed by the governing agency.

3.2. Unloading and Handling

All pipes shall be unloaded and handled with reasonable care. When any joint or section of pipe is damaged during unloading or handling, the undamaged portions of the joint or section may be used where partial lengths are needed or, if damaged sufficiently, the ENGINEER will reject the joint or section as being unfit for installation and the CONTRACTOR shall remove such rejected pipe from the project, at no cost to the OWNER.

3.3. Preparation of Pipe Foundation

3.3.1. The pipe foundation shall be prepared in accordance with the applicable method shown on the plans and shall be true to line and grade and uniformly firm. Bedding material shall be placed and shaped beneath the pipe. The pipe foundation shall be shaped to fit the outside of the pipe for at least 10% of its outside diameter under all pipe culverts. Where bell and spigot type pipe is used, recesses shall be excavated to receive the pipe bells.

3.3.2. Where the foundation material is found to be of poor supporting value or of rock, the ENGINEER may make minor adjustment in the location of the pipe to provide a more suitable foundation. Where this is not practical, the foundation shall be conditioned by removing the existing foundation material by undercutting to the depth as directed by the ENGINEER, within the limits established on the plans, and backfilling with either a suitable local material secured from unclassified excavation or borrow excavation at the nearest accessible location within the project, or foundation conditioning material consisting of crushed stone or gravel or a combination of sand and crushed stone or gravel approved by the ENGINEER as being suitable for the purpose intended. The selection of the type of backfill material to be used for foundation conditioning will be made by the ENGINEER.

3.3.3. When necessary, the CONTRACTOR shall provide for the temporary diversion of water or dewatering in order to maintain the pipe foundation in a dry condition, and shall continue to maintain the trench in a dry condition until backfill and compaction activities are complete.

3.4. Laying Pipe

3.4.1. Rigid pipe shall be carefully laid on the prepared foundation, bell or groove end upgrade with the spigot or tongue fully inserted and each joint check for alignment and grade as the work proceeds. Flexible plastic joint material shall be used. Joint material of other type or design may be used when designated on the plans, by special provisions, or when permitted in writing by the ENGINEER.

3.4.2. Flexible pipe (except structural plate pipe) shall be carefully placed on the prepared foundation starting at the downstream end with the inside circumferential laps pointing downstream and with the longitudinal laps at the side or quarter points.

### 3.5. Backfilling

3.5.1. The fill around the pipe shall be placed in accordance with the applicable method shown on the plans, and shall be placed in layers not to exceed 6 inches loose unless otherwise approved by the ENGINEER and compacted to the density required. Select backfill material shall be used when called for on the plans.

3.5.2. Care shall be taken during backfill and compaction operations to maintain alignment and prevent damage to the joints. The backfill shall be kept free from stones, frozen lumps, chunks of highly plastic clay, or other objectionable material.

3.5.3. All pipe backfill areas shall be graded and maintained in such a condition that erosion or saturation will not damage the pipe bed or backfill.

3.5.4. Heavy equipment shall not be operated over any pipe until it has been properly backfilled and has a minimum cover as required by the plans. Where any part of the required cover is above the proposed finish grade, the CONTRACTOR shall place, maintain, and finally remove such material at no cost to the OWNER. Pipe which becomes misaligned, shows excessive settlement, or has been otherwise damaged by the CONTRACTOR's operations shall be removed and replaced by the CONTRACTOR at no cost to the OWNER.

### 3.6. Maintenance

3.6.1. The CONTRACTOR shall maintain all pipe installations in a condition such that they will function continuously from the time the pipe is installed until the project is accepted.

3.6.2. The ENGINEER may require the CONTRACTOR to thoroughly clean out and maintain all existing pipe and drainage structures at his own expense when necessary erosion control measures not taken by the CONTRACTOR resulted in fouling existing drainage systems.

### 3.7. Reinforced Concrete Pipe

3.7.1. Reinforced concrete drainage pipe shall be installed so as to prevent damage to the pipe. Joints shall be mortar or packing type, and shall be close fitting and generally watertight. Elliptical pipe shall be installed with the major axis horizontal.

### 3.8. Corrugated Steel Pipe

3.8.1. Bituminous coated corrugated steel pipe and paved invert pipe shall be handled with special care to avoid damage to coatings. Paved invert pipe shall be installed with the paved invert centered on the bottom.

3.8.2. The pipe sections shall be joined with coupling bands, fully bolted and properly sealed. Coupling bands for annular and helical corrugated metal pipe shall provide circumferential and



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longitudinal strength sufficient to preserve the alignment, prevent separation of the sections, and prevent infiltration of backfill material.

3.8.3. All pipe 72 inches or larger in diameter shall be wire braced at the place of fabrication to retain its shape while being handled, installed, and backfilled. Wire bracing shall be removed by the CONTRACTOR when no longer needed.

3.9. Corrugated Aluminum Pipe

3.9.1. The pipe sections shall be joined with coupling aluminum bands, fully bolted and properly sealed. Coupling bands for annular and helical corrugated aluminum pipe shall provide circumferential and longitudinal strength sufficient to preserve the alignment, prevent separation of the sections, and prevent infiltration of backfill material.

3.9.2. All pipe 72 inches or larger in diameter shall be wire braced at the place of fabrication to retain its shape while being handled, installed, and backfilled. Wire bracing shall be removed by the CONTRACTOR when no longer needed.

3.10. Corrugated Steel and Corrugated Aluminum Alloy, Structural Plate Pipe and Pipe Arch

3.10.1. Erection shall be in accordance with the manufacturer's assembly diagrams and instruction sheets. All erection procedures and methods shall meet with the approval of the ENGINEER. All structural plate shall be handled with reasonable care. The plate shall not be dragged or skidded. If the spelter coating has been broken during handling or backfilling operations, the plate or the assembled pipe or pipe arch will be rejected, or shall be repaired as directed by the ENGINEER.

3.10.2. The entire pipe line shall be completely assembled before any backfill is placed, unless otherwise permitted by the ENGINEER. Elongated pipe shall be erected with the long diameter in a vertical position. Should spiraling occur during erection, the bolts shall be loosened and the pipe assembly adjusted to the correct position.

3.10.3. All bolting shall be done in a careful and workmanlike manner in accordance with the procedure specified by the manufacturer and approved by the ENGINEER before backfill is placed. All nuts shall be tightened to a minimum of 100 foot-pounds and a maximum of 200 foot-pounds of torque. Nut tightness shall be checked with a properly calibrated torque wrench before, during, and after backfill is placed.

3.10.4. Where necessary, the invert grade shall be cambered by an amount sufficient to prevent the development of sag or back slope in the flow line. The amount of camber used will be determined by the ENGINEER.

3.10.5. First class workmanship shall be used in installing the pipe and pipe arch. Evidence of defective workmanship shall include but not be limited to the following.

- Uneven laps
- Improper shaping
- Variation from a straight center line
- Ragged edges

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- Loose, unevenly lined or spaced bolts
- Illegible identification stamp on any plate
- Bruised, scaled or broken spelter coating
- Dents or bends in the metal itself

3.10.6. Defective workmanship may constitute sufficient cause for rejection of the completed or partially completed work, or of any materials proposed for use in the work.

END OF SECTION 02722

**SECTION 02730 - FORCE MAINS AND GRAVITY SEWERS**

**PART ONE – DESCRIPTION:**

The CONTRACTOR shall furnish all labor, materials, equipment and supplies and shall perform all Work necessary for the construction of the sewers, complete, tested and ready for use. The sewers shall be constructed to the lines and grades shown and shall be the size shown on the plans.

**1.1. Related Work**

See the following sections for related specifications.

- 01016 References to National and State Standard Specifications and Regulations
- 02222 Excavation, Backfilling & Compacting for Utilities
- 02270 Erosion and Sediment Control
- 02575 Paving Repair and Resurfacing
- 02601 Manholes, Drop Connections and Conflict manholes
- 02933 Seeding and Mulching
- 03300 Cast in Place Concrete

**1.2. References**

Any reference to standard National or State Specifications and/or Regulations refers to the most current published date of the specifications and/or regulations listed in Section 01016 of these specifications unless noted otherwise.

The design, manufacture, and installation of these materials shall meet or exceed the applicable provisions and recommendations of the noted National Specifications and/or Regulations or meet the requirements of the latest revision of these specifications or regulations.

**PART TWO – MATERIALS:**

All materials for sewer pipe shall be new and shall be furnished by the CONTRACTOR in accordance with the following requirements unless shown otherwise on the plans.

**2.1. Gravity Sewers (8-Inch Through 16-Inch)**

**2.1.1. Ductile Iron Pipe**

- Pipe: AWWA C151 "Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds, for Water and Other Liquids." Thickness Class 51 for push-on and MJ pipe and Class 53 for flanged pipe, unless shown otherwise on the drawings
- Fittings: AWWA C110, grey or ductile iron, or compact ductile iron conforming to AWWA C153
- Joints: AWWA C111 push-on unless shown otherwise
- Linings: AWWA C104 cement lining, standard thickness, with bituminous seal coat

**2.1.2. PVC Sewer Pipe**

- Pipe: ASTM D3034; "Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings." SDR 35 with a minimum cell classification of 12454-B

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- Fittings: ASTM D3034. Fittings in sizes through 8" shall be molded in one piece with elastomeric joints and minimum socket depths as specified in Sections 6.2 and 7.3.2. Fittings 10" and larger shall be molded or fabricated in accordance with Section 7.11 with manufacturer's standard pipe bells and gaskets
- Joints: ASTM D-3212, Elastomeric gaskets conforming to ASTM F477

2.1.3. PVC Force Main Sewer Pipe

- Pipe: ASTM 2241; "Polyvinyl Chloride (PVC) Force Main Sewer Pipe and Fittings Based on Controlled Inside Diameter". PVC plastic with a minimum cell classification of 12454-C as defined in ASTM D-1784
- Fittings: ASTM D-3034 lateral hubs
- Joints: ASTM D-3212, elastomeric seal gaskets conforming to ASTM F-477

2.2. Force Mains

2.2.1. Ductile Iron Pipe (3-Inch Through 12-Inch)

- Pipe: AWWA C151 "Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds, for Water and Other Liquids." Thickness Class 51 for push-on and MJ pipe and Class 53 for flanged pipe, unless shown otherwise on the drawings
- Fittings: AWWA C110, grey or ductile iron
- Joints: AWWA C111 push-on or mechanical for general buried service; flanged for exposed service unless shown otherwise on the drawings

2.2.2. PVC Pipe (4-Inch Through 12-Inch)

- Pipe: AWWA C900 "Polyvinyl Chloride (PVC) pressure pipe. Pipe provided shall be cast iron pipe equivalent O.D. Pipe shall be pressure Class 150 (DR=18) unless shown otherwise on the drawings
- Fittings: Cement lined, cast or ductile iron fittings conforming to AWWA C110, or compact ductile iron conforming to AWWA C153
- Joints: Pipe, elastomeric gasket, push-on joints, conforming to AWWA C900. Joints may be either integral bell and spigot or couplings. Fittings; AWWA C111, push-on

2.2.3. PVC Pipe (1-Inch Through 4-Inch)

- Pipe: ASTM D-2241 "Polyvinyl Chloride (PVC) pressure water pipe. Pipe provided shall be iron pipe size. Pipe shall be pressure Class 200 (SDR 21) unless shown otherwise on the drawings.
- Fittings: Cement lined, gray-iron or ductile iron conforming to AWWA C104 and C110 for fittings size 4-inch through 12-inch or compact fittings conforming to AWWA C153. Fittings less than 4-inch shall be PVC, Class 200, IPS with bells conforming to ASTM F477.
- Joints: Pipe or compact ductile iron fittings conforming to AWWA C153, elastomeric gasket, push-on joints, conforming to ASTM F477 and ASTM 3139. Joints may be either integral bell and spigot or couplings.

2.3. Sewage Air and Vacuum Valves

Sewage Air and Vacuum Valves in sewer force mains shall be the type specifically designed for use with sewage. Valves shall be designed to vent large quantities of air when the line is being filled and to allow

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air to re-enter the line when it is being drained. Overall height of valve body without accessories shall be not less than fifteen (15”) inches. Materials shall include cast iron body and cover, bronze float stem and guide, rubber seat and stainless steel float. Valves shall be furnished with provisions for backflushing. Valves shall be designed for working pressure of 150 psi.

2.4. Sewage Air Release Valves

Sewage Air Release Valves in sewer force mains shall be the type designed for use with sewage. Valves shall be designed to operate (open) while pressurized allowing entrained air in a sewage force main to escape through the air release orifice and prevent media from escaping. Materials shall include cast iron body and cover, rubber seat, stainless steel float stem and internal linkages. The valves shall be sized according to the detail drawings and designed for minimum working pressures of 150 psi.

2.5. Steel Encasing Pipe

Steel Encasing Pipe shall be smooth wall meeting or exceeding ASTM A-139, Grade B 35,000 psi minimum yield strength with a minimum wall thickness as defined below:

CARRIER PIPE	Casing Pipe	Thickness		Recommended* Min. Tunnel
		D.O.T.	R.R	
6-Inch Ductile Iron	14"	.250"	.281"	48"
8-Inch Ductile Iron	18"	.250"	.281"	48"
10-Inch Ductile Iron	20"	.250"	.344"	48"
12-Inch Ductile Iron	22"	.250"	.375"	48"
16-Inch Ductile Iron	28"	.312"	.469"	48"
18-Inch Ductile Iron	30"	.312"	.469"	48"
20-Inch Ductile Iron	32"	.375"	.501"	48"
24-Inch Ductile Iron	36"	.375"	.532"	48"

2.5. Carrier Pipe Supports

Carrier Pipe Supports within Steel Casing shall be steel plate, cold formed structural collar with flanges and a minimum of four support legs welded to the collar. Each support leg shall have a foot or skid welded on the end extending beyond the front and back edge of the collar. The front and rear of each foot shall be angled inwardly towards the collar to serve as a stable, effective skid during installation of the carrier pipe. The carrier support shall be securely fastened to the carrier pipe with a heavy duty one-

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half (1/2") inch grade five (5) bolt and locking nut passing between the flanges, compressing the collar against the carrier pipe. The support device shall be a Spider or approved equal.

2.6. Utility Line Marking Tape

Utility Line Marking Tape shall be acid and alkali resistant polyethylene film two (2") inches wide and four (4) mil thick. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to three feet. The metallic core of the tape shall be encased in a protective jacket or by other means to prevent corrosion. The tape shall bear a continuous printed marking describing the specific utility, i.e. "SEWER."

**PART THREE – INSTALLATION:**

3.1. Trench Excavation and Backfill

3.1.1. Excavation shall conform to the lines and grades shown on the drawings. No trench shall be opened more than two hundred (200') feet in advance of the completed pipe Work without the written permission of the ENGINEER. The lines of excavation of trenches shall be made so there will be a clearance of at least eight (8") inches on each side of the barrel of the pipe. Excavation shall not be carried below the established grades and any excavation below the required level shall be backfilled and thoroughly tamped as directed by the ENGINEER, at the CONTRACTOR's expense. Bell holes shall be excavated accurately by hand.

3.1.2. During excavation, CONTRACTOR shall separate materials suitable for backfill from those defined unsuitable. Do not use the following materials for pipe foundation or trench backfill within the zones indicated below:

- All zones: material classified as peat (PT), organic soil (OL)(OH) under the Unified Soil Classification (USC) System, ASTM D-2487 and all materials too wet or too dry to achieve minimum compacted density requirements
- Six inches beneath pipe: soft or unstable material and rock
- Beside pipe: any material containing more than 75% fines passing #200 sieve

Suitable material shall be stockpiled near the trench for use as backfill. Unsuitable material shall be removed immediately or shall be stockpiled separately for dewatering or drying and later removal. Where no excavated material is suitable for backfill, furnish suitable material from borrow sites at no additional cost to the OWNER.

3.1.3. All unstable soil, organic soil, or soil types classified as inorganic clays and inorganic elastic silts (Class IV, Unified Class CL or lower) that are encountered at the bottom of pipe trenches or structure excavations shall be removed to a depth and width determined by the ENGINEER and properly disposed of. The resulting undercut shall be backfilled and compacted with sandy soils which meets or exceeds the requirements of Class I or Class II soil, Unified Class SP or better. Placement and compaction shall conform to the compaction specifications herein and on the plans.

3.1.4. All necessary dewatering pumping and bailing shall be performed in such a manner as to keep the trench in a satisfactory condition for pipe laying.

3.1.5. Backfilling shall be done with material free from large clods, frozen earth, organic material and any foreign matter.

3.1.5.1. Around the pipe and to a depth of twelve (12") inches above the pipe the backfill shall be carefully placed and compacted in layers not to exceed six (6") inches compacted thickness. The backfill shall be select and free of rock. Do not place backfill material on either side of the gravity sewer that is finer than the material upon which it is placed. Backfill with coarser material to the top of the pipe.

3.1.5.2. Twelve (12") inches above the crown of the pipe the backfill may contain rock but less than six (6") inches in diameter. Backfill layers shall be horizontal and not exceed twelve (12") inches loose or eight (8") inches compacted.

3.1.5.3. Compaction shall be performed with suitable pneumatic compactors or approved equal equipment. Compaction equipment specifically designed for trench compaction shall be present, operational and at the jobsite at all times. Compaction equipment shall be utilized throughout the length and depth of the trench to achieve uniform compaction density.

3.1.5.4. Compaction density shall be determined by the Standard Proctor Test (ASTM D-698) and shall meet the minimum standards in Section 02222, Excavating, Backfilling & Compacting for Utilities.

3.1.5.5. Surplus material shall be disposed of by the CONTRACTOR at his expense.

3.1.5.6. Clean shoulders and pavement of excess material immediately after backfilling is complete.

### 3.2. Laying Sewers

#### 3.2.1. Gravity Sewers

All sewers shall be laid and jointed in accordance with approved manufacturer's recommendations and shall be laid true to line and grade proceeding upgrade with the spigot pointing in the direction of flow. The sections of pipe shall be laid and fitted together so that, when complete, the sewer will have smooth and uniform invert, with full-length of the barrel resting on the trench bottom or bedding prepared for the pipe. Holes shall be excavated to accommodate pipe bells. The pipe shall be kept thoroughly clean. Each pipe shall be inspected for defects before lowering pipe into trench. Water shall not be allowed to rise around joints until they have been made tight. All sewers shall be constructed with a minimum of three (3) feet of cover, unless justified by the Engineer and approved by the SC DHEC. ( e.g. ductile iron pipe may have less than three (3) feet [Reg R.61-67.300.A.12].)

3.2.1.1. All gravity sewer shall be bedded in accordance with Section D, Pipe Bedding and Backfilling Chapter 9 Section D Page 183 in WPCF (WEF) manual of Practice NO. FD-5 (ASCE Manual No. 60), ASTM D2321 for Flexible Pipe (PVC) and Section F2.9 page 202 in WPCF (WEF) Manual No. FD-5 for Rigid Pipe (Ductile Iron) Chapter 9, Section F2.9 for the proposed depth of sewer, and as detailed in the contract drawings.

3.2.1.2. The exposed end of all pipes shall be closed by means of an approved plug to prevent earth or other substances from entering the pipe. The interior of the sewer shall be kept free from all dirt, cement or superfluous materials of every description as the work progresses.

### 3.2.2. Force Mains

All pipe for force main sewers shall be laid and jointed in accordance to approved manufacturer's recommendations, contract drawings and as specified herein.

3.2.2.1. Each pipe shall be inspected for defects before lowering pipe into the trench. Any defective pipe shall be immediately removed from the site.

3.2.2.2. Water shall not be allowed to rise around the joints until they have been made tight. The exposed end of all pipes shall be closed by means of an approved plug to prevent earth or other foreign substances from entering the pipe. The interior of the pipe shall be kept clean and free of all dirt, stone or foreign material as work progresses.

3.2.2.3. The force mains shall be properly bedded according to the manufacturer's recommendations, contract drawings and the minimum standards defined below.

- All Pipe IN ROCK OR WET TRENCHES: Washed stone bedding from 4-inches below pipe to springline of pipe.
- ALL OTHER CONDITIONS: Hand carve trench to shape of lower quadrant of barrel

3.2.2.4. Concrete Blocking: All bends, tees and plugs shall be blocked with 3000 psi concrete from the pipe to undisturbed ground to the dimensions shown on the plans. Plant mix concrete is preferred although field mix concrete (Sacrete or equal) may be used as long as it is properly mixed outside of the trench in clean containers with potable water. The concrete mix shall be placed and rodded or consolidated by suitable means to minimize voids and shall receive a twenty-four (24) hour cure before being backfilled. If the ground is soft, restrained joint fittings shall be used as directed by the ENGINEER. All blocking shall meet the requirements of SC DHEC Regulation subsection 67.300.D.3.

3.2.2.5 Utility Line Marking Tape: This tape shall be placed above all PVC pipe used in the force main construction. It shall be placed between lifts of backfill approximately twelve (12") inches above the top of the pipe.

3.2.2.6 Air Release Valves: Automatic air relief valves shall be placed at high points in the force main sewer to prevent air locking in accordance with SC DHEC Regulation subsection 67.300.D.4.

3.2.2.7. Connection to manholes: Force mains tying onto manholes shall enter the manhole a vertical distance of not more than two (2) feet above the flow line of the receiving manhole.

### 3.3.3. Boring and Jacking

Where required, smooth wall or spiral weld steel pipe shall be jacked through dry bores slightly larger than the pipe, bored progressively ahead of the leading edge of the advancing pipe. As the boring and jacking operation progresses, each new section of the encasement pipe shall be butt-welded to the section previously jacked in place.

3.3.3.1. Obstructions encountered during the boring and jacking operation or deflections in the bore resulting in less than thirty (30") inches of soil cover above the casing, shall require the bore to be abandoned. The abandonment procedure consists of cutting off the excess pipe, capped then filled with



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Portland cement grout (1:3 parts cement to sand) at sufficient pressure to fill all voids before moving to a new location.

3.3.3.2. The carrier pipe shall be fully supported along its entire length within the casing pipe. Support may be accomplished by securely fastening pressure treated lumber to the carrier pipe or by using "spiders." Either method shall be first submitted to the ENGINEER for approval, detailing the means of fastening the support devices and spacing of supports.

3.3.3.3. Length of encasements shall be determined as follows.

- Cut sections - Ditch line to ditch line
- Fill sections - 5 feet beyond toe of slope
- Curb sections - 3 feet beyond curb
- Future highway or railroad R/W - Extend full width of R/W or unless otherwise noted.

3.3.3.4. Materials and workmanship shall also be governed by the requirements set for by the agency issuing the encroachment (Railroad, Department of Transportation, Pipeline Co., Etc.). Any specific conditions other than listed herein pertaining to the encroachment are listed in the Special Conditions.

**3.4 Separation of Sewers and Water Mains (R-61.67.300.A.14.(aa0 –(f) )**

3.4.1 Portable Water Supply Interconnections. There shall be no physical connection between a public or private potable water supply system and a sewer or appurtenances thereto which may permit the passage of any sewerage or polluted water into the potable supply. No potable water pipe shall pass through or come in contact with any part of a sewer manhole.

3.4.2 Horizontal and Vertical Separation from potable Water Mains: Sewers shall be laid at least 10 feet horizontally from any existing or proposed potable water main. The distance shall be measured from pipe edge to edge. In cases where it is not practical to maintain a ten(10) foot separation, SC DHEC may allow deviation on a case by case basis, if supported by the design engineer. Such deviation may allow installation of the sewer closer to a potable water main, provided that the water main is in a separate trench or on an undisturbed earth self located on one side of the sewer and at an elevation so that the bottom of the water mains is at least eighteen (18) inches above the top of the sewer.

3.4.3 Crossing: Sewers crossing potable water mains shall be laid to provide a minimum vertical separation of eighteen (18) inches between the outside of the water main and the outside edge of the sewer. This shall be the case where the potable water main is either above or below the sewer main. Whenever possible, the potable water main shall be located above the sewer main. When a new sewer crosses a new potable water main, a full length of pipe shall be used for both the sewer line and the potable water main, and the crossing shall be arranged so that the joints of each line be as far as possible from the point of crossing and each other. When a potable water main crosses under a sewer, adequate structural support shall be provided for the sewer line to prevent damage to the potable water main while maintaining line and grade.

3.4.4 Force mains: There shall be at least a ten (10) foot horizontal separation between the sanitary force mains and potable water mains. There shall be an eighteen (18) inch vertical separation at crossings as required in DHEC Regulation R.61- sub section 67.300.A.14.b and subsection 67.300.A.14.c.

3.4.5 Special conditions: When it is impossible to obtain the distance specified Subsection 67.300.A.14.b, subsection 67.300.A.14.d, SC DHEC may allow an alternative design. An alternative design shall:

3.4.5.1 Maximize the distance between the sewer line and the potable water main and the joints of each.

3.4.5.2 Use pipe materials which meet the requirements as specified in SCDHEC Regulation 61-58.4 (DX)(10 for the sewer line

3.4.5.3 Allow enough distance to make repairs to one of the lines without damaging the other.

### 3.5 Installation of Joints

#### 3.5.1. Mechanical Joints

The socket, gasket or spigot of the pipe shall be cleaned of all foreign matter. The gland shall be slipped on the spigot end, followed by the gasket and the pipe end pushed into the bell. The ring gasket shall be properly seated so that it is totally confined under pressure within the bell. The loose gland shall be moved into position against the face of the gasket and the nuts and bolts loosely assembled with the fingers and then made up tight with a suitable ratchet wrench.

#### 3.5.2 Push-On Joints

The joint shall be thoroughly cleaned, prepared, lubricated and installed in accordance with the requirements, instructions and recommendations of the manufacturer and ENGINEER.

#### 3.5.3 Solvent Cements Joints

The joint shall be thoroughly cleaned, prepared and installed in accordance with the requirements, instructions and recommendations of the manufacturer and ENGINEER.

#### 3.5.4 Grooved Joints

Joints shall be installed in accordance with manufacturers' published installation instructions.

### 3.6. TESTING

All pipe installations shall be tested as specified herein. The Testing shall meet all of the requirements of AWWA C-600 (DIP) or AWWA C-605 (PVC) and SC DHEC Regulation subsection 67..300.D.5. Tests shall be performed by CONTRACTOR at his expense in the presence of ENGINEER or his representative. Testing shall not be performed until such time that all Work which may affect the results of the testing has been completed. Where a test section fails to meet test requirements, CONTRACTOR shall make corrections as specified herein and retest the section. The correct/retest procedure shall continue until such time as test requirements are met. All gravity lines will be lamped by the ENGINEER. The CONTRACTOR shall furnish two (2) personnel to assist the ENGINEER in removing and replacing manhole covers, and in carrying ENGINEER's tripod, hoist and other equipment necessary to perform this task.

#### 3.6.1. Air Test: All gravity sewer pipe

##### 3.6.1.1. Procedure

3.6.1.1.1. Air test shall be conducted in strict accordance with the testing equipment manufacturer's instructions, including all recommended safety precautions. No one will be allowed in the manholes during testing. Equipment used for air testing shall be equipment specifically designed for this type of test, and is subject to approval of the ENGINEER.

3.6.1.1.2. The test shall be performed only on clean sewer mains after services are installed and the pipe is completely backfilled. Clean sewer mains by propelling snug fitting inflated rubber ball through the pipe with water. After completely cleaned, plug all pipe outlets with suitable test plugs. Brace each plug securely.

3.6.1.1.3. For pipe within test sections above the ground water table, add air slowly to the portion of the pipe installation under test until the internal air pressure is raised to the starting pressure of 4 psig. After the starting pressure is obtained, allow at least two minutes for air temperature to stabilize, adding only the amount of air required to maintain pressure. When pressure decreases to 3.5 psig, start stopwatch. Determine the time that is required for the internal air pressure to reach 2.5 psig.

3.6.1.1.4. For pipe with test sections below the ground water table, determine the starting pressure for the test section, in psig, as follows.

- Determine the maximum depth of pipe within the test section in feet.
- Multiply this depth by 0.67 and add 9.3 feet.
- Multiply the result in part 2 by 0.43 and round to the nearest 0.5 psig. After this starting pressure is obtained, continue the test in accordance with the procedure in the paragraph above.

**3.6.1.2. Requirement**

The test section shall be acceptable if the elapsed time for pressure drop of 1.0 psig is greater than the sum of the times shown below for all pipe sizes within the test section.

LENGTH	PIPE DIAMETER (INCHES)								
	4	6	8	10	12	15	18	21	24
25	0:04	0:10	0:18	0:28	0:40	1:02	1:29	2:01	2:38
50	0:09	0:20	0:35	0:55	1:19	2:04	2:58	4:03	5:17
75	0:13	0:30	0:53	1:23	1:59	3:06	4:27	6:04	7:55
1000:18	0:40	1:10	1:50	2:38	4:08	5:56	8:05	10:34	
1250:22	0:50	1:28	2:18	3:18	5:09	7:26	9:55	11:20	
1500:26	0:59	1:46	2:45	3:58	6:11	8:30	"	"	
1750:31	1:09	2:03	3:13	4:37	7:05	"	"	"	
2000:35	1:19	2:21	3:40	5:17	"	"	"	12:06	
2250:40	1:29	2:38	4:08	5:40	"	"	10:25	13:36	
2500:44	1:39	2:56	4:35	"	"	8:31	11:35	15:07	
2750:48	1:49	3:14	4:43	"	"	9:21	12:44	16:38	
3000:53	1:59	3:31	"	"	"	10:12	13:53	18:09	

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3501:02	2:19	3:47	"	"	8:16	11:54	16:12	21:10
4001:10	2:38	"	"	6:03	9:27	13:36	18:31	24:12
4501:19	2:50	"	"	6:48	10:38	15:19	20:50	27:13
5001:28	"	"	5:14	7:34	11:49	17:01	23:09	30:14

3.6.1.3. Corrective Measures

If elapsed time is less than the specified amount, CONTRACTOR shall locate and repair leaks and repeat the test until elapsed time exceeds the specified amount.

3.6.2. Infiltration/Exfiltration Test (Use All Manholes)

3.6.2.1. The use of this method for sewer pipe, in lieu of air tests may be used as an alternate test method.

3.6.2.2. Procedure

3.6.2.2.1. Infiltration: Immediately following a period of heavy rain, a test of Work constructed up until that time shall be made. Three (3) measurements shall be made at one (1) hour intervals to compute the amount of the infiltration. Tests for manholes only shall be conducted on individual manholes. Tests for pipe and manholes shall be performed on test sections not exceeding 3,500 linear feet of collector sewer and shall include both pipe and manholes. The ENGINEER reserves the right to use his judgement as to whether the ground is sufficiently saturated and/or whether the fall of rain is adequate to permit making infiltration tests. In the event that sufficient rain does not occur before the date of completion, the CONTRACTOR shall be required to conduct the tests at any time during a thirty (30) day period following this date. Should the ENGINEER determine that certain pipe or manholes cannot be tested by infiltration methods, the ENGINEER may direct the filling of lines and the measurement of exfiltration. The allowable rate of exfiltration shall be the same as for infiltration.

3.6.2.2.2. Exfiltration: Determine test sections as outlined for infiltration tests. Install a temporary water plug at the inlet and outlet of the test section. Fill test section with clean water up to the bottom of the lowest manhole frame within the test section. Allow time for saturation of pipe and manholes refilling test section as required. Beginning with a full test section, allow at least eight (8) hours to elapse without adding water. Measure the water level at the beginning and end of the elapsed time above. Compute the volume of water lost in gallons per hour.

3.6.2.3. Test Requirements

- The rate of water loss/gain shall be less than the rate, in gallons per hour, calculated for the test section using the following allowances:
- Sewer main and manholes with or without service laterals; 100 gallons per 24 hours per inch of sewer main diameter per mile of sewer main (gpd/in-mi)
- Manholes only; 1 gallon per 24 hours per vertical foot of manhole

3.6.2.4. Corrective Measures

If actual leakage rate is greater than required leakage rate, CONTRACTOR shall locate and repair leaks and repeat the test until actual leakage is less than the required rate.

3.6.3. Deflection Test

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3.6.3.1. Use all gravity sewer, eight (8”) inch diameter through fifteen (15”) inch diameter except ductile iron.

3.6.3.2. Procedure

Tests shall be performed by the CONTRACTOR in the presence of the ENGINEER no sooner than thirty (30) days after completion of backfill. The OWNER, at his option, may require a second test within the guarantee period of the project. A nine (9) arm mandrel and proving ring, as manufactured by Wortco, Inc. or an approved equal, will be provided by the CONTRACTOR. The mandrel shall be manually pulled, from manhole, through the entire length of mainline pipe. The mandrel and proving ring shall remain the property of the CONTRACTOR.

3.6.3.3. Requirement

All pipes shall allow passage of the test mandrel. The mandrel and proving ring shall be sized at five (5%) percent less than the ASTM dimension for the pipe in accordance with the following table.

NOM. DIA	L	ASTM D3034 SDR 35 D	ASTM D2680 D
8"	8"	7.28"	7.40"
10"	10"	9.09"	9.31"
12"	12"	10.79"	11.22"
15"	15"	13.20"	14.09"

L = Mandrel Contact Length

D = I.D. of Proving Ring

3.6.3.4. Corrective Measures

All pipe that fails the deflection test shall be removed, replaced and retested at no additional expense to the OWNER.

3.6.4. Force Main Pressure Test

3.6.4.1 The pressure/leakage test of water mains shall be in accordance with Standard AWWA C600, latest revision. The allowable leakage shall not exceed that determined by the following formula:

$$L = \frac{SD \sqrt{P}}{133,200}$$

L = Allowable leakage in gallons per hour

S = Length of line tested in feet

D = Nominal diameter of pipe, in inches

P = Average test pressure, in psi - 1.50 average system pressure in the area, but not less than 100 psi.

3.6.4.2. Where practicable, pipe lines shall be tested in lengths of no more than two thousand (2000') feet.

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3.6.4.3. Duration of test shall be not less than two (2) hours where joints are exposed, and not less than twenty-four (24) hours where joints are covered, unless directed by the ENGINEER.

3.6.4.4. All visible leaks at exposed joints, and all leaks evident on the surface where joints are covered, shall be repaired and leakage minimized, regardless of total leakage as shown by test.

3.6.4.5. All pipe, fittings, and other material found to be defective under test shall be removed and replaced at the CONTRACTOR's expense.

3.6.4.6. Lines which fail to meet tests shall be repaired and retested as necessary, until test requirements are complied with.

END OF SECTION 02730

**SECTION 02825 - DECORATIVE METAL FENCES AND GATES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Decorative aluminum fences.

**1.02 REFERENCE STANDARDS**

- A. ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.
- B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- C. ASTM D523 - Test Method for Specular Gloss.
- D. ASTM D714 - Test Method for Evaluating Degree of Blistering in Paint.
- E. ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.
- F. ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
- G. ASTM D2244 - Test Method for Calculations of Color Differences from Instrumentally Measured Color Coordinates.
- H. ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
- I. ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.
- J. ASTM F2408 - Ornamental Fences Employing Galvanized Steel Tubular Pickets.

**1.03 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C. Shop Drawings:
  - 1. Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.
- D. Installer's Qualification Statement.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
- B. Installer Qualifications: Experienced with type of construction involved and materials and techniques specified.

**1.05 DELIVERY, STORAGE AND HANDLING**

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- A. Store materials in a manner to ensure proper ventilation and drainage. Protect against damage, weather, vandalism and theft.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Decorative Metal Fences:  
1. Ameristar Fence Products, Inc: [www.ameristarfence.com](http://www.ameristarfence.com).

**2.02 FENCES**

- A. Fences: Complete factory-fabricated system of posts and panels, accessories, fittings, and fasteners; finished with electrodeposition coating, and having the following performance characteristics:  
1. Capable of resisting vertical load, horizontal load and infill performance requirements for fence categories defined in ASTM F2408.
- B. Electro-Deposition Coating: Multi-stage pretreatment/wash with zinc phosphate, followed by epoxy primer and acrylic topcoat.  
1. Total Coating Thickness: 2 mils, minimum.  
2. Color: As selected by Architect from manufacturer's standard range.  
3. Coating Performance: Comply with general requirements of ASTM F2408.  
a. Adhesion: ASTM D3359 (Method B); Class 3B with 90 percent or more of coating remaining in tested area.  
b. Corrosion Resistance: ASTM B117, D 714 and D 1654; 1/8 inch coating loss or medium No.8 blisters after 1,500 hours.  
c. Impact Resistance: ASTM D2794; 60 inch pounds.  
d. Weathering Resistance: ASTM D523, D822 and D2244; less than 60 percent loss of gloss.
- C. Aluminum:  
1. Tubular Pickets, Rails and Posts: ASTM B221.  
2. Extrusions for Posts and Rails (Outer Channel): 6005-T5.  
3. Extrusions for Pickets and Rail (Inner Slide Channels): 6063-T5.
- D. Fasteners: Type 302 stainless steel; finished to match fence components.  
1. Self-drilling hex-head screws.

**2.03 ALUMINUM FENCE**

- A. Provide fence meeting requirements for Industrial class as defined by ASTM F2408.
- B. Fence Panels: 4 feet high by as indicated on plans feet long.  
1. Panel Style: Two rail.  
2. Panel Strength: Capable of supporting 300 pound load applied at midspan without deflection  
3. Attach panels to posts with manufacturer's standard panel brackets.
- C. Posts: Aluminum extrusions:  
1. Size: 2-1/2 inches square.  
2. Extrusion Wall: 0.080 inch thick.  
3. Internal Reinforcing: 0.080 inch thick.
- D. Rails: Aluminum extrusions.



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1. Double-walled aluminum U channel; outside cross-section dimensions of 1-3/4 inch square; interior guide channel forms lower limit of raceway for retaining rod.
  2. Effective Wall Thickness:
    - a. Top Wall of Outer Channel: 0.100 inch thick.
    - b. Side Wall: 0.120 inch thick.
  3. Enclosed Retaining Rod: 0.125 inch diameter galvanized steel with variable pitch connection system for high angle racking and elimination of external fasteners.
  4. Picket-to-Rail Intersection Seals: PVC grommets.
  5. Picket Holes: 4.715 inch on center.
- E. Pickets:
1. Size: 1-3/4 inch square by 0.062 inch thick extruded aluminum tubing.
  2. Spacing: 4.715 inch on center.
  3. Style: Pickets with finial extend above top rail.
  4. Finial: Spear point.
- F. Accessories: Aluminum castings.
1. Ball post cap.
  2. Decorative rings.
- G. Flexibility: Capable of following variable slope of up to 1:4.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

**3.02 PREPARATION**

- A. Clean surfaces thoroughly prior to installation.

**3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Set fence posts in accordance with the manufacturer recommended spacing.
- C. When cutting rails immediately seal the exposed surfaces by:
  1. Removing all metal shavings from cut area.
  2. Apply zinc-rich primer to thoroughly cover cut edge and drilled hole; allow to dry.
  3. Apply 2 coats of custom finish spray paint matching fence color.
  4. Failure to seal exposed surfaces in accordance with manufacturer's instructions will negate manufacturer's warranty.
- D. Space gate posts according to the manufacturers' drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected.
  1. Base type and quantity of gate hinges on the application; weight, height, and number of gate cycles.
  2. Provide gate hardware by the manufacturer of the gate and install per manufacturer's recommendations

**3.04 ERECTION TOLERANCES**

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- A. Maximum Variation From Plumb: 1/4 inch.
- B. Maximum Offset From Indicated Position: 1 inch.
- C. Minimum distance from property line: 6 inches..

**3.05 CLEANING**

- A. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.
- B. Clean fence with mild household detergent and clean water rinse well. .

**3.06 PROTECTION**

- A. Protect installed products until completion of project.

**END OF SECTION**

**SECTION 02995 - CLEAN UP**

**PART ONE – GENERAL:**

**1.01 – RELATED DOCUMENTS**

Provide all labor, materials, equipment and services indicated on the drawings, or specified herein, or reasonably necessary for, or incidental to a complete job.

**PART TWO – PRODUCTS:** (This section not applicable.)

**PART THREE – EXECUTION:**

**3.1– Clean Up**

- 3.1.1 During the progress of the work, keep the site and affected adjacent areas in a neat and clean condition at all times. Remove all rubbish, surplus materials, and un-needed construction equipment from the site. Repair all damages so that the public and property owners will be inconvenienced as little as possible.
- 3.1.2 Where materials or debris has washed or flowed into, or has been placed in, existing water-courses, ditches, gutters, drains, pipes, and/or structures by work performed under this contract, or elsewhere during the course of the contractor's operations, remove and satisfactorily dispose of such material or debris during the progress of the work. Upon completion of the work, leave all ditches, channels, drains, pipes, and/or structures and work, etc., in a clean and neat condition.
- 3.1.3 On or before completion of the work, unless otherwise directed or permitted in writing, tear down all temporary buildings and structures built by the contractor for his own use. Remove all temporary works, tools, and machinery or other construction equipment furnished by the contractor. Remove all rubbish from any grounds which have been occupied by the contractor; leave all roads and all parts of the premises and adjacent property affected by the contractor's operations in a neat and satisfactory condition.
- 3.1.4 Remove, acceptably disinfect and cover all organic matter and materials containing organic matter in, under, and around all privies, houses, and other buildings used.
- 3.1.5 Restore or replace, when and as directed, any public or private property damaged by contractor's work, equipment or employees to a condition at least equal to that existing immediately prior to the beginning of the operations. Perform, as required, all necessary highway or driveway reshaping of shoulders and ditches, walks and landscaping work. Use suitable materials, equipment and methods for such restoration. The contractor shall be responsible for obtaining releases from the various property owners, stating that all restoration work is satisfactory.

**END OF SECTION 02995**

SECTION 033000 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with conditions of the Contract and Division 1 Specification Sections.
- B. Product Data: For each type of manufactured material and product, including forming and reinforcement accessories, admixtures, waterstops, joint systems, joint fillers, curing compounds, and others if requested.
- C. Design Mixes: For each concrete mix.
  - 1. Provide laboratory tests of materials and mix design tests.
  - 2. Indicate amounts of mix water, if any, to be withheld for later addition at Project site.
  - 3. Specify the location of the batch plant where the concrete will be mixed and the approximate distance from the job site.
- D. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, spacings, bent bar diagrams, arrangement, and supports of concrete reinforcement.
- E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork. Design and engineering of formwork are Contractor's responsibility.

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1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring.

A. LEED Submittals:

1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
  - a. Include statement indicating costs for each product having recycled content.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete work similar to that indicated for this Project with a record of successful in-service performance.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the state where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for formwork and shoring and reshoring installations that are similar to those indicated for this Project.
- C. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- D. Testing Agency Qualifications: An independent testing agency, acceptable to the Architect, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- E. Source Limitations: Obtain each type of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each type of admixture from the same manufacturer.
- F. ACI Publications: Comply with the following, unless more stringent provisions are indicated:
  1. ACI 301, "Specification for Structural Concrete."
  2. ACI 318, "Building Code Requirements for Structural Concrete."
  3. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

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- A. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material.
- B. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
  - 1. Plywood, metal, or other approved panel materials.
  - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
    - a. Structural 1, B-B, or better, mill oiled and edge sealed.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, unless otherwise indicated.
- D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
  - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
  - 1. Furnish units that will leave no metal closer than 1 inch to the plane of the exposed concrete surface.

**2.2 STEEL REINFORCEMENT**

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706, deformed.
- C. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

**2.3 SYNTHETIC FIBER REINFORCEMENT**

- A. Fibers shall be fibrillated polypropylene fibers designed and manufactured for use in concrete for secondary reinforcement, complying with ASTM C 1116, Type III, 4.1.3. See structural drawings for areas where fibers may be used. Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.5 pounds per cubic yard. Acceptable products include, but are not limited to:
  - 1. Fibermesh 300, by SI Concrete Systems.
  - 2. Grace Fibers, by W.R. Grace & Co.
  - 3. MasterFiber M or F Series, BASF Construction Chemicals.

**2.4 REINFORCEMENT ACCESSORIES**

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:
  - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.
  - 2. Precast concrete supports or concrete bricks may be used only for concrete members cast on earth. Reinforcement shall be wire-tied to these type supports periodically to prevent it from becoming dislodged during concrete placement.
- B. Joint Dowel Bars: Plain-steel bars, ASTM A 36. Cut bars true to length with ends square and free of burrs.

**2.5 CONCRETE MATERIALS**

- A. Portland Cement: ASTM C 150, Type I.
- B. Fly Ash: ASTM C 618, Class C or F.
- C. Normal Weight Aggregate: ASTM C 33.
- D. Water: Potable and complying with ASTM C 94.

**2.6 ADMIXTURES**

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494, Type A.
- D. High-Range Water-Reducing Admixture: ASTM C 494, Type F or Type G.
- E. Water-Reducing Accelerating Admixture: ASTM C 494, Type E.
- F. Water-Reducing Retarding Admixture: ASTM C 494, Type D.

**2.7 FLOOR AND SLAB TREATMENTS**

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- A. Penetrating Liquid Floor Treatment: Chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.

**2.8 CURING MATERIALS**

- A. Contractor shall verify that curing and sealing materials applied to floor slabs are compatible with all floor stains, coatings, tile, and other finish materials.
- B. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to exposed concrete slab surfaces for temporary protection from rapid moisture loss.
- C. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry. (Burleen non-staining mats).
- D. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- E. Clear, Solvent-Borne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

**2.9 RELATED MATERIALS**

- A. Expansion and Isolation Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber. Thickness 1/2 inch unless otherwise indicated. Acceptable products include, but are not limited to:
  - 1. Fibre Expansion Joint, W.R. Meadows, Inc.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, with a Type A shore durometer hardness of 80 per ASTM D 2240.
  - 1. Acceptable epoxy resin products include, but are not limited to:
    - a. EUCO 700, The Euclid Chemical Company.
    - b. MM-80, Metzger/McGuire.
  - 2. Acceptable polyurea products include, but are not limited to:
    - a. EUCO QWIKjoint 200, The Euclid Chemical Company.
    - b. SPAL-PRO RS 88, Metzger/McGuire.
- C. Vapor Retarder: See Division 7 specifications.
- D. Vapor Retarder: Provide vapor retarder that is resistant to deterioration when tested according to ASTM E 154, as follows:
  - 1. Polyethylene sheet not less than 6 mils thick.



- E. Plastic Vapor Retarder: ASTM E 1745, Class A. Woven materials are not acceptable. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.
  - 1. Subject to compliance with requirements, provide products by one of the following:
    - a. Fortifiber Corporation; Moistop Ultra 15.
    - b. Raven Industries, Inc.; VaporBlock 15.
    - c. Stego Industries, LLC; Stego Wrap, 15 mils.
    - d. Reef Industries; Griffolyn 15 Mil Green.
- F. Slab Granular Base Course: Clean crushed stone, crushed gravel, or manufactured or natural sand. Material shall be compactable. Rough or sharp materials which may puncture the vapor retarder shall be covered with a 1/2" layer of fine-graded material rolled or compacted over the base course prior to installation of the vapor retarder.
- G. Latex Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- H. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
  - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

## 2.10 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
  - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
  - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
  - 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109.
- B. Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch.
  - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
  - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.

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4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109.

**2.11 CONCRETE MIXES**

- A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
  1. Proportion normal weight structural concrete according to ACI 211.1 and ACI 301.
- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.
- C. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
  1. Fly Ash: 25 percent.
- D. Maximum Slump:
  1. Concrete containing high-range water-reducing admixture (superplasticizer): 8 inches, after admixture is added to concrete with 2 to 4 inch slump.
  2. Other concrete: 4 inches, plus or minus one inch.
- E. 28-Day Compressive Strength: As indicated.
- F. Air Content: In exterior concrete which is exposed to weather, add air-entraining admixture to result in concrete at point of placement having an air content of 5.5 percent within a tolerance of plus 1 or minus 1.5 percent. Footings and other subterranean concrete do not require air-entrainment.
- G. Do not air entrain concrete in trowel-finished interior floors and suspended slabs except where air entrainment is required to achieve specified unit weights for lightweight concrete. Do not allow entrapped air content in non-air-entrained concrete to exceed 3 percent.
- H. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- I. Admixtures: Use admixtures according to manufacturer's written instructions.
  1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.

**2.12 FABRICATING REINFORCEMENT**

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

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- B. In walls, slabs, and beams where runs of continuous bars too long to be fabricated from single bars, fabricate reinforcing so that lap splices in alternate bars are staggered.

**2.13 CONCRETE MIXING**

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.
  - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Job site mixing is not permitted.
- C. Synthetic Fiber: In concrete for exterior sidewalks and slabs, and at other locations where indicated, uniformly disperse synthetic fibers in concrete mixture at manufacturer's recommended rate, but not less than 1.5 lb/cubic yard.

**PART 3 - EXECUTION**

**3.1 FORMWORK**

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
  - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
  - 2. Class D, 1/2 inch for rough-formed finished surfaces which will be permanently concealed from view.
- D. Construct forms tight enough to prevent loss or leakage of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1 vertical to 1.5 horizontal.
  - 1. Install keyways, reglets, recesses, and the like, for easy removal.
  - 2. Do not use rust-stained steel form-facing material
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, water, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

### 3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, and directions furnished with items to be embedded.
  - 1. Install anchor bolts, accurately located, to elevations required.
- B. Conduits, Pipes, and Sleeves: Conduits are not permitted in elevated slabs or slabs on grade. Conduits, pipes and sleeves shall be permitted to be embedded in other concrete elements only with approval of the Structural Engineer. Embedded items must meet the following requirements:
  - 1. Conduits, pipes and sleeves shall be made only of materials not harmful to concrete. Aluminum is not permitted.
  - 2. Diameter of items shall not be larger than 1/3 the thickness of the wall, footing, or beam in which they are embedded.
  - 3. Items shall not be spaced closer than 3 diameters on center.

### 3.3 VAPOR RETARDER INSTALLATION

- A. General: Following leveling and tamping of granular base course for slabs on grade, place vapor retarder sheeting between the bottom of the slab and the top of the granular base course. Place, protect, and repair vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
  - 1. Lap joints not less than 6 inches and seal joints and penetrations with manufacturer's recommended adhesive or pressure-sensitive tape. Vapor retarder shall be turned up at walls to top of slab and shall be sealed around pipes, conduits, and other penetrations.

2. Repair damaged areas by cutting patches of vapor retarder, overlapping damaged area 6 inches and taping all sides with seam tape.

### 3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.
- C. In walls, slabs, and beams where runs of continuous bars too long to be fabricated from single bars, install reinforcing so that lap splices in alternate bars are staggered.
- D. Before concrete is placed, accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. "Wet-sticking" of dowels and other reinforcing is not permitted. **Do not weld or tack weld reinforcing bars** unless indicated on the drawings or authorized by the Structural Engineer.
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets so that length of overlap measured between outermost cross wires of each fabric sheet is not less than one spacing of cross wires plus 2 inches. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- G. Where blockouts are formed in slabs, unless otherwise indicated provide two #4 diagonal bars, 4'-0" long, at each corner of the blockout in the middle of the depth of the slab.

### 3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Provide construction joints at all locations where concrete placement is terminated resulting in concrete elements not being completed in a single monolithic placement. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
  1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
  2. Provide keys at construction joints using preformed galvanized steel or wood bulkhead forms, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
  3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
  4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.

5. Locate joints in continuous wall footings as required to facilitate construction.
  6. In areas with terrazzo or hard tile, coordinate joint locations to match joints in terrazzo or tile.
- C. Contraction (Control) Joints in Slabs on Grade: Construct contraction joints in slabs on grade to form patterns as shown. Use saw cuts 1/8 inch wide by one-fourth of slab thickness unless otherwise indicated.
1. Contraction joints shall be cut as soon as possible after slab finishing as may safely be done without dislodging aggregate or raveling joint edges. Joints shall be cut within 12 hours after concrete is placed.
  2. If joint pattern is not shown, provide contraction joints at a maximum spacing of 15 feet in each direction. Locate to conform to bay spacing where possible (at column centerlines, half bays, third bays.)
  3. In areas with terrazzo or hard tile, coordinate joint locations to match joints shown in terrazzo or tile.
- D. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.
1. Use dowel sleeves or lubricate one-half of dowel length to prevent concrete bonding to one side of joint.

### 3.6 WATERSTOPS

- A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Use the manufacturer's approved adhesive for bonding to the hardened concrete. Install in longest lengths practicable. Tightly butt ends of waterstop together to form a continuous waterstop. Locate waterstops so that there is a minimum of 3 inches of concrete on all sides of waterstop.

### 3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement, unless water has been withheld from the mix for this purpose.
- C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.
- D. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.

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1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
  2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  2. Maintain reinforcement in position on chairs during concrete placement.
  3. Screed slab surfaces with a straightedge and strike off to correct elevations.
  4. Slope surfaces uniformly to drains where required.
  5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When the average daily outdoor temperature is expected to fall below 40 deg F for three successive days, or when freezing temperatures may occur during the first 24 hours after concrete placement, deliver and maintain concrete temperature within the temperature range required by ACI 306.1. The average daily outdoor temperature is the average of the highest and lowest temperature during the period from midnight to midnight.
  2. Uniformly heat water and/or aggregates before mixing to obtain a concrete mixture temperature at point of placement within the temperature range required by ACI 306.1.
  3. Temperatures specified to be maintained shall be those measured at the concrete surface, whether the surface is in contact with formwork, insulation, or air.
  4. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  5. Do not use salt or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
  6. **Do not use calcium chloride.**
- G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is included in calculation of total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.

3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

- H. The concrete for elevated slabs shall be placed in sequence from the lowest elevated floor to the highest elevated floor. Do not place concrete on an upper floor until the concrete on all elevated floors below has been placed.

### 3.8 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
- B. Smooth-Formed Finish: Provide a smooth-formed finish on formed concrete surfaces exposed to view, to receive a rubbed finish, or to be covered with a coating material applied directly to the concrete. This is the concrete surface imparted by selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
- C. Rubbed Finish: Apply a grout-cleaned rubbed finish as follows to smooth-formed finished concrete where indicated. Rubbed finish shall be done when the air temperature is at least 40 deg F and rising. All finishing on an area shall be completed the same day it is started.
  1. Surfaces to be grout cleaned shall be steel brushed to remove laitance and scale and to reveal partly obscured air bubble holes. Uneven form joints shall be ground smooth.
  2. Combine one part portland cement to one and one-half parts fine sand by volume, with sufficient water to produce a grout having the consistency of thick paint. Blend standard and white portland cement in amounts determined by trial patches so that final color of dry grout will produce the color desired by the architect.
  3. Thoroughly dampen concrete surfaces and cover with an application of grout.
  4. Immediately after application of the grout, the surface shall be scoured with a cork float or other suitable material. This floating shall completely fill all holes and other irregularities in the surface.
  5. When the grout is of such plasticity that it will not be pulled from the holes, remove excess grout by scraping and rubbing with a clean float of sponge rubber or burlap.
  6. When the grout is thoroughly dry, the surface shall be vigorously rubbed with dry burlap to completely remove any dried grout. No visible film of dry grout shall remain.
  7. Obtain approval of a sample area from Architect before proceeding with Work.
  8. Keep surfaces damp for at least 36 hours after rubbing.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

### 3.9 FINISHING FLOORS AND SLABS



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- A. General: Comply with recommendations in ACI 302.1R for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: All slabs shall first receive a float finish. Machine floating shall not be used until the concrete surface will support a finisher on foot without more than a 1/4 inch indentation.
- C. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighen until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
  - 1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, wood flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, stain, or another thin film-finish coating system.
  - 2. On lightweight concrete slabs containing entrained air, machine floating shall be started as late as possible and hard and prolonged troweling shall be avoided.
  - 3. Finish surfaces to the following tolerances, according to ASTM E 1155:
    - a. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for slabs-on-grade.
  - 4. Finish and measure surface so gap at any point between concrete surface and an unlevelled freestanding 10-foot-long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed 1/8 inch.
- D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated and to surfaces where terrazzo, ceramic or quarry tile is to be installed by thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.
  - 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
  - 1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

**3.10 MISCELLANEOUS CONCRETE ITEMS**

- A. Filling In: Fill in holes, beam pockets and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

### 3.11 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss exceeding 0.1 pounds per square foot per hour, based on chart in ACI 305R, before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
  - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
  - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period of seven days.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period of seven days.
- F. Remove curing and sealing materials from floor slabs, without damaging concrete surfaces, by method recommended by curing and sealing manufacturer after the curing period in areas where floor stains, coatings, tile, and other floor finish materials are to be applied if recommended by the floor finish manufacturer.

### 3.12 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
  1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
  2. Do not apply to concrete that is less than seven days old.
  3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

### 3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler where indicated according to ACI 302 and manufacturer's written instructions.
  1. Defer joint filling until concrete has aged at least 60 days. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Do not use backer rod in saw-cut joints. Formed joints may be filled with silica sand to within 2 inches of the slab surface or a backer rod can be placed in compression at a depth of 2 inches below the slab surface.
- D. Overfill joint and trim joint filler flush with top of joint after hardening.

### 3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Concrete which will be exposed to view in the finished structure shall be restored to its original intended appearance or shall be removed and replaced. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
  
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
  
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
  - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension, down to solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
  - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at an inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
  - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
  
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness by using a sloped template.
  - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
  - 2. After concrete has cured at least 14 days, correct high areas by grinding.
  - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
  - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
  - 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
  7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

### 3.15 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd., plus one set for each additional 50 cu. yd. more than the first 25 cu. yd.
    - a. When frequency of testing will provide fewer than five compressive-strength tests for a given concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  2. Slump: ASTM C 143; one test at point of placement for each composite sample. Perform additional tests when concrete consistency appears to change.
  3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample of air-entrained concrete.
  4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 90 deg F and above.
  5. Compression Test Specimens: ASTM C 31; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
  6. Compressive-Strength Tests: ASTM C 39; test one laboratory-cured specimen at 7 days two at 28 days, and hold one specimen in reserve for later testing if necessary.

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- a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- D. Test results shall be reported in writing to Architect, Structural Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project name, date of concrete placement and testing, location of concrete batch in Work, mix identification including design compressive strength at 28 days, slump, compressive breaking strength, and type of break for both 7-and 28-day tests. Air content and concrete temperature results shall also be provided when applicable.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive devices will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Special inspector shall make additional tests of concrete at Contractor's expense when test results indicate that slump, air entrainment, compressive strength, or other requirements have not been met, as directed by Architect. Special inspector may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect. Contractor shall fill core-drilled holes with non-shrink grout unless directed otherwise by Architect.

END OF SECTION 033000

**SECTION 03451 - ARCHITECTURAL PRECAST CONCRETE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Architectural precast concrete coping;.
- B. Supports, anchors, and attachments.

**1.02 REFERENCE STANDARDS**

- A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute International.
- B. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
- C. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
- D. ASTM C150/C150M - Standard Specification for Portland Cement.
- E. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
- F. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete.
- G. PCI MNL-117 - Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products; Precast/Prestressed Concrete Institute.
- H. PCI MNL-120 - PCI Design Handbook - Precast and Prestressed Concrete; Precast/Prestressed Concrete Institute.
- I. PCI MNL-122 - Architectural Precast Concrete; Precast/Prestressed Concrete Institute.
- J. PCI MNL-123 - Design and Typical Details of Connections for Precast and Prestressed Concrete; Precast/Prestressed Concrete Institute.
- K. PCI MNL-135 - Tolerance Manual for Precast and Prestressed Concrete Construction; Precast/Prestressed Concrete Institute.

**1.03 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's information on accessory products, including pigments, admixtures, inserts, plates, etc.
- C. Shop Drawings: Indicate layout, unit locations, configuration, reinforcement, connection details, support items, dimensions, openings, and relationship to adjacent materials.
  - 1. Include details of mix designs.
- D. Initial Color Selection: For initial color selection, submit full range of color options in the White, Gray, Brown/Tan, and Yellow/Buff color range as illustrated in the Architectural Precast Association website, [www.archprecast.org/color.htm](http://www.archprecast.org/color.htm).
- E. Final Color Selection: Submit two (2) samples of each color requested, 12- x 12-inches in size, illustrating surface finish, color, and texture.

**1.04 DELIVERY, STORAGE, AND HANDLING**

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- A. Blocking and Lateral Support During Transport and Storage: Use materials that are clean, non-staining, and non-harmful to exposed surfaces. Provide temporary lateral support to prevent bowing and warping.
- B. Protect units to prevent staining, chipping, or spalling of concrete.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Architectural Precast Concrete:
  - 1. Any manufacturer holding a PCI Group A Plant Certification for the types of products specified; see [www.pci.org](http://www.pci.org).
  - 2. Substitutions: See Section 01600 - Product Requirements.

**2.02 PRECAST UNITS**

- A. Precast Architectural Concrete Units: Comply with PCI MNL-120, PCI MNL-122, PCI MNL-123, PCI MNL-135, and ACI 318.
  - 1. Concrete Face Mix: Minimum 5000 psi, 28 day strength, air entrained to 5 to 7 percent; comply with ACI 301.
  - 2. Accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
- B. Finish Type A: Ensure exposed-to-view finish surfaces of precast units are uniform in color and appearance.

**2.03 REINFORCEMENT**

- A. Steel Welded Wire Reinforcement: ASTM A185/A185M, plain type.
  - 1. Flat Sheets.
  - 2. Mesh Size: 6 x 6.
  - 3. Wire Gage: 9 x 9.

**2.04 CONCRETE MATERIALS**

- A. Cement: ASTM C150, Type IA - Air Entraining Portland type.
- B. Fine and Coarse Structural Aggregates: ASTM C33.
- C. Surface Finish Aggregate: Conforming to sample in office of Architect.
- D. Color Additives: Pure, concentrated mineral pigments specifically intended for mixing into concrete and complying with ASTM C979.
  - 1. Concentration: Base dosage rates on weight of Portland cement, fly ash, silica fume, and other cementitious materials but not aggregate or sand.
  - 2. Color(s): As selected by Architect from manufacturer's full range.
- E. Water: Clean and not detrimental to concrete.
- F. Air Entrainment Admixture: ASTM C260.
- G. Mortar: Match precast color at precast joints. See Division 4 Specification Sections for mortar types.

**2.05 FABRICATION**



- A. Fabricate in conformance with PCI MNL-117 and PCI MNL-135.
- B. Use rigid molds, constructed to maintain precast unit uniform in shape, size, and finish.
- C. Maintain consistent quality during manufacture.
- D. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
- E. Minor patching in plant is acceptable, providing structural adequacy and appearance of units is not impaired.

#### 2.06 FABRICATION TOLERANCES

- A. Conform to PCI MNL-117 and PCI MNL-135.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify that building structure, anchors, devices, and openings are ready to receive work of this section.

#### 3.02 PREPARATION

- A. Provide for erection procedures and induced loads during erection. Maintain temporary bracing in place until final support is provided.

#### 3.03 ERECTION

- A. Erect units without damage to shape or finish. Replace or repair damaged panels.
- B. Erect units level and plumb within allowable tolerances.
- C. Fasten units in place with mechanical connections.
- D. Exposed Joint Dimension: 1/4 inch. Adjust units so that joint dimensions are within tolerances.
- E. Seal perimeter and intermediate joints in accordance with Section 07900.

#### 3.04 TOLERANCES

- A. Erect members level and plumb within allowable tolerances. Conform to PCI MNL-135.

**END OF SECTION**

**SECTION 04810 - UNIT MASONRY ASSEMBLIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Concrete Block.
- B. Concrete Brick.
- C. Mortar.
- D. Reinforcement and Anchorage.
- E. Flashings.
- F. Accessories.

**1.02 REFERENCE STANDARDS**

- A. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries; American Concrete Institute International.
- B. ASTM A82/A82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- D. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
- E. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- F. ASTM C55 - Standard Specification for Concrete Building Brick.
- G. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.
- H. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
- I. ASTM C150/C150M - Standard Specification for Portland Cement.
- J. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
- K. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
- L. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.
- M. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
- N. ASTM C1634 - Standard Specification for Concrete Facing Brick.

**1.03 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Shop drawings including complete details for all reinforcing required by contract documents and

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Building Code Requirements for Masonry Structures.

- D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.
- B. Store masonry accessories to prevent corrosion, dirt accumulation, and other deterioration.

**PART 2 PRODUCTS**

**2.01 CONCRETE MASONRY UNITS**

- A. Manufacturers:
1. Metromont Materials Corporation..
  2. E. Dillon & Company.
  3. Oldcastle.
- B. Concrete Block: Comply with referenced standards and as follows:
1. Size: Standard units with nominal face dimensions of 16 x 8 inches and nominal depths as indicated on the drawings for specific locations.
  2. Special Shapes: Provide non-standard blocks configured for corners.
  3. Load-Bearing Units: ASTM C90, normal weight.
    - a. Hollow block, as indicated.
    - b. Type II - Nonmoisture-controlled; lightweight.
    - c. Exposed faces: Manufacturer's standard color and texture where indicated.
- C. Concrete Brick:
1. For below grade use, ASTM C1634 (or ASTM C55-03 Grade N), normal weight.
  2. For other uses, ASTM C55, normal weight.
  3. Size: As indicated on drawings.

**2.02 MORTAR MATERIALS**

- A. Portland Cement: ASTM C150, Type I.
1. Not more than 0.60 percent alkali.
  2. Hydrated Lime: ASTM C207, Type S.
  3. Mortar Aggregate: ASTM C144.
  4. Grout Aggregate: ASTM C404.
- B. Water: Clean and potable.

**2.03 REINFORCEMENT AND ANCHORAGE**

- A. Manufacturers of Joint Reinforcement and Anchors:
1. Blok-Lok Limited: [www.blok-lok.com](http://www.blok-lok.com).
  2. Hohmann & Barnard, Inc (including Dur-O-Wal brand): [www.h-b.com](http://www.h-b.com).
  3. WIRE-BOND: [www.wirebond.com](http://www.wirebond.com).
  4. Substitutions: See Section 01600 - Product Requirements.
- B. Reinforcing Steel: ASTM A615/A615M Grade 40 (280) deformed billet bars; uncoated.
- C. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.

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- D. Single Wythe Joint Reinforcement: Ladder type; ASTM A 82/A 82M steel wire, hot dip galvanized after fabrication to ASTM A 153/A 153M, Class B; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.

**2.04 FLASHINGS**

- A. Stainless Steel Flashing: ASTM A666, Type 304, soft temper; 0.0359 inch thick; finish 2B to 2D.
- B. Lap Sealant: Butyl type as specified in Section 07900.

**2.05 ACCESSORIES**

**2.06 MORTAR MIXES**

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
  - 1. All masonry: Type S.
- B. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.
- C. Mixing: Use mechanical batch mixer and comply with referenced standards.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

**3.02 PREPARATION**

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

**3.03 COLD AND HOT WEATHER REQUIREMENTS**

- A. Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent.

**3.04 COURSING**

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
  - 1. Bond: Running.
  - 2. Coursing: One unit and one mortar joint to equal 8 inches.
  - 3. Mortar Joints: Raked.

**3.05 PLACING AND BONDING**

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar and mortar smears as work progresses.
- E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- G. Cut mortar joints flush where cement parging is required.

### 3.06 REINFORCEMENT AND ANCHORAGE - GENERAL

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.

### 3.07 REINFORCEMENT AND ANCHORAGE - SINGLE WYTHE MASONRY

- A. Install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.

### 3.08 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
  - 1. Extend flashings full width at such interruptions and at least 4 inches into adjacent masonry or turn up at least 8 inches to form watertight pan at non-masonry construction.
  - 2. Remove or cover protrusions or sharp edges that could puncture flashings.
  - 3. Seal lapped ends and penetrations of flashing before covering with mortar.
- B. Lap end joints of flashings at least 4 inches and seal watertight with mastic or elastic sealant.

### 3.09 REINFORCED COMPONENTS

- A. Reinforce walls as indicated on drawings.
- B. Lap splices as indicated on drawings.
- C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

- D. Place and consolidate grout fill without displacing reinforcing.
- E. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening.

### 3.10 TOLERANCES

- A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- E. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.
- F. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

### 3.11 CUTTING AND FITTING

- A. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

### 3.12 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01400.
- B. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

### 3.13 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.

### 3.14 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

**END OF SECTION**

**SECTION 04852 - STONE MASONRY VENEER**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Cut stone veneer at exterior and interior walls.
- B. Metal anchors and accessories.
- C. Setting mortar and pointing mortar.

**1.02 REFERENCE STANDARDS**

- A. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries; American Concrete Institute International.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- C. ASTM C270 - Standard Specification for Mortar for Unit Masonry.

**1.03 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on stone units, mortar, and reinforcement.
- C. Samples: Submit two stone samples illustrating minimum and maximum stone sizes, color range, texture, and markings.
- D. Samples: Submit mortar color samples.

**1.04 QUALITY ASSURANCE**

- A. Stone Fabricator Qualifications: Company specializing in fabricating cut stone with minimum ten years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type required by this section, with minimum 3 years of documented experience.

**1.05 MOCK-UP**

- A. Construct stone wall mock-up, 10 feet long by 5 feet wide; include stone anchor accessories and corner condition in mock-up.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Protect stone from discoloration during storage on site.
- B. Provide ventilation to prevent condensation from forming on stone.

**1.07 FIELD CONDITIONS**

- A. Cold Weather Requirements: Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent.

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**PART 2 PRODUCTS**

**2.01 STONE**

- A. Nominally "Tennessee Fieldstone".
- B. Ashlar pattern as indicated on drawings.
- C. Mortared joints.
- D. Thickness as required for total wall thickness indicated on the drawings.
- E. Surface Texture: Split face.
- F. Color: Natural.

**2.02 MORTAR**

- A. Setting Mortar: ASTM C270, Type S, using the Proportion Method as specified in Section 04065.
- B. Pointing Mortar: Type N as specified in Section 04065, and using the Property Method in ASTM C270.
  - 1. Color: Mineral oxide pigment; color as selected.

**2.03 ACCESSORIES**

- A. Wall Ties: Formed steel wire, 16 gage diameter, hot dip galvanized per ASTM A123/A123M, eye and pintle type, with provision for vertical adjustment after attachment.
- B. Setting Buttons and Shims: Plastic.
- C. Cleaning Solution: Type that will not harm stone, joint materials, or adjacent surfaces.

**2.04 STONE FABRICATION**

- A. Nominal Thickness: 5 inch.
- B. Pattern and Coursing: Ashlar.
- C. Fabricate for 3/8 inch beds and joints.
- D. Bed and Joint Surfaces:
  - 1. Sawn or cut full square 2 inches back from face; from that point back under square not more than 1 inch in 12 inches.
- E. Backs: Sawn.
- F. Form stone corners to irregular joint profile. Clean jagged corners from stone in preparation for setting.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that support work and site conditions are ready to receive work of this section.
- B. Verify that items built-in under other sections are properly located and sized.

**3.02 PREPARATION**



- A. Establish lines, levels, and coursing. Protect from disturbance.
- B. Clean stone prior to erection. Do not use wire brushes or implements that mark or damage exposed surfaces.
- C. Clean sawn surfaces of rust stains and iron particles.

### 3.03 INSTALLATION

- A. Install flashings of longest practical length and seal watertight to back-up. Lap end joints minimum 6 inches and seal watertight.
- B. Size stone units to fit opening dimensions and perimeter conditions.
- C. Wet absorptive stone in preparation for placement to minimize moisture suction from mortar.
- D. Arrange stone pattern to provide color uniformity and minimize visual variations, and provide a uniform blend of stone unit sizes.
- E. Fill dowel holes in stone units with mortar.
- F. Arrange stone coursing in ashlar bond with consistent joint width.
- G. Set stone in full mortar setting bed to fully support stone over bearing surface. Use setting buttons or shims to maintain correct joint width.

### 3.04 REINFORCEMENT AND ANCHORAGE

- A. Place joint reinforcement continuous in first and second joint below top of walls.
- B. Attach wall ties to back-up to bond veneer to back-up at maximum 16 inches on center vertically and 36 inches on center horizontally.
- C. In addition, place wall ties at maximum 3 inches on center each way around perimeter of openings, within 12 inches of openings.

### 3.05 JOINTS

- A. Leave the following joints open for sealant:
  - 1. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
  - 2. Joints between rigidly anchored units, including soffits, panels, and column covers.
- B. Rake out mortar joints 5/8 to 3/4 inch and brush joints clean to accommodate pointing mortar. Fill joints with pointing mortar.
- C. Pack mortar into joints and work into voids. Neatly tool surface to concave joint.
- D. At joints to be sealed, clean mortar out of joint before it sets. Brush joints clean.

### 3.06 CLEANING

- A. Remove excess mortar as work progresses, and upon completion of work.
- B. Clean soiled surfaces with cleaning solution.
- C. Use non-metallic tools in cleaning operations.

### 3.07 PROTECTION

- A. During temporary storage on site, at the end of working day, and during rainy weather, cover

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stone work exposed to weather with non-staining waterproof coverings, securely anchored.

**END OF SECTION**

SECTION 05120 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes structural steel and architecturally exposed structural steel.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 3 Section "Cast-in-Place Concrete" for installing anchor bolts in concrete.
  - 2. Division 4 Section "Unit Masonry" for installing anchor bolts in unit masonry.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of product specified.
- C. Shop Drawings detailing fabrication of structural steel components.
  - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
  - 2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
  - 3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted snug-tightened, pretensioned, or slip-critical connections.
- D. Welding Certificates: Copies of certificates for welding procedures and personnel.
- E. Mill test reports certifying that structural steel complies with requirements, including chemical and physical properties.
- F. Manufacturer's certificates of compliance certifying that their products, including the following, comply with requirements.
  - 1. Weld filler materials for both shop and field welding.
  - 2. Nonshrink grout.

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- G. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- H. LEED Submittal:
  - 1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.

**1.4 QUALITY ASSURANCE**

- A. Installer Qualifications: Engage an experienced Installer who has completed structural steel work similar to this Project with a record of successful in-service performance.
- B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to this Project and with a record of successful in-service performance. Fabricator must meet one of the following requirements:
  - 1. Fabricator must maintain detailed written fabrication, material control, and quality control procedures that provide a basis for inspection control of the workmanship and the fabricator's ability to conform to approved construction documents and referenced standards.
- C. Comply with applicable provisions of the following specifications and documents:
  - 1. AISC's "Specification for Structural Steel Buildings."
  - 2. AISC's "Seismic Provisions for Structural Steel Buildings."
  - 3. ASTM A 6 "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use."
  - 4. Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
- D. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel."
  - 1. Present evidence that each welder has satisfactorily passed AWS qualification tests for welding processes involved.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from deterioration.

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1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusted before use.
2. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures.

1.6 SEQUENCING

- A. Supply anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting templates and instructions as required for installation.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Structural Steel Shapes, Plates, and Bars: As follows:
  1. Wide Flange Shapes and Tees: ASTM A 992.
  2. Other Shapes, Plates and Bars: ASTM A 36.
  3. Plate Where Indicated 50 ksi: ASTM A572, Grade 50.
- B. Cold-Formed Structural Steel Tubing: ASTM A 500, Grade B.
- C. Steel Pipe: ASTM A 53, Type E or S, Grade B.
- D. Anchor Rods, Nuts, and Washers: As follows:
  1. Anchor Rods: ASTM F 1554, Grade 36, conforming to weldability supplement S1.
  2. Nuts: ASTM A 563, heavy hex carbon steel nuts.
  3. Washers: ASTM F 436, Type 1, hardened carbon steel.
  4. Plate Washers: ASTM A 36, carbon steel plate washers in accordance with Table 14-2 of AISC's "Steel Construction Manual", Thirteenth Edition, 1/4 inch plate thickness for anchor rods up to 1 inch diameter, 3/8 inch plate thickness for anchor rods larger than 1 inch diameter.
- E. High-Strength Bolts, Nuts, and Washers: As follows:
  1. All bolts shall be of domestic manufacture.
  2. Bolts: ASTM A 325, Type 1, heavy hex steel structural bolts.
  3. Nuts: ASTM A 563, heavy hex carbon steel nuts.
  4. Washers: ASTM F 436, flat, circular carbon steel washers.
  5. Twist-Off Type Tension Control Bolts: ASTM F 1852, Type 325.
  6. Finish: Plain, uncoated.
- F. Threaded Rods: ASTM A 36.
- G. Forged Steel Hardware:

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1. Clevises, Turnbuckles: AISI C 1035.
2. Clevis Pins: AISI C 1018 or AISI C 1035.
3. Eye Bolts, Eye Nuts: ASTM A 489.
4. Sleeve Nuts: AISI C 1018, Grade 2.
5. Finish: Plain, Uncoated.

H. Welding Electrodes: Comply with AWS requirements.

1. Electrodes shall be E70XX.
2. All electrodes for welding ASTM A 992 steel shall be low hydrogen electrodes with a maximum of 16 ml of diffusible hydrogen per 100 g of deposited weld metal.
3. Electrodes for all welds in moment connections, including shear tabs and stiffener plates, shall have a minimum Charpy V-Notch toughness of 20 foot-pounds at -20 degrees F, and 40 foot-pounds at 70 degrees F.

## 2.2 PRIMER AND PAINT

- A. See the Architectural drawings and Division 9 Sections for areas which are scheduled to receive a paint topcoat and for topcoat paint systems.
- B. Primer for Steel not to Receive Topcoat: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79.
- C. Primer for Steel to Receive Topcoat: Comply with Division 09 painting Sections, or if not specified in Division 09 painting Sections, use the following:
  1. Interior Steel: SSPC Paint 25, Type II, zinc oxide, alkyd, linseed oil primer.
  2. Exterior Steel: SSPC Paint 25 BCS, Type II, zinc oxide, alkyd, linseed oil primer.
- D. Primer color may be selected by contractor, however only one single color of primer may be incorporated in the Work.
- E. Galvanizing Repair Paint: ASTM A 780.

## 2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time. Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
  1. Five Star Grout; U.S. Grout Corp.
  2. Masterflow 713; Master Builders.
  3. Sonneborn SonogROUT 10K; ChemRex, Inc.
  4. NS Grout, Euclid Chemical Company.
  5. SC Multipurpose Grout, SpecChem, LLC.
  6. Enduro 50; Conspec.

**2.4 FABRICATION**

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
  - 1. Camber structural steel members where indicated.
  - 2. Mark and match-mark materials for field assembly.
  - 3. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.
  - 4. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.
  - 5. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.
  - 6. Welds which will be exposed to view in the completed structure shall have a neat and uniform appearance. Such welds shall be continuous, not intermittent.
  
- B. Fabricate architecturally exposed structural steel with exposed surfaces smooth, square, and free of surface blemishes, including pitting, rust and scale, seam marks, roller marks, rolled trade names, and roughness.
  - 1. Remove blemishes by filling, grinding, or by welding and grinding, prior to cleaning, treating, and shop priming.
  - 2. Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for architecturally exposed structural steel.
  
- C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
  - 1. Plane thermally cut edges to be welded.
  
- D. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members.
  - 1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning.
  
- E. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
  
- F. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning."
  
- G. Tube Members: Provide ¾" minimum cap plates on tube columns which support beams unless otherwise indicated. Provide ¼" closure plates on ends of all other tube members unless another connection is indicated. Where the tube end is exposed to view, grind closure plate smooth and flush with tube face all around, including at curved corners of tube.
  - 1. On tube members which will be exposed to view in the completed structure, the seam on the tube shall be oriented away from view. For columns, locate seam facing towards a wall, and for beams, locate seam on upper surface of tube unless indicated otherwise.

**2.5 SHOP CONNECTIONS**

- A. Shop install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
  - 1. Bolts: ASTM A325 high-strength bolts, unless otherwise indicated.
  - 2. Connection Type: Snug tightened, unless indicated as pretensioned or slip-critical.
  
- B. Welded Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.
  - 1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.
  - 2. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/2 inch and larger. Grind flush butt welds. Dress exposed welds.

**2.6 SHOP PRIMING**

- A. Shop prime steel surfaces, except the following:
  - 1. Surfaces embedded in concrete.
  - 2. Surfaces to be field welded.
  - 3. Surfaces to be high-strength bolted with slip-critical connections.
  - 4. Surfaces to receive sprayed-on fireproofing.
  - 5. Top flanges of beams to receive field welded headed shear connectors.
  - 6. Galvanized surfaces.
  
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Prepare surfaces as follows:
  - 1. Steel not to Receive Topcoat: SSPC-SP 1 "Solvent Cleaning", followed by SSPC-SP 2 "Hand Tool Cleaning."
  - 2. Interior Steel to Receive Topcoat: Comply with Division 09 painting Sections, or if not specified in Division 09 painting Sections, use SSPC-SP 1 "Solvent Cleaning", followed by SSPC-SP 2 "Hand Tool Cleaning."
  - 3. Exterior Steel to Receive Topcoat: SSPC-SP 6 "Commercial Blast Cleaning."
  - 4. Faying surfaces and surfaces adjacent to bolt heads and nuts shall be free of dirt and foreign material. Faying surfaces at slip-critical connections shall also be free of scale, except tight mill scale, and free of coatings, including inadvertent overspray.
  
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions and at rate recommended by SSPC to provide a dry film thickness complying with Division 09 painting Sections, but not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

**2.7 GALVANIZING**



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- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel indicated for galvanizing according to ASTM A123.
- B. Galvanize shelf angles, steel lintels in exterior walls, and other items as indicated.
- C. Where tubes or pipes in exterior elements exposed to the weather have vent holes for galvanizing, the vent holes shall be closed using plug welds and then ground smooth and flush. Holes shall be closed after galvanizing and then painted with galvanizing repair paint.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Before erection proceeds, verify elevations of concrete and masonry bearing surfaces and locations of anchorages for compliance with requirements.
- B. Do not proceed with erection until unsatisfactory conditions have been corrected.

**3.2 PREPARATION**

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.
  - 1. Where temporary shoring is required for composite deck construction, do not remove shoring until cast-in-place concrete has attained its 70 percent of its design compressive strength.

**3.3 ERECTION**

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.
- B. Base Plates and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
  - 1. Set base plates and bearing plates for structural members on wedges, shims, or leveling nuts as required.
  - 2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
  - 3. Grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.

- a. Comply with manufacturer's instructions for proprietary grout materials.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
  1. Maintain erection tolerances of architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  1. Level and plumb individual members of structure.
- E. Splice members only where indicated.
- F. Remove welded identification tags, erection bolts and clips on all steel which will be exposed to view in the completed structure; fill holes with plug welds; and grind smooth at exposed surfaces. Remove paper tags and stickers which will interfere with or show through painting.
- G. Finish sections thermally cut during erection equal to a sheared appearance.
- H. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.

### 3.4 FIELD CONNECTIONS

- A. Install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
  1. Bolts: ASTM A325 high-strength bolts, unless otherwise indicated.
  2. Connection Type: Snug tightened, unless indicated as pretensioned or slip-critical.
  3. Tensioned bolts: For bolted connections indicated as pretensioned or slip-critical, use twist-off type tension control bolts.
- B. Welded Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.
  1. Comply with AISC specifications referenced in this Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
  2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.
  3. Welds which will be exposed to view in the completed structure shall have a neat and uniform appearance. Such welds shall be continuous, not intermittent.
  4. Shielded Metal Arc Welding (SMAW) or Flux Cored Arc Welding (FCAW) are acceptable welding processes for shop or field welding. FCAW-S (self-shielded) shall not be mixed with any other welding process in the same weld in moment connections.

5. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/2 inch and larger. Grind flush butt welds. Dress exposed welds.

### 3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform field inspections and tests and to prepare test reports.
  1. Special inspector will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.
- B. Contractor shall ensure that no items which are to be tested or inspected are covered up by earth, concrete, deck or other materials before testing and inspection are complete.
- C. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
- D. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- E. Periodically inspect steel frame joint details for compliance with approved construction documents.
- F. Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
  1. Verify that washers are installed as required by RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
  2. Snug-Tightened Connections: Visually verify that all plies of the connected elements have been brought into firm contact.
  3. Slip-Critical Connections and Pretensioned connections indicated to have faying surfaces prepared as required for slip-critical connections: Prior to assembly, visually verify that faying surfaces of joints meet the requirements of RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
  4. Pretensioned and Slip-Critical Joints Using Twist-Off Type Tension Control Bolts: Inspector shall observe pre-installation verification required by RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts." Verify by periodic monitoring of the work in progress that the splined ends are properly severed during installation.
- G. Provide continuous visual inspection of all multi-pass fillet welds, all single-pass fillet welds greater than 5/16", and all complete and partial penetration groove welds. Provide periodic visual inspection of single-pass fillet welds less than or equal to 5/16".

### 3.6 CLEANING

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- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.
  - 1. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils.
  
- B. Galvanized Surfaces: All exposed galvanized surfaces which have been damaged by shipping, handling, welding or other operations shall be repaired. Surfaces to be repaired shall be clean, dry, and free of oil, grease, welding slag or flux and corrosion products. Apply galvanizing repair paint according to ASTM A 780 and the manufacturer's instructions to attain the required dry-film thickness.

END OF SECTION 05120

**SECTION 06100 - ROUGH CARPENTRY**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Framing with dimension lumber.
  - 2. Framing with timber.
  - 3. Framing with engineered wood products.
  - 4. Wood blocking and nailers.
- B. Related Sections include the following:
  - 1. Division 1 Section "LEED Requirements" for additional LEED requirements.
  - 2. Division 6 Section "Sheathing."

**1.3 DEFINITIONS**

- A. Exposed Framing: Framing not concealed by other construction.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- C. Timber: Lumber of 5 inches nominal or greater in least dimension.
- D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
  - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
  - 2. NLGA: National Lumber Grades Authority.
  - 3. SPIB: The Southern Pine Inspection Bureau.
  - 4. WCLIB: West Coast Lumber Inspection Bureau.
  - 5. WWPA: Western Wood Products Association.

**1.4 SUBMITTALS**

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

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1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

**B. LEED Submittals:**

1. Credit EQ 4.1: Manufacturers' product data for construction adhesive, including printed statement of VOC content.
2. Credit EQ 4.4: Composite wood manufacturer's product data for each composite wood product used indicating that bonding agent used contains no urea formaldehyde.

**1.5 QUALITY ASSURANCE**

- A. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.

**1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

**PART 2 - PRODUCTS**

**2.1 WOOD PRODUCTS, GENERAL**

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
  2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
  3. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, which meet or exceed those indicated.

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Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

**2.2 WOOD-PRESERVATIVE-TREATED LUMBER**

- A. Preservative Treatment by Pressure Process: AWPAC2.
  - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
  - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
  - 2. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.
  - 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
  - 4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
  - 5. Wood floor plates that are installed over concrete slabs-on-grade.

**2.3 DIMENSION LUMBER FRAMING**

- A. Maximum Moisture Content: 19 percent.
- B. Non-Load-Bearing Interior Partitions: No. 2 of any species.
- C. All Framing Other Than Interior Non-Load-Bearing Walls: No. 2 grade of the following species:
  - 1. Southern pine; SPIB.

**2.4 TIMBER FRAMING**

- A. Provide timber framing complying with the following requirements, according to grading rules of grading agency indicated:
  - 1. Species and Grade: Southern pine, No. 1 grade; SPIB.
  - 2. Maximum Moisture Content: 20 percent.

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**2.5 MISCELLANEOUS LUMBER**

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
  - 1. Blocking.
  - 2. Nailers.
  - 3. Cants.
- B. For items of dimension lumber size, provide Construction or No. 2, Standard, Stud, or No. 3 grade lumber with 19 percent maximum moisture content of any species.
- C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

**2.6 FASTENERS**

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
  - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, fire retardant treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.



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1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

**2.7 METAL FRAMING ANCHORS AND SHEAR WALL HOLDOWNS**

- A. Basis-of-Design Products: Subject to compliance with requirements, provide products indicated on Drawings or comparable products by one of the following:
  1. Alpine Engineered Products, Inc.
  2. Cleveland Steel Specialty Co.
  3. Harlen Metal Products, Inc.
  4. KC Metals Products, Inc.
  5. Simpson Strong-Tie Co., Inc.
  6. Southeastern Metals Manufacturing Co., Inc.
  7. USP Structural Connectors.
- B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of the Simpson Strong-Tie products indicated on the structural drawings. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- C. For interior use on untreated wood where stainless steel is not specified, provide framing anchors made from hot-dip galvanized steel sheet complying with ASTM A 653, G60 coating designation.
- D. Where stainless steel is not specified, for exterior use and on treated wood provide Simpson framing anchors with hot-dipped galvanized ZMAX coating, or other framing anchors complying with ASTM A 653, G185 coating designation.

**2.8 MISCELLANEOUS MATERIALS**

- A. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
  1. Use adhesives that comply with current VOC content limits of South Coast Air Quality Management District Rule #1168 when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chlorpyrifos as its active ingredient.

3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- D. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions.
- E. Shear Wall Holdowns: Install metal framing holdowns to comply with manufacturer's written instructions. Bolt to multiple studs and bolt to concrete as indicated.
- F. Do not splice structural members between supports, unless otherwise indicated.
- G. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- H. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
  - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
  - 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal- thickness.
  - 3. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.
- I. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- J. Comply with AWP A M4 for applying field treatment to cut surfaces of preservative-treated lumber.
  - 1. Use inorganic boron for items that are continuously protected from liquid water.
  - 2. Use copper naphthenate for items not continuously protected from liquid water.

- K. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. NES NER-272 for power-driven fasteners.
  - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
- L. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

### 3.2 WOOD SLEEPER, BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

### 3.3 WALL AND PARTITION FRAMING INSTALLATION

- A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions. Provide studs of size indicated spaced 16 inches o.c., unless otherwise indicated. Fasten plates to supporting construction.
  - 1. For exterior walls and interior bearing walls, fasten plates as indicated.
  - 2. For non-load-bearing interior partitions, fasten plates to slabs with Hilti X-CP (or equal) powder actuated fasteners at 32" oc. Fasten plates to wood construction with 16d nails at 16" oc.
- B. Construct corners and intersections with three or more studs.
- C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jack studs. Provide full-height king studs beside jack studs.
  - 1. For non-load-bearing interior partitions, provide single jack studs and single king studs. Provide headers not less than 4-inch nominal depth for openings 48 inches and less in width, 6-inch nominal depth for openings 48 to 72 inches in width, 8-inch nominal depth for openings 72 to 120 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet in width.
  - 2. For load-bearing walls and exterior walls, provide single jack stud and single king studs at each side of opening 48 inches and less in width, and provide double jack studs and double king studs for wider openings, unless a greater number of studs is indicated. Provide headers of depth indicated.

**3.4 ENGINEERED WOOD I-JOIST FRAMING INSTALLATION**

- A. General: Install wood I-joists in accordance with manufacturer's recommendations.
- B. Provide web stiffeners on each side of joists at all bearing locations as indicated, or if not indicated, in accordance with manufacturer's recommendations.

**3.5 TIMBER FRAMING INSTALLATION**

- A. Install timber with crown edge up and provide not less than 4 inches of bearing on supports. Provide continuous members, unless otherwise indicated; tie together over supports as indicated if not continuous.
- B. Where beams or girders are framed into pockets of exterior concrete or masonry walls, provide 1/2-inch air space at top, sides and of wood members.
- C. Install wood posts using metal anchors indicated.
- D. Treat ends of timber beams and posts exposed to weather by dipping in water-repellent preservative for 15 minutes.

**3.6 FIELD QUALITY CONTROL**

- A. Special Inspections: Owner will engage a special inspector to perform field quality control inspections of rough framing installation:
  - 1. Visually verify that specified shear wall holdowns are installed in accordance with manufacturer's recommendations.
- B. Special inspector will report results of inspections promptly to Architect and Contractor.

END OF SECTION 06100

SECTION 06192 – METAL-PLATE-CONNECTED WOOD TRUSSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes pre-engineered, prefabricated wood trusses and truss accessories.
  - 1. Extent and configuration of prefabricated wood trusses, and design criteria are indicated on the drawings.
  - 2. Plan layout does not necessarily indicate the exact number of trusses required. Unless otherwise indicated, provide trusses at 24 inch maximum spacing.

1.3 DEFINITIONS

- A. Prefabricated Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to the project site.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with conditions of the Contract and Division 1 Specification Sections.
- B. Fabricator Qualifications: Submit documentation that the fabrication shop is certified by the Wood Truss Council of America (WTCA) Quality Control Program or the TPI Quality Assurance Inspection Program.
- C. Product Data: Provide product data for the following:
  - 1. Metal framing anchors.
  - 2. Metal plate connectors.
  - 3. Wood-preservative treatment.
    - a. Include data from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

- b. For waterborne treatments, include statement that moisture content of treated materials was reduced to levels specified before shipment to project site.
  - c. Include copies of warranties from chemical manufacturers for each type of treatment.
  - d. For fire-retardant treatments specified to be High-Temperature (HT) type, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
- D. Shop Drawings: Individual truss drawings shall be sealed and signed by a qualified professional engineer licensed to practice in the state where the project is located. Shop drawings shall include all of the information listed in International Building Code section 2303.4.1, and the following information:
- 1. Design criteria and loads, including uplift and any other special loads for which trusses are designed; member stresses and truss deflection.
  - 2. Location, pitch, span, configuration, and spacing for each type of truss required.
  - 3. Species, sizes, and stress grades of lumber for each truss member.
  - 4. Type, size, material, finish, design values, orientation, and location of metal connector plates.
  - 5. Chord and web bracing; bridging and their connections.
  - 6. Reactions, bearing details, and bearing width requirements.
  - 7. Connections of plies of multiple ply trusses, connections of piggyback trusses to base trusses, connection of valley sets to main roof, splice details and all truss-to-truss connections including required metal framing anchors.

#### 1.5 QUALITY ASSURANCE

- A. Metal Connector Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with TPI quality control procedures for manufacture of connector plates published in TPI 1.
- B. Fabricator Qualifications: Engage a firm that complies with the following requirements for quality control and is experienced in fabricating metal-plate-connected wood trusses similar to those indicated for this Project and with a record of successful in-service performance.
  - 1. Shop shall participate in a recognized quality assurance program that involves third-party inspection. Shop shall be certified by the Wood Truss Council of America (WTCA) Quality Control Program or the TPI Quality Assurance Inspection Program.
- C. Installer Qualifications: Engage an experienced Installer who has completed wood truss installation similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- D. Professional Engineer Qualifications: A professional engineer who is licensed to practice in the state where the project is located and who is experienced in providing engineering services of the kind indicated that have resulted in a record of successful in-service performance.
- E. Comply with applicable requirements and recommendations of the following publications:

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1. TPI 1, "National Design Standard for Metal Plate Connected Wood Truss Construction" (referred to as "TPI 1" in this specification).
2. TPI DSB, "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."
3. TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."

- F. Wood Structural Design Standard: Comply with applicable requirements of AFPA's "National Design Specification for Wood Construction" and its "Supplement."
- G. Inspection: Manufacturer shall inspect trusses before shipment to ensure compliance with drawings and specifications.
- H. Codes and Standards: Applicable editions of codes and standards shall be the editions specified in the Building Code in effect for this Project.

**1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Handle and store trusses to comply with recommendations of TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."
1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
  2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
  3. Provide for air circulation around stacks and under coverings.
- B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

**1.7 COORDINATION**

- A. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying progress of other trades whose work must follow erection of trusses.

**PART 2 - PRODUCTS**

**2.1 DIMENSION LUMBER**

- A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
1. Factory mark each piece of lumber with grade stamp of grading agency.
  2. Provide dressed lumber, S4S, manufactured to actual sizes required by DOC PS 20 for moisture content specified.
  3. Provide dry lumber with 19 percent maximum moisture content at time of dressing.

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- B. Grade and Species: Provide dimension lumber of species indicated for truss chord and web members, graded as follows and capable of supporting required loads without exceeding allowable design values according to AFPA's "National Design Specification for Wood Construction" and its "Supplement."
  - 1. Species: Southern Pine; Southern Pine Inspection Bureau.
  - 2. Grading Method: Visual or mechanical.

**2.2 WOOD-PRESERVATIVE-TREATED LUMBER**

- A. Preservative Treatment by Pressure Process: AWPA C2.
  - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
  - 2. For exposed trusses indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat trusses where indicated on Drawings.

**2.3 FIRE-RETARDENT TREATED WOOD**

- A. General: Comply with performance requirements in AWPA C20.
  - 1. Use Exterior type for exterior locations and where indicated.
  - 2. Use Interior Type A, High Temperature (HT) for enclosed roof trusses and where indicated.
  - 3. Use Interior Type A, unless otherwise indicated.
- B. Identify fire-retardent treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Application: Treat all trusses.

**2.4 METAL CONNECTOR PLATES**

- A. General: Fabricate connector plates to comply with TPI 1.
- B. Hot-Dip Galvanized Steel Sheet: ASTM A 653; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 coating designation; and not less than 0.036 inch thick.



1. Use for interior locations where stainless steel is not indicated
- C. Stainless-Steel Sheet: ASTM A 666, Type 304, and not less than 0.035 inch thick.
  1. Use for exterior locations and where indicated
- D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  1. Alpine Engineered Products, Inc.
  2. Clary Corporation.
  3. Gang Nail Systems, Inc.
  4. Mitek Industries, Inc.
  5. TEE-LOK Corporation.

## 2.5 METAL FRAMING ANCHORS

- A. Basis-of-Design Products: Subject to compliance with requirements, provide products indicated on Drawings or comparable products by one of the following:
  1. Alpine Engineered Products, Inc.
  2. Simpson Strong-Tie Company, Inc.
  3. Teco/Lumberlok.
  4. United Steel Products Company, Inc. (Kant-Sag brand).
- B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of the Simpson Strong-Tie products indicated on the structural drawings. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- C. For interior use on untreated wood, provide framing anchors made from hot-dip galvanized steel sheet complying with ASTM A 653, G60 coating designation.
- D. For exterior use and on treated wood, where stainless steel is not specified, provide Simpson framing anchors with hot-dipped galvanized ZMAX coating, or other framing anchors complying with ASTM A 653, G185 coating designation.

## 2.6 FASTENERS

- A. For metal framing anchors, provide fasteners of the quantity, type, size, material, and finish specified by the metal framing anchor manufacturer.
- B. For other fasteners indicated on the drawings or truss shop drawings, provide fasteners complying with the following:
  1. Nails, wire, brads, and staples: FS FF-N-105.
  2. Power-actuated fasteners: CABO NER-272.

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3. Wood screws: ASME B18.6.1.
4. Lag bolts: ASME B18.2.1.
5. Bolts: Steel bolts complying with ASTM A 307, Grade A, with ASTM A 563 hex nuts and flat washers.
6. Finish: Where trusses are exposed to weather, in ground contact, made from pressure-preservative treated wood, or in an area of high relative humidity, provide fasteners with hot-dip galvanized coating complying with ASTM A 153.

**2.7 MISCELLANEOUS MATERIALS**

- A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

**2.8 DESIGN AND FABRICATION**

- A. Design trusses to comply the applicable building code and with loads and design criteria indicated on the structural drawings, and the following:
  1. Vertical deflection due to combined dead and live load shall be less than or equal to  $1/360$  of the span.
- B. Except where specific clearances or dimensional requirements are indicated, truss web configurations indicated are schematic and may be modified by the truss designer.
- C. Design shall be based on the bearing widths of supports indicated on the drawings. If insufficient bearing width is available, multiple ply trusses shall be provided or bearing blocks shall be added to the sides of the truss bottom chords to increase the bearing area as required. Details shall be provided showing the length and nailing pattern for the bearing blocks.
- D. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.
- E. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.
- F. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
- G. Connect truss members by metal connector plates located and securely embedded simultaneously on both sides of wood members by air or hydraulic press.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Examine supporting construction, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after supporting construction is in place, braced and secured and unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Installation of trusses, including proper handling, safety precautions, temporary bracing and bridging, and other safeguards or procedures are the responsibility of the Contractor and the contractor's installer. Avoid damage to trusses during installation and keep horizontal bending of trusses to a minimum.
- B. Install and brace trusses according to TPI recommendations and as indicated on the drawings and truss shop drawings. Fasten bracing during truss erection and before construction loads are applied. Anchor ends of bracing where terminating at walls or beams. Where no wall or beam is available, provide diagonal bracing at ends of bracing.
- C. Install trusses plumb, square, true to line, at the proper locations and spacings within installation tolerances in TPI 1. Adjust and align trusses before permanently fastening.
- D. Cutting, notching, removal and drilling of truss members, components, and connections are prohibited.
- E. At wood truss roofs with valley truss sets, main roof sheathing shall run continuous under valley trusses. Valley trusses shall be installed on top of sheathing.
- F. Fastening: Provide all connections of trusses and components and of trusses to structure as required for a complete installation, and as follows:
  - 1. Securely connect each ply of multiple ply trusses as indicated on the truss shop drawings.
  - 2. Securely splice trusses delivered to site in more than one piece as indicated on the truss shop drawings.
  - 3. Anchor trusses at bearing points using metal framing anchors as indicated. Install fasteners in metal framing anchors according to manufacturer's fastening schedules and written instructions. Where specific framing anchors are not indicated, provide framing anchors of the appropriate type and with sufficient capacity to support the reactions indicated on the truss shop drawings.
  - 4. Anchor trusses to girder trusses using metal framing anchors as indicated on the truss shop drawings. Install fasteners in metal framing anchors according to manufacturer's fastening schedules and written instructions.

### 3.3 REPAIRS AND PROTECTION

- A. Misfabricated or Damaged Trusses: Misfabricated or damaged trusses shall be replaced or repaired. Before trusses are repaired, the manufacturer shall submit for review details of the proposed repair method, approved, stamped, and signed by a qualified professional engineer

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licensed to practice in the state where the project is located. The capacity of the repaired trusses shall be equal to or greater than the originally specified trusses.

- B. Galvanizing Repairs: Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780 and the manufacturer's instructions.
- C. Maintain conditions that ensure trusses and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 06192

**SECTION 06200 - FINISH CARPENTRY**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Finish carpentry items.
- B. Wood casings and moldings.

**1.02 REFERENCE STANDARDS**

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards.

**1.03 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
  - 1. Minimum Scale of Detail Drawings: 1-1/2 inch to 1 foot.
  - 2. Provide the information required by AWI/AWMAC/WI Architectural Woodwork Standards.
- C. Samples: Submit two samples of finish plywood, 12 x 12 inch in size illustrating wood grain and specified finish.
- D. Samples: Submit two samples of wood trim 8 inch long.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Protect work from moisture damage.

**PART 2 PRODUCTS**

**2.01 FINISH CARPENTRY ITEMS**

- A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI/AWMAC/WI Architectural Woodwork Standards for Premium Grade.
- B. Interior Woodwork Items:
  - 1. Moldings, Bases, Casings, and Miscellaneous Trim: Clear fir; prepare for transparent finish.
  - 2. Window Sills: Clear fir; prepare for transparent finish.

**2.02 LUMBER MATERIALS**

- A. Softwood Lumber: fir species, quarter sawn, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.
- B. Hardwood Lumber: cedar species, quarter sawn, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.

**2.03 FASTENINGS**

- A. Fasteners: Of size and type to suit application.
- B. Concealed Joint Fasteners: Threaded steel.

**2.04 ACCESSORIES**

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- A. Primer: Alkyd primer sealer.
- B. Wood Filler: Solvent base, tinted to match surface finish color.

**2.05 FABRICATION**

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify adequacy of backing and support framing.

**3.02 INSTALLATION**

- A. Install work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards requirements for grade indicated.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

**3.03 PREPARATION FOR SITE FINISHING**

- A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
- B. Site Finishing: See Section 09900.
- C. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

**3.04 TOLERANCES**

- A. Maximum Variation from True Position: 1/16 inch.
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

**END OF SECTION**

**SECTION 07115 - BITUMINOUS DAMPPROOFING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Bituminous dampproofing.

**1.02 REFERENCE STANDARDS**

- A. ASTM D4479/D4479M - Standard Specification for Asphalt Roof Coatings - Asbestos-Free.

**1.03 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide properties of primer, bitumen, and mastics.
- C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

**1.04 FIELD CONDITIONS**

- A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application until dampproofing has cured.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Other Acceptable Manufacturers:
  - 1. Karnak Corporation: [www.karnakcorp.com](http://www.karnakcorp.com).
  - 2. Mar-Flex Systems, Inc: [www.mar-flex.com](http://www.mar-flex.com).
  - 3. W.R. Meadows, Inc: [www.wrmeadows.com](http://www.wrmeadows.com).
  - 4. Sonneborn.

**2.02 DAMPPROOFING PRODUCTS**

- A. Bituminous Dampproofing: Cold-applied, spray-grade; asphalt base, volatile petroleum solvents, and other content, suitable for application by spray, brush, roller, or squeegee; asbestos-free; suitable for application on vertical and horizontal surfaces.
  - 1. Composition: ASTM D4479 Type I, minimum.
  - 2. VOC Content: Not more than permitted by local, State, and federal regulations.
  - 3. Applied Thickness: 1/16 inch, minimum, wet film.
  - 4. Products:
    - a. W.R. Meadows, Inc.; Sealmastic Spray-Mastic: [www.wrmeadows.com](http://www.wrmeadows.com).
    - b. Substitutions: See Section 01600 - Product Requirements.
- B. Primers, Mastics, and Related Materials: Type as recommended by dampproofing manufacturer.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing system.

- C. Verify that items that penetrate surfaces to receive dampproofing are securely installed.

### 3.02 PREPARATION

- A. Protect adjacent surfaces not designated to receive dampproofing.
- B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.
- C. Do not apply dampproofing to surfaces unacceptable to manufacturer.
- D. Apply mastic to seal penetrations, small cracks, or minor honeycomb in substrate.

### 3.03 APPLICATION

- A. Foundation Walls: Apply two coats of dampproofing.
- B. Prime surfaces in accordance with manufacturer's instructions.
- C. Apply bitumen by spray application.
- D. Apply bitumen at a temperature limited by equiviscous temperature (EVT) plus or minus 25 F; do not exceed finish blowing temperature for four hours.
- E. Apply from 2 inches below finish grade elevation down to top of footings.
- F. Seal items projecting through dampproofing surface with mastic. Seal watertight.
- G. Immediately backfill against dampproofing to protect from damage.

**END OF SECTION**



**SECTION 07212 - BOARD AND BATT INSULATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Board insulation and integral vapor retarder at perimeter foundation wall.
- B. Batt insulation and vapor retarder in exterior wall construction.
- C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

**1.02 REFERENCE STANDARDS**

- A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
- B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C.

**1.03 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

**1.04 FIELD CONDITIONS**

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

**PART 2 PRODUCTS**

**2.01 APPLICATIONS**

- A. Insulation at Perimeter of Foundation: Expanded polystyrene board.
- B. Insulation in Wood Framed Walls: Batt insulation with integral vapor retarder.

**2.02 FOAM BOARD INSULATION MATERIALS**

- A. Termite- Resistant Expanded Polystyrene Board Insulation: ASTM C578; with the following characteristics:
  - 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
  - 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
  - 3. Board Size: 48 x 96 inch.
  - 4. Board Thickness: 2 inches.
  - 5. Thermal Resistance: R-value of 10.
  - 6. Board Edges: Square.
  - 7. Manufacturers:

- a. Nisus Corporation; Bora Foam: [www.nisuscorp.com](http://www.nisuscorp.com).

### 2.03 BATT INSULATION MATERIALS

- A. 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. Thermal Resistance: R of 19.
  3. Thickness: 6-1/4 inch.
  4. Facing: Aluminum foil, flame spread 25 rated; one side.
  5. Manufacturers:
    - a. CertainTeed Corporation: [www.certainteed.com](http://www.certainteed.com).
    - b. Johns Manville Corporation: [www.jm.com](http://www.jm.com).
    - c. Owens Corning Corp: [www.owenscorning.com](http://www.owenscorning.com).

### 2.04 ACCESSORIES

- A. Tape: Bright aluminum self-adhering type, mesh reinforced, 2 inch wide.
- B. Adhesive: Type recommended by insulation manufacturer for application.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation and adhesive.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

### 3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

- A. Apply adhesive to back of boards:
  1. Three continuous beads per board length.
- B. Install boards horizontally on foundation perimeter.
  1. Place boards to maximize adhesive contact.
  2. Butt edges and ends tightly to adjacent boards and to protrusions.
- C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

### 3.03 BATT INSTALLATION

- A. Install insulation and vapor retarder in accordance with manufacturer's instructions.
- B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- E. Install with factory applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.
- F. Staple or nail facing flanges in place at maximum 6 inches on center.

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- G. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.
- H. At wood framing, place vapor retarder on warm side of insulation by stapling at 6 inches on center. Lap and seal sheet retarder joints over member face.
- I. Tape seal tears or cuts in vapor retarder.
- J. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.

**3.04 PROTECTION**

- A. Do not permit installed insulation to be damaged prior to its concealment.

**END OF SECTION**

**SECTION 07260 - WEATHER BARRIERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

**1.02 DEFINITIONS**

- A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.
- B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.

**1.03 REFERENCE STANDARDS**

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension.
- B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials.
- E. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing; ICC Evaluation Service, Inc..

**1.04 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on material characteristics.
- C. Shop Drawings: Provide drawings of special joint conditions.
- D. Manufacturer's Installation Instructions: Indicate preparation.

**1.05 FIELD CONDITIONS**

- A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

**PART 2 PRODUCTS**

**2.01 WEATHER BARRIER ASSEMBLIES**

- A. Air Barrier:
  - 1. On outside surface of sheathing of exterior walls use air barrier coating.

**2.02 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)**

- A. Air Barrier Coating: Cold-fluid-applied, vapor permeable, elastomeric waterproofing membrane.
  - 1. Material: Water-based acrylic.

2. Acceptable Substrates: Stated by manufacturer as suitable for installation on visibly damp surfaces and concrete that has hardened but is not fully cured ("green" concrete) without requiring a primer.
3. Dry Film Thickness: 20 mils (0.020 inch), minimum.
4. Air Permeance: 0.004 cubic feet per minute per square foot, maximum, when tested in accordance with ASTM E2178.
5. Water Vapor Permeance: 5 perms, minimum, when tested in accordance with ASTM E96/E96M.
6. Ultraviolet and Weathering Resistance: Approved in writing by manufacturer for minimum of 4 months weather exposure.
7. Elongation: 300 percent, minimum, when tested in accordance with ASTM D412.
8. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 50 or less, when tested in accordance with ASTM E84.
9. Nail Sealability: Comply with requirements of ASTM D1970.
10. VOC Content: 25 g per L or less.
11. Code Acceptance: Comply with applicable requirements of ICC-ES Acceptance Criteria AC 212.
12. Products:
  - a. BASF Corporation; ENERSHIELD-HP: [www.enershield.basf.com](http://www.enershield.basf.com).
  - b. Carlisle Coatings and Waterproofing, Inc.; Barritech-VP: [www.carlisle-ccw.com](http://www.carlisle-ccw.com).
  - c. Epro Services, Inc.; ECOFLEX-PS: [www.eproserv.com](http://www.eproserv.com).
  - d. Mar-flex Waterproofing & Building Products; Air Barrier 1200VP: [www.mar-flex.com](http://www.mar-flex.com).
  - e. Parex USA, Inc.; Parex USA WeatherSeal Trowel-on: [www.parexusa.com](http://www.parexusa.com).
  - f. W.R. Meadows, Inc.; Air-Shield LMP: [www.wrmeadows.com](http://www.wrmeadows.com).

### 2.03 SEALANTS

- A. Primers, Cleaners, and Other Sealant Materials: As recommended by sealant manufacturer, appropriate to application, and compatible with adjacent materials.

### 2.04 ACCESSORIES

- A. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970, except slip resistance requirement is waived if not installed on a roof.
  1. Composition: Any material that meets physical requirements of ASTM D1970 with exceptions indicated.
  2. Thickness: 40 mil (0.040 inch), nominal.
  3. Products:
    - a. DuPont Building Innovations; FlexWrap NF: [www.dupont.com](http://www.dupont.com).
    - b. Carlisle Coatings and Waterproofing, Inc.; CCW-705 TFW: [www.carlisle-ccw.com](http://www.carlisle-ccw.com).
- B. Thinners and Cleaners: As recommended by material manufacturer.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that surfaces and conditions are ready to accept the work of this section.

### 3.02 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

**3.03 INSTALLATION**

- A. Install materials in accordance with manufacturer's instructions.
- B. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- C. Self-Adhesive Sheets:
  - 1. Prepare substrate in manner recommended by sheet manufacturer; fill and tape joints in substrate and between dissimilar materials.
  - 2. Lap sheets shingle-fashion to shed water and seal laps air tight.
  - 3. Once sheets are in place, press firmly into substrate with resilient hand roller; ensure that all laps are firmly adhered with no gaps or fishmouths.
  - 4. Use same material, or other material approved by sheet manufacturer for the purpose, to seal to adjacent construction and as flashing.
  - 5. At wide joints, provide extra flexible membrane allowing joint movement.
- D. Coatings:
  - 1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
  - 2. Where exterior masonry veneer is to be installed, install masonry anchors before installing weather barrier over masonry; seal around anchors air tight.
  - 3. Use flashing to seal to adjacent construction and to bridge joints.
- E. Openings and Penetrations in Exterior Weather Barriers:
  - 1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
  - 2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with at least 4 inches wide; do not seal sill flange.
  - 3. At openings to be filled with non-flanged frames, seal weather barrier to all sides of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
  - 4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
  - 5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
  - 6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

**3.04 FIELD QUALITY CONTROL**

- A. Do not cover installed weather barriers until required inspections have been completed.

**3.05 PROTECTION**

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.

**END OF SECTION**

**SECTION 07411 - PREFORMED METAL ROOF PANELS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Architectural roofing system of preformed aluminum panels.
- B. Thermal roof insulation.
- C. Fastening system.
- D. Factory finishing.
- E. Accessories and miscellaneous components.

**1.02 REFERENCE STANDARDS**

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric].
- C. ASTM D226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- D. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- E. ASTM D4869/D4869M - Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
- H. IAS AC472 - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems.
- I. ICC-ES AC188 - Acceptance Criteria for Roof Underlayments.

**1.03 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Storage and handling requirements and recommendations.
  - 2. Installation methods.
  - 3. Specimen warranty.
- C. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
  - 1. Show work to be field-fabricated or field-assembled.
- D. Selection Samples: For each roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each roofing system specified, submit samples of minimum size 12 inches square, representing actual roofing metal, thickness, profile, color, and texture.

- F. Manufacturer Qualification Statement: Provide documentation showing metal roof panel fabricator is accredited under IAS AC472.
- G. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

#### 1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in the manufacture of roofing systems similar to those required for this project.
  - 1. Not less than 5 years of documented experience
  - 2. Accredited by IAS according to IAS AC472.
- B. Installer Qualifications: Company trained and authorized by roofing system manufacturer.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

#### 1.06 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Finish Warranty: Provide manufacturer's special warranty covering failure of factory-applied exterior finish on metal roof panels and agreeing to repair or replace panels that show evidence of finish degradation, including significant fading, chalking, cracking, or peeling within specified warranty period of 20 year period from date of Substantial Completion.
- C. Waterproofing Warranty: Provide manufacturer's warranty for weathertightness of roofing system, including agreement to repair or replace roofing that fails to keep out water within specified warranty period of 10 years from date of Substantial Completion.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are:
  - 1. Architectural Building Components: [www.archmetalroof.com](http://www.archmetalroof.com).
  - 2. ATAS International, Inc: [www.atas.com](http://www.atas.com).
  - 3. Petersen Aluminum Corporation: [www.pac-clad.com](http://www.pac-clad.com).

#### 2.02 ARCHITECTURAL METAL ROOF PANELS

- A. Architectural Metal Roofing: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.
- B. Metal Panels: Factory-formed panels with factory-applied finish.
  - 1. Aluminum Panels:
    - a. Alloy: Aluminum conforming to ASTM B209/B209M; temper as required for forming.
    - b. Thickness: Minimum 0.028 inch.
  - 2. Profile: Standing seam, with minimum 1.0 inch seam height; concealed fastener system lapped seam in standing seam profile.
  - 3. Texture: Smooth.
  - 4. Length: Full length of roof slope, without lapped horizontal joints.



5. Width: Maximum panel coverage of 16 inches.

### 2.03 ATTACHMENT SYSTEM

- A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

### 2.04 PANEL FINISH

- A. Fluoropolymer Coating System: Manufacturer's standard multi-coat thermocured coating system, including minimum 70 percent fluoropolymer color topcoat with minimum total dry film thickness of 0.9 mil; color and gloss to match sample.

### 2.05 ACCESSORIES AND MISCELLANEOUS ITEMS

- A. Miscellaneous Sheet Metal Items: Provide flashings, trim, moldings, and closure strips of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.
- B. Sealants: As specified in Section 07900.
  1. Exposed sealant must cure to rubber-like consistency.
  2. Concealed sealant must be non-hardening type.
  3. Seam sealant must be factory-applied, non-skinning, non-drying type.
- C. Thermal Insulation: Provide rigid type, faced with white, flexible, non-dusting vapor retarder tested for maximum flame-spread rating of 50, per ASTM E84; for installation using spacer blocks.
  1. Thickness: As indicated.
- D. Underlayment: Self-adhering rubber-modified asphalt sheet complying with ASTM D1970/D1970M; 22 mil total thickness; with strippable release film and woven polypropylene sheet top surface.
  1. Minimum Requirements: Comply with requirements of ICC-ES AC188 for non-self-adhesive sheet.
  2. Self Sealability: Passing nail sealability test specified in ASTM D1970/D1970M.
  3. Low Temperature Flexibility: Passing test specified in ASTM D1970/D1970M.
  4. Water Vapor Permeance: 0.067 perm, when tested in accordance with ASTM E96/E 96M Procedure A (desiccant method).
  5. Performance: Meet or exceed requirements for ASTM D 226, Type II asphalt-saturated organic felt.
  6. Liquid Water Transmission: Passes ASTM D4869/D4869M.
  7. Functional Temperature Range: Minus 70 degrees F to 212 degrees F.
  8. Products:
    - a. System Components Corporation, Inc.; FelTex SA300: [www.systemcomponents.net](http://www.systemcomponents.net).

### 2.06 FABRICATION

- A. Panels: Fabricate panels and accessory items at factory, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.
- B. Joints: Factory-install captive gaskets, sealants, or separator strips at panel joints to provide weathertight seals, eliminate metal-to-metal contact, and minimize noise from panel movements.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### 3.02 PREPARATION

- A. Broom clean wood sheathing prior to installation of roofing system.
- B. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to assure that the completed roof will be free of leaks.
- C. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by roof panel manufacturer.
- D. Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

### 3.03 INSTALLATION

- A. Overall: Install roofing system in accordance with approved shop drawings and panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement.
  - 1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
  - 2. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches for field cutting is absolutely prohibited.
- B. Accessories: Install all components required for a complete roofing assembly, including flashings, trim, moldings, closure strips, rib closures, ridge closures, and similar roof accessory items.
- C. Roof Panels: Install panels in strict accordance with manufacturer's instructions, minimizing transverse joints except at junction with penetrations.
- D. Insulation: Install insulation between roof covering and supporting members to present a neat appearance. Fold, staple, and tape seams unless otherwise approved by Architect.

### 3.04 CLEANING

- A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

### 3.05 PROTECTION

- A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.
- B. Touch-up, repair, or replace damaged roof panels or accessories before date of Substantial Completion.

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**END OF SECTION**

**SECTION 07466 - FIBER CEMENT SIDING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Wood-fiber cement siding.

**1.02 REFERENCE STANDARDS**

- A. ASTM C1186 - Standard Specification for Flat Fiber Cement Sheets.

**1.03 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Manufacturer's requirements for related materials to be installed by others.
  - 2. Preparation instructions and recommendations.
  - 3. Storage and handling requirements and recommendations.
  - 4. Installation methods, including nail patterns.
- C. Test Report: Applicable model code authority evaluation report (e.g. ICC-ES).
- D. Maintenance Instructions: Periodic inspection recommendations and maintenance procedures.
- E. Warranty: Submit copy of manufacturer's warranty, made out in Owner's name, showing that it has been registered with manufacturer.

**1.04 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum 3 years of experience.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Store products under waterproof cover and elevated above grade, on a flat surface.

**PART 2 PRODUCTS**

**2.01 SIDING**

- A. Trim: Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186 Type A Grade II; with machined edges, for nail attachment.
  - 1. Style: Batten and trim as indicated on the drawings.
  - 2. Texture: Smooth.
  - 3. Length: 12 ft, nominal.
  - 4. Thickness: 3/4 inch, nominal.
  - 5. Finish: Unfinished.
  - 6. Warranty: 50 year limited; transferable.
  - 7. Trim Manufacturers:
    - a. CertainTeed Corporation: [www.certainteed.com](http://www.certainteed.com).
    - b. James Hardie Building Products, Inc: [www.jameshardie.com](http://www.jameshardie.com).
    - c. Nichiha USA, Inc: [www.nichiha.com](http://www.nichiha.com).
- B. Panel Siding: Vertically oriented panels made of cement and cellulose fiber formed under high

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pressure with integral surface texture, complying with ASTM C1186 Type A Grade II; with machined edges, for nail attachment.

1. Texture: Smooth.
2. Length: 96 inches, nominal.
3. Width: 48 inches.
4. Thickness: 5/16 inch, nominal.
5. Finish: Unfinished.
6. Warranty: 50 year limited; transferable.
7. Panel Siding Manufacturers:
  - a. CertainTeed Corporation: [www.certainteed.com](http://www.certainteed.com).
  - b. James Hardie Building Products, Inc: [www.jameshardie.com](http://www.jameshardie.com).
  - c. Nichiha USA, Inc: [www.nichiha.com](http://www.nichiha.com).

## 2.02 ACCESSORIES

- A. Trim: Same material and texture as siding.
- B. Fasteners: Galvanized or corrosion resistant; length as required to penetrate minimum 1-1/4 inch.
- C. Joint Sealer: As specified in Section 07900.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Examine substrate and clean and repair as required to eliminate conditions that would be detrimental to proper installation.
- B. Verify that water-resistive barrier has been installed over substrate completely and correctly.
- C. Do not begin until unacceptable conditions have been corrected.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### 3.02 PREPARATION

- A. Install sheet metal flashing:
  1. Above door and window trim and casings.
  2. Above horizontal trim in field of siding.

### 3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions and recommendations.
  1. Read warranty and comply with all terms necessary to maintain warranty coverage.
  2. Install in accordance with conditions stated in model code evaluation report applicable to location of project.
  3. Use trim details indicated on drawings.
  4. Touch up all field cut edges before installing.
  5. Pre-drill nail holes if necessary to prevent breakage.
- B. Over Wood Studs without Sheathing: Install siding over weather-resistive barrier, fastened into studs.
- C. Over Wood and Wood-Composite Sheathing: Fasten siding through sheathing into studs.

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- D. Allow space between both ends of siding panels that butt against trim for thermal movement; seal joint between panel and trim with exterior grade sealant.
- E. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses.
- F. Joints in Vertical Siding: Install Z-flashing in horizontal joints between successive courses of vertical siding.
- G. Do not install siding less than 6 inches from surface of ground nor closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.
- H. After installation, seal all joints except lap joints of lap siding. Seal around all penetrations. Paint all exposed cut edges.
- I. Finish Painting: Specified in Section 09900.

**3.04 PROTECTION**

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

**END OF SECTION**

**SECTION 07620 - SHEET METAL FLASHING AND TRIM**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Fabricated sheet metal items, including flashings and counterflashings.

**1.02 REFERENCE STANDARDS**

- A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
- B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric].
- D. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- E. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association.

**1.03 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- C. Samples: Submit two samples 4 X 4 inch in size illustrating metal finish color.

**1.04 QUALITY ASSURANCE**

- A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.
- B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 5 years of documented experience.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

**PART 2 PRODUCTS**

**2.01 SHEET MATERIALS**

- A. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 0.032 inch thick; plain finish shop pre-coated with fluoropolymer coating.
  - 1. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
  - 2. Color: As selected by Architect from manufacturer's standard colors.

**2.02 ACCESSORIES**

- A. Concealed Fasteners: Same metal as item fastened or other noncorrosive metal as recommended

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by manufacturer.

- B. Primer: Zinc chromate type.
- C. Protective Backing Paint: FS TT-C-494, Bituminous.
- D. Sealant: Type 5 specified in Section 07900.
- E. Plastic Cement: ASTM D4586, Type I.

**2.03 FABRICATION**

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Fabricate cleats of same material as sheet, minimum 1 inches wide, interlocking with sheet.
- C. Form pieces in longest possible lengths.
- D. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- E. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- F. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

**PART 3 EXECUTION**

**3.01 PREPARATION**

- A. Install starter and edge strips, and cleats before starting installation.
- B. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.
- C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

**3.02 INSTALLATION**

- A. General: Comply with manufacturer's written installation instructions and recommendations. Coordinate with installation of roof deck and other substrates to receive work of this section, with vapor retarders, roof insulation, roofing membrane, flashing, and wall construction; as required to ensure that each element of the work performs properly, and that combined elements are waterproof and weather tight. Anchor products included in this section securely to structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures. Install all work true to line and elevation.
- B. Isolation: Where metal surfaces of units are installed in contact with dissimilar metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation as recommended by aluminum producer.
- C. Secure flashings in place using concealed fasteners.
- D. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- E. Seal metal joints watertight.

**3.03 CLEANING**



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- A. Following complete installation, wash sheet metal with non-alkali soap and water solution followed by clear rinse. Touch-up damaged metal coatings.
- B. Protection: Provide protective measures as required to ensure that work of this section will be without damage or deterioration at time of substantial completion.

**END OF SECTION**

**SECTION 07900 - JOINT SEALERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Sealants and joint backing.
- B. The sealing of joints indicated on schedule at the end of this section.
- C. The sealing of joints in interior wet areas, including:
  - 1. Toilet rooms.
  - 2. Shower rooms.
- D. The sealing of other joints indicated on drawings.
- E. Joints of a nature similar to that of joints indicated on the schedule shall be sealed with same sealer, whether indicated on drawings to be sealed or not.

**1.02 REFERENCE STANDARDS**

- A. ASTM C834 - Standard Specification for Latex Sealants.
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- C. ASTM C1193 - Standard Guide for Use of Joint Sealants.

**1.03 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.
- C. Samples: Submit two samples, illustrating sealant colors for selection.
- D. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, and perimeter conditions requiring special attention.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials in original containers or bundles with labels showing manufacturer, product name or designation, color, shelf life, and installation instructions.

**1.05 FIELD CONDITIONS**

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.
- B. Environmental Limitations: Do not install sealers if any of the following conditions exist:
  - 1. Air or substrate temperature exceeds the range recommended by sealer manufacturer or is below 40 degrees F (4.4 degrees C).
  - 2. Substrate is wet, damp, or covered with snow, ice, or frost.
- C. Dimensional Limitations: Do not install sealers if joint dimensions are less than or greater than that recommended by sealer manufacturer; notify the Architect and get sealer manufacturer's recommendations for alternative procedures.

**PART 2 PRODUCTS**

**2.01 MATERIALS - GENERAL**

- A. General: Provide only products which are recommended and approved by their manufacturer for the specific use to which they are put and which comply with all requirements of the contract documents.
  - 1. For each generic product, use only materials from one manufacturer.
  - 2. Provide only materials which are compatible with each other and with joint substrates.
  - 3. Colors of exposed sealers: To match Architect's samples.
- B. Products: The design is based on the product(s) listed for each generic type. Comparable products of the manufacturers listed will be considered for substitution.

**2.02 MANUFACTURERS**

- A. Polyurethane Sealants:
  - 1. Bostik Inc: [www.bostik-us.com](http://www.bostik-us.com).
  - 2. Pecora Corporation: [www.pecora.com](http://www.pecora.com).
  - 3. BASF Construction Chemicals-Building Systems: [www.buildingsystems.basf.com](http://www.buildingsystems.basf.com).
  - 4. Substitutions: See Section 01600 - Product Requirements.
- B. Butyl Sealants:
  - 1. Bostik Inc: [www.bostik-us.com](http://www.bostik-us.com).
  - 2. Pecora Corporation: [www.pecora.com](http://www.pecora.com).
  - 3. Substitutions: See Section 01600 - Product Requirements.
- C. Acrylic Emulsion Latex Sealants:
  - 1. Bostik Inc: [www.bostik-us.com](http://www.bostik-us.com).
  - 2. Pecora Corporation: [www.pecora.com](http://www.pecora.com).
  - 3. BASF Construction Chemicals-Building Systems: [www.buildingsystems.basf.com](http://www.buildingsystems.basf.com).

**2.03 SEALANTS**

- 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:
    - a. Control, expansion, and soft joints in masonry.
    - b. Joints between concrete and other materials.
    - c. Joints between metal frames and other materials.
    - d. Other exterior joints for which no other sealant is indicated.
- B. Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, nondrying, nonskinning, noncuring.
  - 1. Applications: Use for:
    - a. Concealed sealant bead in sheet metal work.
    - b. Concealed sealant bead in siding overlaps.
- C. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.
  - 1. Color: Colors as selected.
  - 2. Applications: Use for:
    - a. Interior wall and ceiling control joints.
    - b. Joints between door and window frames and wall surfaces.
    - c. Joints between countertops and wall surfaces.
    - d. Other interior joints for which no other type of sealant is indicated.

**2.04 ACCESSORIES**

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: Round foam rod compatible with sealant; closed cell polyethylene; oversized 30 to 50 percent larger than joint width.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that substrate surfaces and joint openings are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.

**3.02 PREPARATION**

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean and prime joints in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Protect elements surrounding the work of this section from damage or disfigurement.

**3.03 INSTALLATION**

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer.
- D. Install bond breaker where joint backing is not used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- G. Tool joints concave.

**3.04 CLEANING**

- A. Clean adjacent soiled surfaces.

**3.05 PROTECTION**

- A. Protect sealants until cured.

**END OF SECTION**

**SECTION 08110 - STEEL DOORS AND FRAMES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Steel frames for wood doors.
- B. Thermally insulated steel doors.

**1.02 REFERENCE STANDARDS**

- A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council.
- B. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames.
- C. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- E. ASTM C1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
- F. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames.
- G. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers.

**1.03 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.
- D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
- E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

**1.04 QUALITY ASSURANCE**

- A. Hollow Metal supplier shall be a qualified direct distributor of products to be furnished. In addition, the distributor shall have in their regular employment an AHC/CDC or person of equivalent experience who will be available at reasonable times to consult with the Architect/Contractor and or Owner regarding any matters affecting the total door and frame openings.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Maintain at the project site a copy of all reference standards dealing with installation.

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**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Store in accordance with NAAMM HMMA 840.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Steel Doors and Frames:
  - 1. Assa Abloy Ceco, Curries, or Fleming: [www.assaabloydss.com](http://www.assaabloydss.com).
  - 2. Republic Doors: [www.republicdoor.com](http://www.republicdoor.com).
  - 3. Steelcraft, an Ingersoll Rand brand: [www.steelcraft.com](http://www.steelcraft.com).
  - 4. Substitutions: See Section 01600 - Product Requirements.

**2.02 DOORS AND FRAMES**

- A. Requirements for All Doors and Frames:
  - 1. Accessibility: Comply with ANSI/ICC A117.1.
  - 2. Door Top Closures: Flush with top of faces and edges.
  - 3. Door Edge Profile: Beveled on both edges.
  - 4. Door Texture: Smooth faces.
  - 5. Hardware Preparation: In accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
  - 6. Galvanizing for Units in Wet Areas: All components hot-dipped zinc-iron alloy-coated (galvannealed), manufacturer's standard coating thickness.
  - 7. Finish: Factory primed, for field finishing.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

**2.03 STEEL DOORS**

- A. Exterior Doors:
  - 1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless.
  - 2. Core: Polystyrene foam.
  - 3. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.
  - 4. Insulating Value: U-value of 0.50, when tested in accordance with ASTM C1363.
  - 5. Weatherstripping: Integral, recessed into door edge or frame.

**2.04 STEEL FRAMES**

- A. General:
  - 1. Comply with the requirements of grade specified for corresponding door, except:
    - a. Frames for Wood Doors: Comply with frame requirements specified in ANSI A250.8 for Level 1, 18 gage
  - 2. Finish: Same as for door.
  - 3. Frames Wider than 48 Inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

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- B. Exterior Door Frames: Face welded, seamless with joints filled.
  - 1. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.
  - 2. Weatherstripping: Integral, recessed into door edge or frame.
- C. Interior Door Frames, Non-Fire-Rated: Fully welded type.

**2.05 ACCESSORY MATERIALS**

- A. Astragals for Double Doors: Specified in Section 08710.
  - 1. Exterior Doors: Steel, Z-shaped.
- B. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.
- C. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.

**2.06 FINISH MATERIALS**

- A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.
- B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that project conditions are suitable before beginning installation of frames.
- B. Verify that opening sizes and tolerances are acceptable.

**3.02 PREPARATION**

- A. Coat inside of frames with bituminous coating to a thickness of 1/16 inch.

**3.03 INSTALLATION**

- A. Install in accordance with SDI 105.
- B. Coordinate frame anchor placement with wall construction.
- C. Coordinate installation of hardware.
- D. Coordinate installation of electrical connections to electrical hardware items.
- E. Touch up damaged factory finishes.

**3.04 TOLERANCES**

- A. Clearances Between Door and Frame: As specified in ANSI A250.8.
- B. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

**3.05 ADJUSTING AND CLEAN**

- A. Adjust for smooth and balanced door movement.

**3.06 SCHEDULE - See Drawings**

**END OF SECTION**

**SECTION 08212 - STILE AND RAIL WOOD DOORS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Wood doors, stile and rail design.

**1.02 REFERENCE STANDARDS**

- A. AWI (QCP) - Quality Certification Program, [www.awiqcp.org](http://www.awiqcp.org).

**1.03 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate stile and rail core materials and construction; veneer species, type and characteristics.
- C. Specimen warranty.
- D. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, factory finishing criteria.
- E. Samples: Submit two samples of door veneer, 12 x 12 inch in size illustrating wood grain, stain color, and sheen.
- F. Manufacturer's Installation Instructions: Indicate special installation instructions.
- G. Warranty, executed in Owner's name.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years of documented experience.
  - 1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
- B. Quality Certification: Provide AWI Quality Certification Program inspection report and quality certification of completed work.
  - 1. Provide labels or certificates indicating that the work complies with requirements of AWS Grade or Grades specified.
  - 2. Prior to delivery to the site provide shop drawings with certification labels.
  - 3. Provide labels on each product when required by certification program.
  - 4. Upon completion of installation provide certificate certifying that the installation and products meet the specified requirements.
  - 5. Arrange and pay for inspections required for certification.
  - 6. Replace, repair, or rework all work for which certification is refused.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Package, deliver, and store doors in accordance with quality standard specified.
- B. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.



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1.06 WARRANTY

- A. See Section 01780 - Closeout Submittals for additional warranty requirements.
- B. Interior Doors: Provide manufacturer's warranty for the life of the installation.
- C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Stile and Rail Wood Doors:
  - 1. Eggers Industries: [www.eggersindustries.com](http://www.eggersindustries.com).
  - 2. Maiman Company: [www.maiman.com](http://www.maiman.com).
  - 3. Marshfield DoorSystems, Inc: [www.marshfielddoors.com](http://www.marshfielddoors.com).
  - 4. Substitutions: See Section 01600 - Product Requirements.

2.02 DOORS

- A. Quality Level: Premium Grade, in accordance with AWI/AWMAC/WI Architectural Woodwork Standards.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; solid lumber construction; doweled and glued joints.

2.03 DOOR FACINGS

- A. Interior Doors: Wood veneer, maple species, plain sliced, with slip matched grain, for transparent finish.
- B. Adhesive: Type I - waterproof.

2.04 DOOR CONSTRUCTION

- A. Vertical Exposed Edge of Stiles: Of same species as veneer facing.
- B. Fit door edge trim to edge of stiles after applying veneer facing.
- C. Bond edge banding to cores.
- D. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.
- E. Factory fit doors for frame opening dimensions identified on shop drawings.

2.05 FACTORY FINISHING

- A. Finish work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards, Section 5 - Finishing for Grade specified and as follows:
  - 1. Transparent:
    - a. System - 1, Lacquer, Nitrocellulose.
    - b. Sheen: Satin.
- B. Factory finish doors in accordance with approved sample.

PART 3 EXECUTION

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**3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out of tolerance for size or alignment.

**3.02 INSTALLATION**

- A. Install doors in accordance with manufacturer's instructions and AWI/AWMAC Quality Standards requirements.
- B. Trim door width by cutting equally on both jamb edges.
- C. Trim door height by cutting bottom edges to a maximum of 3/4 inch.
- D. Machine cut for hardware.
- E. Coordinate installation of doors with installation of frames and hardware.

**3.03 TOLERANCES**

- A. Conform to specified quality standard for fit, clearance, and joinery tolerances.
- B. Maximum Width Distortion (Cup): 1/8 inch measured with straight edge or taut string, edge to edge, over an imaginary 36 x 84 inch surface area.

**3.04 ADJUSTING**

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

**3.05 SCHEDULE - See Drawings**

**END OF SECTION**

**SECTION 08310 - ACCESS DOORS AND PANELS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Ceiling access door and frame units.

**1.02 REFERENCE STANDARDS**

- A. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc..

**1.03 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
- C. Manufacturer's Installation Instructions: Indicate installation requirements.
- D. Project Record Documents: Record actual locations of all access units.

**PART 2 PRODUCTS**

**2.01 ACCESS DOOR AND PANEL APPLICATIONS**

- A. Ceilings, Unless Otherwise Indicated: Same type as for walls.
  - 1. Material: Steel.
  - 2. In shower rooms or wet areas: Material: Steel, hot-dipped zinc or zinc-aluminum-alloy coated.
  - 3. Size in Other Ceilings: 18 X 18 inches, unless otherwise required to access or remove device.
  - 4. Standard duty, hinged door.
  - 5. Tool-operated spring or cam lock; no handle.

**2.02 WALL AND CEILING UNITS**

- A. Manufacturers:
  - 1. Acudor Products Inc: [www.acudor.com](http://www.acudor.com).
  - 2. Cendrex, Inc: [www.cendrex.com](http://www.cendrex.com).
  - 3. Karp Associates, Inc: [www.karpinc.com](http://www.karpinc.com).
  - 4. Milcor by Commercial Products Group of Hart & Cooley, Inc: [www.milcorinc.com](http://www.milcorinc.com).
- B. Access Doors: Factory fabricated door and frame units, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies units are to be installed in.
  - 1. Style: Exposed frame with door surface flush with frame surface.
    - a. In Gypsum Board: Use drywall bead type frame.
  - 2. Door Style: Single thickness with rolled or turned in edges.
  - 3. Frames: 16 gage, 0.0598 inch, minimum.
  - 4. Single Thickness Steel Door Panels: 0.070 inch, minimum.
  - 5. Frames, flush installation: 0.058 inch steel.
  - 6. Steel Finish: Primed.
  - 7. Primed Finish: Polyester powder coat; manufacturer's standard color.
  - 8. Size(s): As required.

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9. Hardware:
  - a. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
  - b. Latch/Lock: Screw driver slot for quarter turn cam latch.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that rough openings are correctly sized and located.

**3.02 INSTALLATION**

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings. Secure rigidly in place.
- C. Position units to provide convenient access to the concealed work requiring access.

**END OF SECTION**

**SECTION 08550 - WOOD WINDOWS AND ENTRANCES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Factory fabricated unfinished and metal clad wood windows and entrances with fixed sash.
- B. Operating hardware.

**1.02 REFERENCE STANDARDS**

- A. AAMA/WDMA/CSA 101/I.S.2/A440 - Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors; American Architectural Manufacturers Association.
- B. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers.
- C. 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.
- D. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- E. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- F. WDMA I.S.4 - Water-Repellent Preservative Non-Pressure Treatment for Millwork; National Wood Window and Door Association.

**1.03 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Show component dimensions, anchorage and fasteners, glass, and internal drainage details.
- C. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work, and installation requirements.
- D. Manufacturer's Certificate: Certify that products furnished meet or exceed specified requirements.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer and Installer Qualifications: Company specializing in manufacturing residential wood windows with minimum three years of documented experience.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Protect factory finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

**1.06 WARRANTY**

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

- C. Provide five year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same.
- D. Warranty: Include coverage for:
  - 1. Degradation of color finish.
  - 2. Delamination or separation of finish cladding from window member.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. Andersen Windows Corp: [www.andersenwindows.com](http://www.andersenwindows.com).
  - 2. Pella Corp: [www.pella.com](http://www.pella.com).
  - 3. Weather Shield Manufacturing, Inc: [www.weathershield.com](http://www.weathershield.com).
  - 4. Substitutions: See Section 01600 - Product Requirements.

### 2.02 WOOD WINDOWS AND ENTRANCES

- A. Windows: Wood frame and sash, factory fabricated and assembled.
  - 1. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 R15.
  - 2. Exterior Finish: Metal clad, painted.
  - 3. Interior Finish: Unfinished, for transparent finish.
  - 4. Color(s): As selected by Architect from manufacturer's standard range.
  - 5. Configuration: As indicated on drawings.
  - 6. Factory glazed; dry glazing method.
  - 7. Frame and Sash Members: Mortise and tenon joints. Glue and steel pin joints to hairline fit, weather tight.
  - 8. Transparent Finish: Finger joints not permitted in units intended for transparent finish.
  - 9. Weather Stop Flange: Continuous at perimeter of unit.
  - 10. Clearances and Shim Spacing: Minimum required for installation and dynamic movement of perimeter seal.
  - 11. Fasteners: Concealed from view.
  - 12. Internal Drainage of Glazing Spaces to Exterior: Weep holes.
- B. Performance Requirements:
  - 1. Design and size windows to withstand dead loads and positive and negative wind loads acting normal to plane of wall calculated in accordance with ASCE 7 , when tested in accordance with ASTM E330, using test loads equal to 1.5 times the design wind loads and 10 second duration of maximum load.
  - 2. Deflection: Limit member deflection to flexure limit of glass with full recovery of glazing materials.
  - 3. Design windows to accommodate, without damage to components or deterioration of seals, movement between window and perimeter framing and deflection of lintel.
  - 4. Air Infiltration: Limit air leakage through assembly to 0.3 cu ft/min/sq ft of wall area, measured at a reference differential pressure across assembly of 1.57 psf as measured in accordance with ASTM E283.
  - 5. Water Leakage: None, when measured in accordance with ASTM E331.
  - 6. Air and Vapor Seal: Maintain continuous air and vapor barrier throughout assembly, primarily in line with inside pane of glass and inner sheet of infill panel and heel bead of glazing compound.

### 2.03 COMPONENTS

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- A. Frames: 2 inch wide x 4.5 inch deep profile; flush formed metal glass stops to match cladding of screw fastened type, sloped for wash.
- B. Entrance Hardware, refer to hardware specifications.
- C. Fasteners: Stainless steel.
- D. Accessories: Provide all related flashings, and anchorage and attachment devices.

**2.04 MATERIALS**

- A. Wood: Fir, clear preservative treated in accordance with WDMA I.S.4 using treatment type suitable for transparent or opaque finish.
- B. Metal Cladding: Formed aluminum, factory finished, factory fit to profile of wood members.
- C. Glass and Glazing Materials:
  - 1. Double pane insulated glass with low-e coating on no 2 surface.
  - 2. Visible Light Transmittance: 66 percent minimum.
  - 3. Winter Nighttime U-Factor: 0.29 maximum.
  - 4. Summer Daytime U-Factor: 0.27 maximum.
  - 5. Solar Heat Gain Coefficient: 0.27 maximum.
  - 6. Outdoor Visible Light Reflectance: 11 percent maximum.
  - 7. Light to Solar Gain (LSG): 2.43 minimum.

**2.05 HARDWARE**

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

**3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- D. Install operating hardware.
- E. Install glass and infill panels in accordance with Section 08800.

**3.03 TOLERANCES**

- A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.

**3.04 ADJUSTING**

- A. Adjust hardware for smooth operation and secure weathertight closure.

**3.05 CLEANING**

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- A. Remove protective material from factory finished surfaces.
- B. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.

**END OF SECTION**



**SECTION 09260 - GYPSUM BOARD ASSEMBLIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Acoustic insulation.
- B. Gypsum wallboard.
- C. Joint treatment and accessories.

**1.02 REFERENCE STANDARDS**

- A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- C. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
- D. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- E. ASTM C1396/C1396M - Standard Specification for Gypsum Board.

**1.03 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on gypsum board, accessories, joint finishing system, accessories, and joint finishing system.

**1.04 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing gypsum board application and finishing, with minimum 5 years of documented experience.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.
- C. Handle gypsum boards to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

**PART 2 PRODUCTS**

**2.01 GYPSUM BOARD ASSEMBLIES**

**2.02 BOARD MATERIALS**

- A. Manufacturers - Gypsum-Based Board:
  - 1. American Gypsum: [www.americangypsum.com](http://www.americangypsum.com).
  - 2. CertainTeed Corporation: [www.certainteed.com](http://www.certainteed.com).

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3. Georgia-Pacific Gypsum: [www.gpgypsum.com](http://www.gpgypsum.com).
4. Lafarge North America Inc: [www.lafargenorthamerica.com](http://www.lafargenorthamerica.com).
5. National Gypsum Company: [www.nationalgypsum.com](http://www.nationalgypsum.com).
6. PABCO Gypsum: [www.pabco gypsum.com](http://www.pabco gypsum.com).
7. Temple-Inland Inc: [www.templeinland.com](http://www.templeinland.com).
8. USG Corporation: [www.usg.com](http://www.usg.com).

- B. 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:
    - a. Vertical Surfaces: 5/8 inch.
    - b. Ceilings: 5/8 inch.

### 2.03 ACCESSORIES

- A. Acoustic Insulation: ASTM C 665; preformed glass fiber, friction fit type, unfaced. Thickness: 2 inches. Thickness as indicated.
- B. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless otherwise indicated.
1. Types: As detailed or required for finished appearance.
  2. Special Shapes: In addition to conventional cornerbead and control joints, provide U-bead at exposed panel edges.
  3. Manufacturers - Finishing Accessories:
    - a. Same manufacturer as framing materials.
- C. Joint Materials: ASTM C475 and as recommended by gypsum board manufacturer for project conditions.
1. Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
  2. Ready-mixed vinyl-based joint compound.
- D. High Build Drywall Surfer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
- E. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.
- B. Examine substrates to which gypsum board construction attaches or abuts, preset hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of gypsum board construction. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.02 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

### 3.03 BOARD INSTALLATION

- A. Comply with ASTM C 840 and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
  - 1. Exception: Tapered edges to receive joint treatment at right angles to framing.
- C. Double-Layer Non-Rated: Use gypsum board for first layer, placed perpendicular to framing or furring members, with ends and edges occurring over firm bearing. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.
- D. Moisture Protection: Treat cut edges and holes in moisture resistant gypsum board with sealant.

#### 3.04 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as follows:
  - 1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

#### 3.05 JOINT TREATMENT

- A. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.
- B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
  - 1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
  - 2. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
  - 3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
- C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
  - 1. Feather coats of joint compound so that camber is maximum 1/32 inch.
  - 2. Taping, filling, and sanding is not required at surfaces behind adhesive applied ceramic tile and fixed cabinetry.
  - 3. Taping, filling and sanding is not required at base layer of double layer applications.
- D. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

#### 3.06 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

**END OF SECTION**

**SECTION 09300 - TILE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Tile for floor applications.
- B. Tile for wall applications.
- C. Cementitious backer board as tile substrate.
- D. Stone thresholds.
- E. Non-ceramic trim.

1.02 REFERENCE STANDARDS

- A. ANSI A108 Series/A118 Series/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium).
- B. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar.
- C. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.
- D. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex Portland Cement Mortar.
- E. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive.
- F. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
- G. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy.
- H. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout.
- I. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout.
- J. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework.
- K. ANSI A108.11 - American National Standard for Interior Installation of Cementitious Backer Units.
- L. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone.
- M. ANSI A118.1 - American National Standard Specifications for Dry-Set Portland Cement Mortar.
- N. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive.

- O. ANSI A118.4 - American National Standard Specifications for Latex-Portland Cement Mortar.
- P. ANSI A118.5 - American National Standard Specifications for Chemical Resistant Furan Mortars and Grouts for Tile Installation.
- Q. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation.
- R. ANSI A118.7 - American National Standard Specifications for Polymer Modified Cement Grouts for Tile Installation.
- S. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units.
- T. ANSI A137.1 - American National Standard Specifications for Ceramic Tile.
- U. TCNA (HB) - Handbook for Ceramic Tile Installation.

#### 1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01600 - Product Requirements, for additional provisions.
  - 2. Extra Tile: 10 square feet of each size, color, and surface finish combination.

#### 1.04 QUALITY ASSURANCE

- A. Maintain one copy of The Tile Council of North America Handbook and ANSI A108 Series/A118 Series on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum 5 years of documented experience.
- C. Installer Qualifications: Company specializing in performing tile installation, with minimum of 5 years of documented experience.

#### 1.05 MOCK-UP

- A. See Section 01400 - Quality Requirements, for general requirements for mock-up.
- B. Construct tile mock-up where indicated on the drawings, incorporating all components specified for the location.
- C. Minimum size of mock-up is indicated on the drawings.
- D. Approved mock-up may remain as part of the Work.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.07 FIELD CONDITIONS

- A. Do not install adhesives in an unventilated environment.
- B. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

PART 2 PRODUCTS

2.01 TILE

- A. Manufacturers: All products by the same manufacturer.
  - 1. American Olean: [www.americanolean.com](http://www.americanolean.com).
  - 2. Dal-Tile Corporation: [www.daltile.com](http://www.daltile.com).
  - 3. Summitville Tiles, Inc: [www.summitville.com](http://www.summitville.com).
- B. Ceramic Mosaic Floor Tile: ANSI A137.1, and as follows:
  - 1. Keystones, All Price Groups, Field Tile manufactured by Dal-Tile or approved equivalent product.
  - 2. Moisture Absorption: 0 to 0.5 percent.
  - 3. Size and Shape: 2 inch square.
  - 4. Edges: Square.
  - 5. Surface Finish: Unglazed.
  - 6. Colors: To be selected by Architect from manufacturer's full range.
- C. Glazed Wall Tile: ANSI A137.1, and as follows:
  - 1. Modern Dimensions manufactured by Dal-Tile or approved equivalent product.
  - 2. Moisture Absorption: Over 7.0 but less than 20.0 percent.
  - 3. Size and Shape: 4.25" x 8.5".
  - 4. Edges: Cushioned.
  - 5. Surface Finish: Matte glaze.
  - 6. Colors: To be selected by Architect from manufacturer's full range.

2.02 TRIM AND ACCESSORIES

- A. Non-Ceramic Trim: Brushed stainless steel, style and dimensions to suit application, for setting using tile mortar or adhesive.
  - 1. Applications: Use in the following locations:
    - a. Open edges of wall tile.
  - 2. Manufacturer:
    - a. Schluter-Systems: [www.schluter.com](http://www.schluter.com).
    - b. Genesis APS International: [www.genesis-aps.com](http://www.genesis-aps.com).
- B. Thresholds: Marble, white, honed finish; 2 inches wide by full width of wall or frame opening; 1/2 inch thick; beveled one long edge with radiused corners on top side; without holes, cracks, or open seams.
  - 1. Applications: Provide at the following locations:
    - a. At doorways where tile terminates.
    - b. At open edges of floor tile where adjacent finish is a different height.

2.03 SETTING MATERIALS

2.04 ADHESIVE MATERIALS

- A. Manufacturers

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1. Bonsal American, Inc: [www.prospec.com](http://www.prospec.com)
2. Bostik Inc: [www.bostik-us.com](http://www.bostik-us.com).
3. Custom Building Products: [www.custombuildingproducts.com](http://www.custombuildingproducts.com).
4. LATICRETE International, Inc: [www.laticrete.com](http://www.laticrete.com).
5. Mapei Corporation: [www.mapei.com](http://www.mapei.com).
6. Substitutions: See Section 01600 - Product Requirements.

B. Tile Setting Adhesive: Elastomeric, waterproof, liquid applied.

#### 2.05 MORTAR MATERIALS

A. Manufacturers:

1. Bonsal American, Inc: [www.prospec.com](http://www.prospec.com)
2. Bostik Inc: [www.bostik-us.com](http://www.bostik-us.com).
3. Custom Building Products: [www.custombuildingproducts.com](http://www.custombuildingproducts.com).
4. LATICRETE International, Inc: [www.laticrete.com](http://www.laticrete.com).
5. Custom Building Products: [www.custombuildingproducts.com](http://www.custombuildingproducts.com).
6. Substitutions: See Section 01600 - Product Requirements.

B. Mortar Bed Materials: Portland cement, sand, latex additive and water.

C. Mortar Bond Coat Materials:

1. Dry-Set Portland Cement type: ANSI A118.1.
2. Latex-Portland Cement type: ANSI A118.4.
3. Epoxy: ANSI A118.3.
4. Furan: ANSI A118.5.

#### 2.06 GROUT MATERIALS

A. Manufacturers:

1. Bonsal American, Inc: [www.prospec.com](http://www.prospec.com)
2. Bostik Inc: [www.bostik-us.com](http://www.bostik-us.com).
3. Custom Building Products: [www.custombuildingproducts.com](http://www.custombuildingproducts.com).
4. LATICRETE International, Inc: [www.laticrete.com](http://www.laticrete.com).
5. Custom Building Products: [www.custombuildingproducts.com](http://www.custombuildingproducts.com).
6. Substitutions: See Section 01600 - Product Requirements.

B. Grout: Any type specified in ANSI A118.6 or A118.7.

1. Colors: To be selected by Architect from manufacturer's standard range.

#### 2.07 ACCESSORY MATERIALS

A. Cleavage Membrane: No. 15 asphalt saturated felt.

B. Waterproofing Membrane at Floors: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.

1. Type: Fluid-applied.
2. Material: Fluid-applied water-based SBS rubber membrane, 40 mils thick, minimum, with polyester fabric reinforcing at edges, corners, joints, and cracks.
3. Manufacturers:
  - a. AVM Industries, Inc: [www.avmindustries.com](http://www.avmindustries.com).

C. Membrane at Walls: 4 mil thick polyethylene film.

D. Reinforcing Mesh: 2 x 2 inch size weave of 16/16 wire size; welded fabric, galvanized.

- E. Cementitious Backer Board: ANSI A118.9; High density, cementitious, glass fiber reinforced, 1/2 inch thick; 2 inch wide coated glass fiber tape for joints and corners.
- F. Mesh Tape: 2-inch wide self-adhesive fiberglass mesh tape.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.
- D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

#### 3.02 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
- D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.
- E. Install cementitious backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of dry-set mortar to a feather edge.
- F. Install tile backer board in strict accordance with manufacturer's instructions, using galvanized roofing nails or corrosion-resistant bugle head drywall screws. Bed fiberglass self-adhesive tape at all joints and corners with material used to set tiles.
- G. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

#### 3.03 INSTALLATION - GENERAL

- A. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108.1 through A108.13, manufacturer's instructions, and The Tile Council of North America Handbook recommendations.
- B. Request tile pattern. Do not interrupt tile pattern through openings.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor, base, and wall joints.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make



joints watertight, without voids, cracks, excess mortar, or excess grout.

- E. Form internal angles square and external angles square.
- F. Install non-ceramic trim in accordance with manufacturer's instructions.
- G. Install thresholds where indicated or at transitions between floor materials.
- H. Sound tile after setting. Replace hollow sounding units.
- I. Keep expansion joints free of adhesive or grout. Apply sealant to joints.
- J. Allow tile to set for a minimum of hours prior to grouting.
- K. Grout tile joints. Use standard grout unless otherwise indicated.
- L. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.
- M. Slope floor to drains at showers or where indicated on the floor plans for positive drainage and to eliminate ponding or puddling of water. Slope at 1/8"/ft maximum.

#### 3.04 INSTALLATION - FLOORS - MORTAR BED METHODS

- A. At elevated slabs and at showers, install waterproofing membrane and waterproof grout type, install in accordance with The Tile Council of North America Handbook Method F121.
- B. Waterproofing Membrane: Install as specified in ANSI A108.13.
- C. Mortar Bed Thickness: 1-1/4 inch, unless otherwise indicated.

#### 3.05 INSTALLATION - WALL TILE

- A. Over cementitious backer units on studs, install in accordance with The Tile Council of North America Handbook Method W244, using membrane at toilet rooms and locker rooms.

#### 3.06 CLEANING

- A. Clean tile and grout surfaces.

#### 3.07 PROTECTION

- A. Do not permit traffic over finished floor surface for 4 days after installation.

**END OF SECTION**

**SECTION 09900 - PAINTS AND COATINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of paints, stains, varnishes, and other coatings.
- C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
- D. Do Not Paint or Finish the Following Items:
  - 1. Items fully factory-finished unless specifically so 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. Stainless steel, anodized aluminum, bronze, terne, and lead items.
  - 6. Marble, granite, slate, and other natural stones.
  - 7. Floors, unless specifically so indicated.
  - 8. Ceramic and other tiles.
  - 9. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
  - 10. Glass.
  - 11. Acoustical materials, unless specifically so indicated.
  - 12. Concealed pipes, ducts, and conduits.

**1.02 REFERENCE STANDARDS**

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.
- B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials.

**1.03 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of all 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.
- C. Samples: Submit three paper "drop" 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. Where sheen is not specified, submit each color in each sheen available.
  - 3. Paint color submittals will not be considered until color submittals for major materials not

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to be painted, such as siding, factory finished metals, wood cabinets, and wood doors, have been approved.

- D. Samples: Submit two paper chip samples, 2 x 3 inch in size illustrating range of colors and textures available for each surface finishing product scheduled.
- E. Manufacturer's Instructions: Indicate special surface preparation procedures.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01600 - Product Requirements, for additional provisions.
  - 2. Extra Paint and Coatings: 1 gallon of each color; store where directed.
  - 3. Label each container with color in addition to the manufacturer's label.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

**1.05 MOCK-UP**

- A. See Section 01400 - Quality Requirements, for general requirements for mock-up.
- B. Provide door and frame assembly illustrating paint coating color, texture, and finish.
- C. Field Samples: On interior wall surfaces duplicate finishes of prepared samples. Provide full-coat finish samples on at least 200 sq. ft. of surface until required sheen, color and texture are obtained; simulate finish lighting conditions for review of in- place work.
- D. Locate where directed.
- E. Mock-up may remain as part of the work.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. 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.
- C. 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.

**1.07 FIELD CONDITIONS**

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- E. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior,

unless required otherwise by manufacturer's instructions.

- F. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.
- B. Provide all paint and coating products from the same manufacturer to the greatest extent possible.
1. In the event that a single manufacturer cannot provide all specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
  2. Substitution of MPI-approved products by a different manufacturer is preferred over substitution of unapproved products by the same manufacturer.
  3. Substitution of a paint different system using MPI-approved products by the same manufacturer will be considered.
- C. Paints:
1. Con-Lux Coating, Inc. (Con-Lux).
  2. Benjamin Moore & Co: [www.benjaminmoore.com](http://www.benjaminmoore.com).
  3. PPG Architectural Finishes, Inc: [www.ppgaf.com](http://www.ppgaf.com).
  4. Sherwin-Williams Company: [www.sherwin-williams.com](http://www.sherwin-williams.com).
- D. Transparent Finishes:
1. Sherwin-Williams Company: [www.sherwin-williams.com](http://www.sherwin-williams.com).
- E. Stains:
1. Sherwin-Williams Company: [www.sherwin-williams.com](http://www.sherwin-williams.com).
- F. Primer Sealers: Same manufacturer as top coats.
- G. Substitutions: See Section 01600 - Product Requirements.

### **2.02 PAINTS AND COATINGS - GENERAL**

- A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
1. Provide paints and coatings 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 coating material in quantity required to complete entire project's work from a single production run.
  4. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
- B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.
- C. Volatile Organic Compound (VOC) Content:
1. Provide coatings that comply with the most stringent requirements specified in the

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following:

- a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
  2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- D. Flammability: Comply with applicable code for surface burning characteristics.
- E. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- F. Colors: As indicated on drawings
1. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
  2. Extend colors to surface edges; colors may change at any edge as directed by Architect.

**2.03 PAINT SYSTEMS - EXTERIOR**

- A. All Exterior Concrete and Masonry Surfaces Indicated to be Painted, Unless Otherwise Indicated: Including cement board.
1. Preparation as specified by manufacturer.
  2. Two top coats and one coat primer recommended by manufacturer.
  3. Top Coat(s): MPI Exterior High Build Latex (MPI #40).
  4. Satin: MPI gloss level 4; use this sheen at all locations.
- B. Wood, Opaque, Latex, 3 Coat:
1. One coat of latex primer sealer.
  2. Semi-gloss: Two coats of latex enamel.
- C. Paint MgE-OP-3L - Galvanized Metals, Latex, 3 Coat:
1. One coat galvanize primer.
  2. Semi-gloss: Two coats of latex enamel.

**2.04 PAINT SYSTEMS - INTERIOR**

- A. All Interior Surfaces Indicated to be Painted, Unless Otherwise Indicated: Including gypsum board, uncoated steel, shop primed steel, and galvanized steel.
1. Two top coats and one coat primer.
  2. Top Coat(s): MPI Institutional Low Odor/VOC Interior Latex; MPI #143-148.
  3. Satin: MPI gloss level 4; use this sheen for items subject to frequent touching by occupants, including door frames and railings.
  4. Top Coat Product(s):
    - a. Sherwin-Williams Harmony Low Odor Interior Latex.
  5. Primer(s): As recommended by manufacturer of top coats.
- B. Medium Duty Vertical/Overhead: Including gypsum board.
1. Two top coats and one coat primer.
  2. Top Coat(s): MPI Institutional Low Odor/VOC Interior Latex; MPI #143-148.
  3. Flat: MPI gloss level 1; use this sheen for ceilings and other overhead surfaces.
  4. Top Coat Product(s):
    - a. Sherwin-Williams Harmony Low Odor Interior Latex.
  5. Primer(s): As recommended by manufacturer of top coats.

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- C. Transparent Finish on Wood, Unless Otherwise Indicated:
  - 1. Stain: MPI Semi-Transparent Stain for Wood; MPI #90.
  - 2. Top Coat(s): MPI Clear Water Based Varnish; MPI #128, 129, 130.
  - 3. Satin: MPI gloss level 4; use this sheen at all locations.
  - 4. Top Coat Product(s):
    - a. Sherwin-Williams Wood Classics Waterborne Polyurethane Varnish.
  - 5. Stain Product(s):
    - a. Sherwin-Williams Wood Classics 250 VOC Oil Stain.

**2.05 ACCESSORY MATERIALS**

- A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Do not begin application of coatings until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. Test shop-applied primer for compatibility with subsequent cover materials.
- E. 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. Gypsum Wallboard: 12 percent.
  - 2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
  - 3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
  - 4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.

**3.02 PREPARATION**

- A. Clean surfaces thoroughly and correct defects prior to coating application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding

metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

- G. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- H. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- I. Corroded Steel and Iron Surfaces to be Painted: Prepare using at least SSPC-PC 2 (hand tool cleaning) or SSPC-SP 3 (power tool cleaning) followed by SSPC-SP 1 (solvent cleaning).
- J. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.
- K. Shop-Primed Steel Surfaces to be Finish Painted: 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.
- L. Interior Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.
- M. 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 caulking compound after prime coat has been applied. Back prime concealed surfaces before installation.
- N. Glue-Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease and dirt.
- O. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

### 3.03 APPLICATION

- A. 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.
- B. Apply products in accordance with manufacturer's instructions. Use applicators and techniques best suited for substrate type of material being applied and to produce a uniform appearance. Paint film must be free of runs, skips, sags and other defects.
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance.
- E. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- F. Sand wood and metal surfaces lightly between coats to achieve required finish.
- G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- H. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain

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before set. Wipe excess from surface.

- I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

**3.04 CLEANING**

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

**3.05 PROTECTION**

- A. Protect finished coatings until completion of project.
- B. Touch-up damaged coatings after Substantial Completion.

**END OF SECTION**



**SECTION 10523 - FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

**1.02 REFERENCE STANDARDS**

- A. NFPA 10 - Standard for Portable Fire Extinguishers.
- B. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc..

**1.03 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate cabinet physical dimensions.
- C. Product Data: Provide extinguisher operational features, color and finish, and anchorage details.
- D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

**1.04 FIELD CONDITIONS**

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Fire Extinguisher Cabinets and Accessories:
  - 1. JL Industries, Inc: [www.jlindustries.com](http://www.jlindustries.com).
  - 2. Larsen's Manufacturing Co: [www.larsensmfg.com](http://www.larsensmfg.com).
  - 3. Potter-Roemer: [www.potterroemer.com](http://www.potterroemer.com).
  - 4. Johnson-Lee, Division of W.F. Lee Corp..
  - 5. Watrous, Inc.
  - 6. Substitutions: See Section 01600 - Product Requirements.

**2.02 FIRE EXTINGUISHERS**

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
  - 1. Provide extinguishers labeled by UL for the purpose specified and indicated.
- B. Dry Chemical Type Fire Extinguishers: Stainless steel tank, with pressure gage.
  - 1. Class 2A-10 B:C.
  - 2. Size 10.

3. Finish: Baked enamel, red color.

#### 2.03 FIRE EXTINGUISHER CABINETS

- A. Construction: Manufacturer's standard enameled steel box, with trim, frame, door and hardware to suit cabinet type, trim style, and door style indicated. Weld all joints and grind smooth. Miter and weld perimeter door frames.
- B. Cabinet Configuration: Recessed type.
  1. Sized to accommodate extinguisher and accessories.
  2. Form cabinet enclosure with right angle inside corners and seams. Form perimeter trim and door stiles.
- C. Door: 0.036 inch thick, reinforced for flatness and rigidity; latch. Hinge doors for 180 degree opening with continuous piano hinge. Provide roller type catch.
- D. Door Style: Vertical Duo.
- E. Door Glazing: Glass, clear, 1/8 inch thick tempered. Set in resilient channel gasket glazing.
- F. Cabinet Mounting Hardware: Appropriate to cabinet. Pre-drill for anchors.
- G. Weld, fill, and grind components smooth.
- H. Finish of Cabinet Exterior Trim and Door: Baked enamel, color as selected.
- I. Finish of Cabinet Interior: White enamel.

#### 2.04 ACCESSORIES

- A. Graphic Identification: FIRE EXTINGUISHER.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

#### 3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings, 40 inches from finished floor to inside bottom of cabinet.
- C. Secure rigidly in place.
- D. Place extinguishers and accessories in cabinets.

#### 3.03 IDENTIFICATION

- A. Identify existence of fire extinguisher in cabinet with lettering spelling FIRE EXTINGUISHER applied to door. Provide lettering to comply with requirements indicated for letter style, color, size, spacing and location or, if not otherwise indicated, as selected by Architect from manufacturer's standard arrangements.

**END OF SECTION**

**SECTION 10800 - TOILET, BATH, AND LAUNDRY ACCESSORIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Accessories for toilet rooms, showers, and utility rooms.
- B. Grab bars.
- C. Note: Some items are Owner Furnished and Owner Installed. Refer to the plans for locations.

**1.02 REFERENCE STANDARDS**

- A. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; (ADA Standards for Accessible Design).
- B. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- D. ASTM C1036 - Standard Specification for Flat Glass.
- E. GSA CID A-A-3002 - Mirrors, Glass; U.S. General Services Administration.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

**1.04 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Products listed are made by Bobrick: [www.bobrick.com](http://www.bobrick.com).
- B. Other Acceptable Manufacturers:
  - 1. American Specialties, Inc: [www.americanspecialties.com](http://www.americanspecialties.com).
  - 2. Bradley Corporation: [www.bradleycorp.com](http://www.bradleycorp.com).
- C. All items of each type to be made by the same manufacturer.

**2.02 MATERIALS**

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
  - 1. Grind welded joints smooth.
  - 2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.

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- B. Keys: Provide 2 keys for each accessory to Owner; master key all lockable accessories.
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Stainless Steel Tubing: ASTM A269, Type 304 or 316.
- E. Mirror Glass: Float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.
- F. Adhesive: Contact type, waterproof.
- G. Fasteners, Screws, and Bolts: Hot dip galvanized.
- H. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

**2.03 FINISHES**

- A. Stainless Steel: No. 4 satin brushed finish, unless otherwise noted.
- B. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.
- C. Back paint components where contact is made with building finishes to prevent electrolysis.

**2.04 TOILET ROOM ACCESSORIES**

- A. Toilet Paper Dispenser: Double roll, surface mounted type, stainless steel.
  - 1. Product: Contura Series - B4288 manufactured by Bobrick.
- B. Paper Towel Dispenser: Folded paper type, stainless steel, surface-mounted, with viewing slots on sides as refill indicator and tumbler lock.
  - 1. Capacity: 400 C fold minimum.
  - 2. Product: Contura Series B-4262 manufactured by Bobrick.
- C. Mirrors: Stainless steel framed, 6 mm thick float glass mirror.
  - 1. Size: as indicated.
  - 2. Frame: 0.05 inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; No.4 finish.
  - 3. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
- D. Grab Bars: Stainless steel, 1-1/4 inches outside diameter, minimum 0.05 inch wall thickness, nonslip grasping surface finish, concealed flange mounting; 1-1/2 inches clearance between wall and inside of grab bar.
  - 1. Length and configuration: As indicated on drawings.
  - 2. Product: B-6806 x required length manufactured by Bobrick.
- E. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
  - 1. Product: Contura Series B-270 manufactured by Bobrick.

**2.05 SHOWER AND TUB ACCESSORIES**

- A. Shower Curtain Rod: Stainless steel tube, 1 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick satin-finished stainless steel flanges, for concealed mounting.

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1. Product: B207 x required length manufactured by Bobrick.
- B. Shower Curtain:
  1. Material: Opaque vinyl, 0.008 inch thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
  2. Size as required for opening.
  3. Grommets: Stainless steel; pierced through top hem on 6 inch centers.
  4. Color: White.
  5. Shower curtain hooks: Chrome-plated or stainless steel spring wire designed for snap closure.
- C. Folding Shower Seat: Wall-mounted surface; welded tubular seat frame, structural support members, hinges and mechanical fasteners of Type 304 stainless steel, folding seat.
  1. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of color as selected.
  2. Size: ADA compliant.
- D. Wall-Mounted Soap Dish: Heavy duty, seamless stainless steel, surface-mounted with drain holes, without grab bar, satin finish; with concealed mechanical fastening suitable for substrate and backplate.
- E. Towel Pin: Stainless steel, 3 inch extension from wall; rectangular-shaped bracket and backplate for concealed attachment, satin finish.
  1. Product: B6777 manufactured by Bobrick.

#### 2.06 UTILITY ROOM ACCESSORIES

- A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
  1. Hooks: 5, 0.06 inch stainless steel rag hooks at shelf front.
  2. Mop/broom holders: 4 spring-loaded rubber cam holders at shelf front.
  3. Length: 44 inches.
  4. Length: Manufacturer's standard length for number of holders/hooks.
  5. Product: B239 x 44 manufactured by Bobrick.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. Verify that field measurements are as indicated on drawings.
- D. See Section 09260 for installation of blocking, reinforcing plates, and concealed anchors in walls, and ceilings.

#### 3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

#### 3.03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions.

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- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights and Locations: As required by accessibility regulations and as indicated on drawings

**3.04 SCHEDULE**

- A. Storage 101
  - 1. 1 surface mounted paper towel dispenser.
- B. Toilet 105
  - 1. ANSI/ADA grab bars at ADA watercloset.
  - 2. 1 toilet paper dispenser per watercloset indicated.
  - 3. 1 sanitary napkin disposal unit per watercloset indicated.
  - 4. 1 mirror per lavatory indicated - size as indicated.
  - 5. 1 vanity mounted soap dispenser per sink indicated
  - 6. 1 paper towel dispenser.
  - 7. 2 shower curtain rods per shower indicated.
  - 8. 2 shower curtains per shower indicated
  - 9. 1 soap dish per shower indicated.
  - 10. 2 towel pins per shower indicated.
  - 11. 1 shower seat at ADA shower
- C. Janitor 106
  - 1. 1 Combination Utility Shelf/Mop and Broom Holder per mop sink indicated. Install over mop sink.

**END OF SECTION**

**SECTION 15010 - GENERAL MECHANICAL**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Work under Division 15 shall include furnishing of all labor, accessories, tools, equipment and material required to completely execute installation of the entire heating, ventilating and air conditioning systems, plumbing systems and fire protection systems as shown on the drawings and as specified. Work shall include but not be limited to the furnishing, unloading, handling distribution, setting, supporting and installation of all components required for the mechanical systems.
- B. Mechanical specification Sections 15000 through 15299 generally apply to all mechanical trades. Sections 15300 through 15399 apply generally to fire protection work. Sections 15400 through 15499 apply generally to plumbing work. Sections 15500 through 15999 apply generally to HVAC work.

**1.02 REFERENCES**

- A. FM P7825 - Approval Guide; Factory Mutual.
- B. NEMA MG 1 - Motors and Generators.
- C. NFPA 70 - National Electrical Code.
- D. SSPC-Paint 15 - Steel Joist Shop Paint; Steel Structures Painting Council.
- E. ASME American Society of Mechanical Engineers
- F. ASTM American Society for Testing Materials
- G. NEMA National Electrical Manufacturers Association
- H. NFPA National Fire Protection Association
- I. OSHA Occupational Safety and Health Act
- J. SMACNA Sheet Metal and Air Conditioning Contractors National Association, Inc.
- K. IBC International Building Code
- L. IMC International Mechanical Code
- M. IPC International Plumbing Code
- N. IFC International Fire Code

**1.03 Interpretation of Contract Documents:**

- A. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item, in the drawings or specifications or both, carries with it the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated as part of the indication or description.
- B. It shall be understood that the specifications and drawings are complimentary and are to be taken together for a complete interpretation of the work.
- C. No exclusions from, or limitations in, the language used in the drawings or specifications shall

be interpreted as meaning that the appurtenances or accessories necessary to complete any required system or item of equipment are to be omitted

- D. The drawings of necessity utilize symbols and schematic diagrams to indicate various items of work. Neither of these have any dimensional significance nor do they delineate every item required for the intended installations. The work shall be installed in accordance with the diagrammatic intent expressed on the drawings, and in conformity with the dimensions indicated on final architectural and structural working drawings and on equipment shop drawings.
- E. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for complete work are excluded.
- F. Certain details appear on the drawings which are specific with regard to the dimensioning and positioning of the work. These details are intended only for the purpose of establishing general feasibility. They do not obviate field coordination for the intended work.
- G. Information as to the general construction shall be derived from structural and architectural drawings and specifications only.
- H. The use of words in the singular shall not be considered as limiting where other indications denote that more than one item is referred to.

#### 1.04 PERFORMANCE REQUIREMENTS

- A. Work shall be installed to conform with any City or State law, regulation, code, ordinance, ruling or Fire Underwriters requirement applicable to this class of work.
- B. All installations for construction purposes shall conform with the Department of Labor "Safety and Health Regulations for Construction".
- C. All equipment with electrical components shall bear the UL label.

#### 1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements for submittal procedures.

### PART 2 PRODUCTS

#### 2.01 Materials and Manufacturers:

- A. Equipment and materials installed under this contract shall be new and without blemish or defect.
- B. Each major component of equipment shall have the manufacturer's name, address, model number and rating on a plate securely affixed in a conspicuous place. The nameplate of a distributing agent will not be acceptable. ASME Code Ratings, UL label, or other data which is die-stamped into the surface of the equipment shall be stamped in a location easily visible.
- C. In all cases the contractor shall be completely responsible for changes in dimension of other than first named manufacturer equipment, electrical changes, etc. required for proper function and final performance. Item shall comply with all requirements herein set forth and as required to perform as designed.

#### 2.02 Electrical Equipment

- A. Within 60 days of award of contract, the person responsible for work in this division shall verify that the appropriate number of contacts have been provided in the stators or drives and if



a control power transformer is required that it has been provided to control the equipment as described in Section 15940-HVAC Sequence of Operation.

- B. If additional devices are required, it is the responsibility of this Division to coordinate and provide the devices required to control the equipment as specified within the starters, adjustable frequency drives and motor control centers provided under Division 16.

#### 2.03 Substitution of Specified Materials:

- A. Throughout the drawings and specifications, equipment and systems have been selected and are referenced by name, manufacturer, model number, etc. These references are not intended to limit competition and in most cases materials and methods of construction equal to that specified will be accepted provided prior approval of any substitute item is obtained from the Architect/Engineer. Only products by the listed manufacturers will be acceptable. Contractors and other manufacturers may submit requests to be listed as an acceptable manufacturer on the specified item by submitting documentation in accordance with the requirements of Section 1600. All bidders will be notified by addendum of any approved substitutions. Under no circumstances will any substitutes be accepted after that date; and any item installed on the job which has not been approved in accordance with the noted procedure shall be removed and replaced with the appropriate approved item at the contractor's expense.
- B. In all cases the contractor shall be completely responsible for changes in dimension of other than first named manufacturer equipment, electrical changes, etc. required for proper function and final performance. Item shall comply with all requirements herein set forth and as required to perform as designed.

### PART 3 EXECUTION

#### 3.01 Protection of Equipment:

- A. Protect all materials and equipment from damage during storage at the site and throughout the construction period.
- B. Protection from damage from rain, dirt, sun and ground water shall be accomplished by storing the equipment on elevated supports and covering them on all sides with protective rigid or flexible water proof coverings securely fastened.
- C. Piping shall be protected by storing it on elevated supports and capping the ends with suitable material to prevent dirt accumulation in the piping.

#### 3.02 COORDINATION OF WORK

- A. All work shall be coordinated to avoid conflict with other contractors.
- B. The contractor shall be responsible for checking to insure that the equipment to be installed will fit in the space shown on the drawings. If there is a conflict, the contractor shall notify the Engineer before bid. By submitting a bid the contractor assures that the equipment to be installed will fit or that provisions have been included in the bid to move the equipment to a location where it can be installed without conflict.

#### 3.03 Contiguous Work:

- A. If any part of the Contractor's work is dependent for its proper execution or for its subsequent efficiency or appearance on the character or conditions of contiguous work not executed by him, this contractor shall examine and measure such contiguous work and report to the Architect in

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writing any imperfection therein, or conditions that render it unsuitable for the reception of this work. Should the contractor proceed without making such written report, he shall be held to have accepted such work and the existing conditions and he shall be responsible.

**3.04 Equipment Pads:**

- A. Provide concrete housekeeping pads under all equipment.

**3.05 Access to Equipment and Valves:**

- A. All control devices, specialties, valves and removable panels on equipment shall be so located as to provide easy access for inspection and maintenance, including removal of any interior components.
- B. Should any work, such as piping, ducts, conduit, etc. be installed without due regard to the accessibility of devices installed by other contractors, the installation shall be relocated, offset or rerouted without cost to the Owner.

**3.06 Excavating and Backfilling:**

- A. Perform all excavating and backfilling required for installation of the work. All excavating and backfill shall conform with the requirements of Division 2 of the specifications.

**3.07 Project Closeout:**

- A. Maintenance Manuals: At the end of construction, furnish to the Architect three (3) bound and indexed sets of maintenance and operating instructions, parts lists, electrical wiring diagrams, balance data, and manufacturer's literature sufficient for operation and complete maintenance of all equipment by the Owner.
- B. Approved submittals and shop drawings may be included in the Maintenance Manuals instead of being separately furnished, if desired.
- C. It is intended that the documentation provided in maintenance manuals, along with as-built drawings, shall be complete and detailed enough to permit and facilitate troubleshooting, engineering analysis, and design work for future changes, without extensive field investigations and testing. Manuals shall be prepared so as to explain system operation and equipment to those not acquainted with the job.
- D. Manuals shall be durably bound and clearly identified on the front cover (and on the spine of thick volumes). Identification shall include the building or project name, applicable trade (such as HVAC, Plumbing, Fire Protection, etc.), approximate date of completion (month and year) and contractor's name.
- E. Manuals shall be organized into well defined and easy to locate sections, with index tabs or separators to divide the sections. A complete table of contents shall be provided at the front indicating the section or page number for each system, subsystem, or supplier/manufacturer.
- F. Manuals shall include complete information and diagrams on all controls, indicators, sensors, and signal sources. Control diagrams are to show the locations of components and major equipment by room number or other identification when room numbers are not applicable. Locations of out-of-sight components, such as duct mounted sensors, flow switches, etc. should be clearly indicated. Control diagrams must include identification of components by make and model number, operating ranges, recommended set points, reset schedules, and other job-specific data useful for troubleshooting, calibration and maintenance. Complete narrative

descriptions of operating sequences of control systems and subsystems shall be included on the prints adjacent to the corresponding schematics. Catalog data and cuts shall be clearly marked to indicate model numbers, sizes, capacities, operating points, and other characteristics of each item used. This should include accessories or special features provided. Where various sizes or variations of a series or model are used, documents should clearly show which are used where. Where quantities are appropriate, schedule of usage should be provided. Maintenance literature shall include complete information for identifying and ordering replacement parts, such as illustrated parts breakdowns.

- G. Maintenance manuals must include complete balance data on all systems.

3.08 Instructions to Owner:

- A. Contractor shall conduct a maintenance and operational instruction session for the Owner. Where highly technical or complex equipment is supplied, such as chillers and control systems, manufacturer's representatives, controls subcontractors, and other appropriate personnel who are particularly qualified, shall conduct training sessions pertaining to their equipment, or systems. Such training shall be scheduled with the Owner in advance.

3.09 Spare Filters:

- A. Spare filters shall be delivered to Owner's representative.

3.10 Warranties:

- A. This Contractor warrants the mechanical systems to be free of defects in materials and workmanship for a period of one year after date of final payment. The effective dates of this warranty apply to all components of the mechanical systems regardless of any equipment manufacturer's warranties which may expire at an earlier date. Any system malfunctions, or any previously undiscovered non-compliance with the plans and specifications, during the warranty period shall be repaired at no cost to the Owner.
- B. Deliver to Owner all warranties, guarantees, etc. and obtain written receipts.

**END OF SECTION**

**SECTION 15073 - VIBRATION AND SEISMIC CONTROLS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Equipment support bases.
- B. Vibration isolators.

**1.02 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data:
  - 1. Provide manufacturer's product literature documenting compliance with PART 2 PRODUCTS.
- C. Shop Drawings:
  - 1. Provide schedule of vibration isolator type with location and load on each.
  - 2. Fully dimensioned fabrication drawings and installation details for vibration isolation bases, member sizes, attachments to isolators, and supported equipment.
  - 3. Include auxiliary motor slide bases and rails, base weights, inertia bases, concrete weights, equipment static loads, support points, vibration isolators, and detailed layout of isolator location and orientation with static and dynamic load on each isolator.
  - 4. Include selections from prescriptive design tables that indicate compliance with the applicable building code and the vibration isolator manufacturer's requirements.
  - 5. Clearly indicate the load and capacity assumptions selected. Include copies of any calculations.
  - 6. Include the calculations that indicate compliance with the applicable building code for seismic controls and the vibration isolator manufacturer's requirements.
- D. See Section 15010 - General Mechanical, for additional submittal procedures.

**1.03 QUALITY ASSURANCE**

- A. Perform design and installation in accordance with applicable codes.
- B. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and registered and licensed in South Carolina.
- C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section. See Section 01453 - Code-Required Special Inspections, for additional requirements.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Kinetics Noise Control, Inc: [www.kineticsnoise.com](http://www.kineticsnoise.com).
- B. Mason Industries: [www.mason-ind.com](http://www.mason-ind.com).
- C. Vibro-Acoustics: [www.vibro-acoustics.com](http://www.vibro-acoustics.com)

**2.02 VIBRATION ISOLATION AND SEISMIC RESTRAINTS**

- A. General:
  - 1. Housekeeping Pads
    - a. Housekeeping pad reinforcement and monolithic pad attachment to the structure details and design shall be prepared by the restraint vendor if not already indicated on the drawings.
    - b. Housekeeping pads shall be coordinated with restraint vendor and sized to provide a minimum edge distance of ten (10) bolt diameters all around the outermost anchor bolt to allow development of full drill-in wedge anchor ratings. If cast-in anchors are to be used, the housekeeping pads shall be sized to accommodate the ACI requirements for bolt coverage and embedment.
  - 2. Supplementary Support Steel
    - a. Contractor shall supply supplementary support steel for all equipment, piping, ductwork, etc. including roof mounted equipment, as required or specified.
  - 3. Attachments:
    - a. Contractor shall supply restraint attachment plates cast into housekeeping pads, concrete inserts, double sided beam clamps, etc. in accordance with the requirements of the vibration vendor's calculations.
- B. Specification Type "E"
  - 1. Spring isolators shall be free standing and laterally stable without any housing and complete with a molded neoprene cup or 1/4" (6mm) neoprene acoustical friction pad between the baseplate and the support. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include spring diameters, deflection, compressed spring height and solid spring height.
  - 2. Mason Industries, Inc. type SLF
- C. Specification Type "J"
  - 1. Hangers shall consist of rigid steel frames containing minimum 1 1/4" (32mm) thick neoprene elements at the top and a steel spring with general characteristics as in specification E seated in a steel washer reinforced neoprene cup on the bottom. The neoprene element and the cup shall have neoprene bushings projecting through the steel box. To maintain stability the boxes shall not be articulated as clevis hangers nor the neoprene element stacked on top of the spring. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30 arc from side to side before contacting the rod bushing and short circuiting the spring. Submittals shall include a hanger drawing showing the 30 capability.
  - 2. Mason Industries, Inc. type 30N.

**PART 3 EXECUTION**

**3.01 INSTALLATION - GENERAL**

- A. Install in accordance with manufacturer's instructions.

**3.02 GENERAL**

- A. All vibration isolators and seismic restraint systems must be installed in strict accordance with the manufacturers written instructions and all certified submittal data.

- B. Installation of vibration isolators and seismic restraints must not cause any change of position of equipment, piping or ductwork resulting in stresses or misalignment.
- C. No rigid connections between equipment and the building structure shall be made that degrades the noise and vibration control system herein specified.
- D. The contractor shall not install any equipment, piping, duct or conduit which makes rigid connections with the building unless isolation is not specified. "Building" includes, but is not limited to, slabs, beams, columns, studs and walls.
- E. Coordinate work with other trades to avoid rigid contact with the building.
- F. Any conflicts with other trades which will result in rigid contact with equipment or piping due to inadequate space or other unforeseen conditions should be brought to the architects/engineers attention prior to installation. Corrective work necessitated by conflicts after installation shall be at the responsible contractors expense.
- G. Bring to the architects/engineers attention any discrepancies between the specifications and the field conditions or changes required due to specific equipment selection, prior to installation. Corrective work necessitated by discrepancies after installation shall be at the responsible contractors expense.
- H. Correct, at no additional cost, all installations which are deemed defective in workmanship and materials at the contractors expense.
- I. Overstressing of the building structure must not occur because of overhead support of equipment. Contractor must submit loads to the structural engineer of record for approval. Generally bracing may occur from:
  - 1. Flanges of structural beams.
  - 2. Upper truss cords in bar joist construction.
  - 3. Cast in place inserts or wedge type drill-in concrete anchors.
- J. Locate isolation hangers as near to the overhead support structure as possible.
- K. All mechanical equipment shall be vibration isolated and seismically restrained as per the schedules in the drawings.

### 3.03 SCHEDULE

- A. Equipment Isolation Schedule.
  - 1. Exhaust Fan.
    - a. Isolator Deflection: 2.5 inches.

**END OF SECTION**

**SECTION 15075 - MECHANICAL IDENTIFICATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Nameplates.
- B. Tags.
- C. Pipe Markers.

**1.02 RELATED REQUIREMENTS**

- A. Section 09900 - Paints and Coatings: Identification painting.

**1.03 REFERENCE STANDARDS**

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials.

**1.04 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Product Data: Provide manufacturers catalog literature for each product required.
- E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- F. Project Record Documents: Record actual locations of tagged valves.
- G. Operation and Maintenance Manuals: Include in manuals the information listed below. For information on how to prepare and submit manuals see section 1780 (Closeout Submittals).
  - 1. Spare parts lists
  - 2. Shop drawings and product data

**PART 2 PRODUCTS**

**2.01 IDENTIFICATION APPLICATIONS**

- A. Air Handling Units: Nameplates.
- B. Exhaust Fan: Nameplates
- C. Valves: Tags.

**2.02 NAMEPLATES**

- A. Description: Laminated three-layer plastic with engraved letters.
  - 1. Letter Color: White.
  - 2. Letter Height: 1/4 inch.
  - 3. Background Color: Black.
  - 4. Plastic: Conform to ASTM D709.

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**2.03 TAGS**

- A. Manufacturers:
  - 1. Brady Corporation: [www.bradycorp.com](http://www.bradycorp.com).
  - 2. Substitutions: See Section 01600 - Product Requirements.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

**2.04 PIPE MARKERS**

- A. Manufacturers:
  - 1. Brady Corporation: [www.bradycorp.com](http://www.bradycorp.com).
  - 2. MIFAB, Inc.: [www.mifab.com](http://www.mifab.com).
  - 3. Seton Identification Products: [www.seton.com](http://www.seton.com).
- B. Comply with ASME A13.1.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- D. Color code as follows:
  - 1. Potable Water: Green with white letters.

**PART 3 EXECUTION**

**3.01 PREPARATION**

- A. Degrease and clean surfaces to receive adhesive for identification materials.

**3.02 INSTALLATION**

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

**3.03 SCHEDULES**

- A. Piping
  - 1. All pipe identification shall be color coded in accordance with the following:
    - a. Domestic cold water - Green
    - b. Domestic hot water - Beige
    - c. Domestic hot water return - Beige

**END OF SECTION**



**SECTION 15080 - MECHANICAL INSULATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Duct insulation.
- B. Piping insulation.

**1.02 SCOPE OF WORK:**

- A. Provide insulation as specified for domestic hot and cold water piping systems, ductwork and refrigerant systems, including valves, fittings, flanges, strainers, and mechanical couplings.

**1.03 RELATED SECTIONS**

- A. Section 15075 - Mechanical Identification.
- B. Section 15145 - Plumbing Piping: Placement of hangers and hanger inserts.
- C. Section 15186 - Refrigerant Piping and Specialties: Placement of inserts.

**1.04 REFERENCES**

- A. ASTM C 518 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- B. ASTM C 534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 1994.
- C. ASTM C 547 - Standard Specification for Mineral Fiber Pipe Insulation; 1995.
- D. ASTM C 553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- E. ASTM C 592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 1980.
- F. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.
- G. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
- H. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible.
- I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

**1.05 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Samples: Submit two samples of any representative size illustrating each insulation type.
- D. Manufacturer's Instructions: Indicate installation procedures which ensure acceptable workmanship and installation standards will be achieved.
- E. Operation and Maintenance Manuals: Include in manuals the information listed below. For

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information on how to prepare and submit manuals see section 1780 (Closeout Submittals).

1. Shop drawings and product data

**1.06 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

**1.07 DELIVERY, STORAGE, AND PROTECTION**

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

**1.08 ENVIRONMENTAL REQUIREMENTS**

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

**PART 2 PRODUCTS**

**2.01 DUCT INSULATION**

**A. GLASS FIBER, FLEXIBLE**

1. Manufacturers.
  - a. Provide products complying with the specifications by one of the following manufactures.
    - 1) Certain Teed Corporation.
    - 2) Johns Manville
    - 3) Knauf Fiberglass GmbH.
    - 4) Owens-Corning Fiberglass Corporation.
2. Insulation: ASTM C 553; flexible, noncombustible blanket.
  - a. 'K' value : ASTM C 518, 0.27 at 75 degrees F.
  - b. Maximum service temperature: 250 degrees F.
  - c. Maximum moisture absorption: 0.20 percent by volume.
3. Vapor Barrier Jacket:
  - a. Kraft paper with glass fiber yarn and bonded to aluminized film.
  - b. Moisture vapor transmission: ASTM E 96; 0.02 perm.
  - c. Secure with pressure sensitive tape.
4. Vapor Barrier Tape:
  - a. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
5. Outdoor Vapor Barrier Mastic:
  - a. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

**B. CELLULAR GLASS, RIGID**

1. Manufacturers.
  - a. Provide products complying with the specifications by one of the following manufactures.
    - 1) Pittsburgh Corning Corporation

- 2) Substitutions: See Section 01600 - Product Requirements
2. Insulation: ASTM C552 cellular glass insulation, rigid.
3. Joint sealant: butyl based sealant compatible with insulation
4. Vapor Retarder Mastic: asphalt cutback mastic compatible with insulation
5. Weather Barrier Mastic: acrylic latex mastic compatible with insulation
6. Reinforcing Fabric: polyester fabric mesh compatible with insulation
7. Jacket: 0.76mm (30 mil) thick, self-sealing, non-metalllic modified bituminous vapor retarder membrane
8. Tape - shall be 25.4mm (1") wide high tensile strength fiber reinforced strapping tape. Scotch Brand Filament Tape or approved equal. Tape is appropriate for providing temporary securement to insulation with O.D.'s 46cm (18") or smaller as long as it is covered with metal jacket afterwards. Tape is not acceptable if the insulation system is being designed to provide fire protection.

**C. JACKETS**

1. Aluminum Jacket: ASTM B 209 (ASTM B 209M).
  - a. Thickness: 0.016 inch sheet.
  - b. Finish: Smooth.
  - c. Joining: Longitudinal slip joints and 2 inch laps.
  - d. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
  - e. Metal Jacket Bands: 3/8 inch wide; 0.020 inch thick aluminum.

**2.02 PIPE INSULATION**

- A. Insulation shall have composite (insulation jacket or facing, and adhesive used to adhere the facing or jacket to the insulation) fire and smoke hazard ratings as tested by procedure ASTM E84, NFPA 255 or UL 723 not exceeding:
  1. Flame Spread: 25.
  2. Smoke Developed: 50.
- B. Insulation shall be glass fiber with a maximum K factor of .24 at 75 degrees F mean temperature with factory applied fire resistant vapor barrier jacket, for cold piping and fire retardant jacket for hot water. Insulation for outdoor piping shall be rigid foam urethane, Armalok II or equal.
  1. For fittings and valve bodies 3" and smaller, insulation shall be one-pound density glass fiber blanket wrapped firmly under compression with No. 20 gauge galvanized annealed steel wire and given a smoothing coat of finishing cement.
- C. Accessories such as adhesives, mastics, cements, tapes and cloth for fittings shall have the same component rating as listed above. All products or their shipping cartons shall bear a label indicating that flame and smoke ratings do not exceed requirements. Treatment of jackets or facings to impart flame and smoke-safety shall be permanent. The use of water-soluble treatments are prohibited.
  1. Where Benjamin-Foster adhesives are specified equal products manufactured by 3M Company, or the manufacturer of the insulation are acceptable upon approval by the Engineer. Armstrong 520 adhesive shall be used for Armstrong insulation.
  2. In lieu of longitudinal lap seam specified, self-sealing lapped jacket shall be acceptable with requirement for aluminum bands on concealed piping.
- D. FLEXIBLE ELASTOMERIC CELLULAR INSULATION
  1. Manufacturer:
    - a. Armacell International: [www.armacell.com](http://www.armacell.com).

- b. Substitutions: See Section 01600 - Product Requirements.
- 2. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C 534; use molded tubular material wherever possible.
  - a. Minimum Service Temperature: -40 degrees F.
  - b. Maximum Service Temperature: 220 degrees F.
  - c. Connection: Waterproof vapor barrier adhesive.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify that ducts have been tested before applying insulation materials.
- B. Verify that piping has been tested before applying insulation materials.
- C. Verify that surfaces are clean, foreign material removed, and dry.

#### 3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. DUCT INSULATION
  - 1. Insulated ducts conveying air below ambient temperature:
    - a. Provide insulation with vapor barrier jackets.
    - b. Finish with tape and vapor barrier jacket.
    - c. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
    - d. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
  - 2. External Duct Insulation Application:
    - a. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
    - b. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
    - c. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
- D. PIPE INSULATION
  - 1. Longitudinal lap and 4" wide vapor barrier joint seal strips shall be adhered neatly in place with BF 85-20 adhesive or approved equal and banded.
  - 2. The ends of pipe insulation shall be sealed off with BF 30-35 coatings at all flanges, valves and fittings and at intervals of not more than 21 feet on continuous runs or pipes.
  - 3. Fittings shall be vapor sealed by applying a layer of white open weave glass fabric (20 x 20 between two 1/16" thick coats of BF 30-35.
  - 4. Insulation shall be fastened in place with 16 gauge annealed wire on 18" centers maximum for piping runs and as required for a secure installation at fittings, valves, and appurtenances. Provide 8 ounce canvas jacket pasted in place and sized for all exposed piping.
  - 5. Glass fiber insulated pipes conveying fluids below ambient temperature:
    - a. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
    - b. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC

fitting covers.

6. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
7. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07840.
8. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

### 3.03 SCHEDULES

#### A. DUCTWORK INSULATION

1. Exhaust Ducts Within 10 ft of Exterior Openings:
  - a. Flexible Glass Fiber Duct Insulation: 1-1/2 inch thick.
2. Supply Ducts.
  - a. Flexible Glass Fiber Duct Insulation: 1-1/2 inch thick.
3. Return and Relief Ducts concealed.
  - a. Flexible Glass Fiber Duct Insulation: 1-1/2 inch thick.
4. Ducts Exposed to Outdoors.
  - a. Rigid Cellular Glass Insulation: 1-1/2 inch thick.

#### B. PIPING INSULATION

1. Domestic hot, hot water recirculating and cold water piping (above ground):
  - a. Pipe sizes 1/2 - 3 inches: 1-inch Glass fiber insulation.
  - b. Cold water pipe sizes 4 inches and larger: 1-inch Glass fiber insulation.
  - c. Hot water pipe sizes 4 inches and larger: 1 1/2-inch Glass fiber insulation.
2. Refrigerant Hot Gas:
  - a. All pipe sizes: 1 inch Flexible elastomeric insulation.

**END OF SECTION**

**SECTION 15145 - PLUMBING PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pipe, pipe fittings, valves, and connections for piping systems.
  - 1. Sanitary sewer.
  - 2. Domestic water.

**1.02 RELATED REQUIREMENTS**

- A. Section 15073 - Vibration and Seismic Control.
- B. Section 15080 - Mechanical Insulation.

**1.03 REFERENCE STANDARDS**

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 1996 (Reaffirmed 2003).
- B. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings; The American Society of Mechanical Engineers.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers (ANSI B16.18).
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers.
- E. Pipe.ASTM B 32 - Standard Specification for Solder Metal.
- F. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
- G. ASTM B302 - Standard Specification for Threadless Copper Pipe, Standard Sizes.
- H. ASTM D2846/D2846M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems.
- I. ASTM F441/F441M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.
- J. ASTM F442/F442M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR).
- K. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.

**1.04 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories.
- C. Project Record Documents: Record actual locations of valves.

**1.05 QUALITY ASSURANCE**

- A. Perform Work in accordance with State of South Carolina, standards.
  - 1. Maintain one copy on project site.

- B. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

#### 1.06 SEISMIC RESTRAINT

- A. All piping and water heater shall be seismically restrained as per the International Building Code.
- B. Contractor shall submit plans by a licensed seismic engineer showing the recommended seismic design for the plumbing system. See section 15073 for detail information.

#### 1.07 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with State of South Carolina plumbing code.

#### 1.08 PIPE MARKERS

- A. Color: Conform to ASME A13.1.
- B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

#### 1.09 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

### PART 2 PRODUCTS

#### 2.01 SANITARY SEWER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

#### 2.02 WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B 88, Type L (B), Drawn (H). See plans and details for required copper pipe locations.
  - 1. Fittings: ASME B16.22, wrought copper and bronze, or ASME B16.18 bronze sand castings. Fittings manufactured to copper tubing sizes, with grooved ends designed to accept grooved end couplings of the same manufacturer. (Flaring of tube and fitting ends to IPS dimensions is not allowed.
  - 2. Joints: ASTM B 32, alloy Sn95 solder. Maximum lead content 0.10%
- B. CPVC Pipe: ASTM D2846/D2846M, ASTM F441/F441M, or ASTM F442/F442M.
  - 1. Fittings: CPVC; ASTM D2846/D2846M, ASTM F437, ASTM F438, or ASTM F439.
  - 2. Joints: ASTM D2846/D2846M, solvent weld with ASTM F493 solvent cement.

### 2.03 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches and Under:
  - 1. Copper tube and pipe: Class 150 bronze unions with soldered joints.

### 2.04 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
  - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
  - 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
  - 3. Trapeze Hangers: Welded steel channel frames attached to structure.
  - 4. Vertical Pipe Support: Steel riser clamp.
- B. Plumbing Piping - Drain, Waste, and Vent:
  - 1. Conform to ASME B31.9.
  - 2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
  - 3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
  - 4. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
  - 5. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
  - 6. Vertical Support: Steel riser clamp.
  - 7. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
  - 8. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- C. Plumbing Piping - Water:
  - 1. Conform to ASME B31.9.
  - 2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
  - 3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
  - 4. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

### 2.05 BALL VALVES

- A. Manufacturers:
  - 1. Apollo
  - 2. Conbraco Industries: [www.conbraco.com](http://www.conbraco.com).
  - 3. Nibco, Inc: [www.nibco.com](http://www.nibco.com).
  - 4. Substitutions: See Section 01600 - Product Requirements.
- B. Construction 2 Inches and Smaller: Meets the intent of MSS SP-110, 300 psi CWP, forged brass body, two piece, chrome plated brass ball and stem, full port, Teflon seats, blow-out proof stem, lever handle, Vic Press 304™ ends.

### 2.06 WATER PRESSURE REDUCING VALVES

- A. Manufacturers:
  - 1. Amico: [www.amico.com](http://www.amico.com)
  - 2. Amtrol Inc: [www.amtrol.com](http://www.amtrol.com).
  - 3. Cla-Val Co: [www.cla-val.com](http://www.cla-val.com).
  - 4. Conbraco: [www.conbraco.com](http://www.conbraco.com)
  - 5. Honeywell: [www.honeywell.com](http://www.honeywell.com)



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6. Watts Regulator Company: [www.wattsregulator.com](http://www.wattsregulator.com).
7. Substitutions: See Section 01600 - Product Requirements.

**B. Up to 2 Inches:**

1. MSS SP-80, ASTM B 584, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.

**C. Over 2 Inches:**

1. MSS SP-85, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

**2.07 RELIEF VALVES**

**A. Pressure Relief:**

1. Manufacturers:
  - a. Amico: [www.amico.com](http://www.amico.com)
  - b. Cla-Val Co: [www.cla-val.com](http://www.cla-val.com).
  - c. Conbraco: [www.conbraco.com](http://www.conbraco.com)
  - d. Henry Technologies: [www.henrytech.com](http://www.henrytech.com).
  - e. Milwaukee Valve: [www.milwaukeevalve.com](http://www.milwaukeevalve.com)
  - f. Watts Regulator Company: [www.wattsregulator.com](http://www.wattsregulator.com).
  - g. Substitutions: See Section 01600 - Product Requirements.
2. AGA Z21.22 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

**B. Temperature and Pressure Relief:**

1. Manufacturers:
  - a. Amico: [www.amico.com](http://www.amico.com)
  - b. Cla-Val Co: [www.cla-val.com](http://www.cla-val.com).
  - c. Conbraco: [www.conbraco.com](http://www.conbraco.com)
  - d. Henry Technologies: [www.henrytech.com](http://www.henrytech.com).
  - e. Milwaukee Valve: [www.milwaukeevalve.com](http://www.milwaukeevalve.com)
  - f. Watts Regulator Company: [www.wattsregulator.com](http://www.wattsregulator.com).
  - g. Substitutions: See Section 01600 - Product Requirements.
2. AGA Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME (BPV IV) certified and labelled.

**2.08 STRAINERS**

**A. Manufacturers:**

1. Armstrong International, Inc: [www.armstronginternational.com](http://www.armstronginternational.com).
2. Grinnell: [www.grinnell.com](http://www.grinnell.com)
3. ITT Fluid Handling: <http://fhs.ittind.com/>
4. Green Country Filter Manufacturing: [www.greencountryfilter.com](http://www.greencountryfilter.com).
5. Victaulic Company of America: [www.victaulic.com](http://www.victaulic.com)
6. Watts Regulator: [www.wattsreg.com](http://www.wattsreg.com)
7. WEAMCO: [www.weamco.com](http://www.weamco.com).
8. Substitutions: See Section 01600 - Product Requirements.

**B. Size 2 inch and Under:**

1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel

perforated screen.

### PART 3 EXECUTION

#### 3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel or groove plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges, grooved joint couplings or unions.

#### 3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 15080. Refer to Section 15082.
- F. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08310.
- G. Install valves with stems upright or horizontal, not inverted.
- H. Install water piping to ASME B31.9.
- I. Sleeve pipes passing through partitions, walls and floors.
- J. Inserts:
  - 1. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
  - 2. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- K. Pipe Hangers and Supports:
  - 1. Install in accordance with ASME B31.9.
  - 2. Support horizontal piping as scheduled.
  - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
  - 4. Place hangers within 12 inches of each horizontal elbow.
  - 5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  - 6. Provide copper plated hangers and supports for copper piping.

#### 3.03 APPLICATION

- A. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

#### 3.04 TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/8 inch per foot slope.

- B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

### 3.05 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed and clean.
- B. Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- D. Maintain disinfectant in system for 24 hours.
- E. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- F. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- G. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

### 3.06 SCHEDULES

- A. Pipe Hanger Spacing:
  - 1. Metal Piping:
    - a. Pipe size: 1/2 inches to 1-1/4 inches:
      - 1) Maximum hanger spacing: 6.5 ft.
      - 2) Hanger rod diameter: 3/8 inches.
    - b. Pipe size: 1-1/2 inches to 2 inches:
      - 1) Maximum hanger spacing: 10 ft.
      - 2) Hanger rod diameter: 3/8 inch.
    - c. Pipe size: 2-1/2 inches to 3 inches:
      - 1) Maximum hanger spacing: 10 ft.
      - 2) Hanger rod diameter: 1/2 inch.
    - d. Pipe size: 4 inches to 6 inches:
      - 1) Maximum hanger spacing: 10 ft.
      - 2) Hanger rod diameter: 5/8 inch.
  - 2. CPVC Plastic Piping:
    - a. All Sizes:
      - 1) Maximum hanger spacing: 6 ft.
      - 2) Hanger rod diameter: 3/8 inch.

**END OF SECTION**

**SECTION 15146 - PLUMBING SPECIALTIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Floor drains.
- B. Cleanouts.
- C. Hydrants.
- D. Backflow preventers.
- E. Water hammer arrestors.
- F. Thermostatic mixing valves.

**1.02 RELATED REQUIREMENTS**

- A. Section 15145 - Plumbing Piping.
- B. Section 15410 - Plumbing Fixtures.

**1.03 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- C. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.
- D. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.
- E. Operation and Maintenance Manuals: Include in manuals the information listed below. For information on how to prepare and submit manuals see section 1780 (Closeout Submittals).
- F. Operating instructions
- G. Maintenance instructions, including preventative and corrective maintenance.
- H. Copies of warranties
- I. Wiring diagrams
- J. Shop drawings and product data

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Accept specialties on site in original factory packaging. Inspect for damage.

**PART 2 PRODUCTS**

**2.01 DRAINS**

- A. Manufacturers:

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1. Jay R. Smith Manufacturing Company: [www.jayrsmith.com](http://www.jayrsmith.com).
2. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
3. Substitutions: See Section 01600 - Product Requirements.

**B. Floor Drains:**

1. Assembly: ASME A112.21.1M.
2. Body: Lacquered cast iron two piece body with double drainage flange..

**2.02 CLEANOUTS**

**A. Manufacturers:**

1. Jay R. Smith Manufacturing Company: [www.jayrsmith.com](http://www.jayrsmith.com).
2. Josam Company: [www.josam.com](http://www.josam.com).
3. Wade
4. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
5. Watts

**2.03 HYDRANTS**

**A. Wall Hydrant Manufacturers:**

1. Josam Model 71050.
2. J.R. Smith Model 5609.
3. Watts Model HY-42
4. Woodford Model 65.
5. Zurn Model Z-1310
6. Arrowhead Brass Company: [www.arrowheadbrass.com](http://www.arrowheadbrass.com).
7. Jay R. Smith Manufacturing Company: [www.jayrsmith.com](http://www.jayrsmith.com).
8. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
9. Substitutions: See Section 01600 - Product Requirements.

**B. Wall Hydrants W/Box:**

1. Manufacturers:
2. Josam Model 71000.
3. J.R. Smith Model 5509.
4. Watts Model HY-42B
5. Woodford Model B-65
6. Zurn Model Z-1300.
7. ASSE 1019; chrome plated lockable recessed box, hose thread spout, lockshield and removable key, and vacuum breaker.

**2.04 WASHING MACHINE BOXES AND VALVES**

**A. Box Manufacturers:**

1. Guy Grey
2. IPS Corporation/Water-Tite: [www.ipscorp.com](http://www.ipscorp.com).
3. Oatey: [www.oatey.com](http://www.oatey.com).

**B. Valve Manufacturers:**

1. Guy Grey
2. IPS Corporation/Water-Tite: [www.ipscorp.com](http://www.ipscorp.com).

**C. Description: Plastic preformed rough-in box with brass long shank valves with wheel handles, socket for 2 inch waste, slip in finishing cover.**

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**2.05 BACKFLOW PREVENTERS**

- A. Manufacturers:
  - 1. Ames
  - 2. Conbraco Industries: [www.conbraco.com](http://www.conbraco.com).
  - 3. FEBCO.
  - 4. Valve Solutions, Inc.
  - 5. Watts Regulator Company: [www.wattsregulator.com](http://www.wattsregulator.com).
  - 6. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
  - 7. Wilkins

**2.06 DOUBLE CHECK VALVE ASSEMBLIES**

- A. Manufacturers:
  - 1. Ames
  - 2. Conbraco Industries: [www.conbraco.com](http://www.conbraco.com).
  - 3. Watts Regulator Company: [www.wattsregulator.com](http://www.wattsregulator.com).
  - 4. Substitutions: See Section 01600 - Product Requirements.
- B. Double Check Valve Assemblies:
  - 1. ASSE 1012; Bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.

**2.07 VACUUM BREAKERS**

- A. Manufacturers:
  - 1. T&S Brass
  - 2. Charlotte Pipe and Foundry
  - 3. WATERSAVER
  - 4. Watts Regulator Company: [www.wattsregulator.com](http://www.wattsregulator.com).
  - 5. Substitutions: See Section 01600 - Product Requirements.

**2.08 WATER HAMMER ARRESTORS**

- A. Manufacturers:
  - 1. Jay R. Smith Manufacturing Company; Model 5000: [www.jayrsmith.com](http://www.jayrsmith.com).
  - 2. Watts Regulator Company; Model Series 15: [www.wattsregulator.com](http://www.wattsregulator.com).
  - 3. Zurn Industries, Inc; Model Z-1700: [www.zurn.com](http://www.zurn.com).
  - 4. Josam 75000
  - 5. Wade Model
- B. Water Hammer Arrestors:
  - 1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psi working pressure.

**2.09 MIXING VALVES**

- A. Thermostatic Mixing Valves:
  - 1. Manufacturers:
    - a. Bradley Corporation. [www.bradleycorp.com](http://www.bradleycorp.com)
    - b. Griswold Controls: [www.griswoldcontrols.com](http://www.griswoldcontrols.com)
    - c. Lawler: [www.lawlervalve.com](http://www.lawlervalve.com)
    - d. Leonard Valve Company: [www.leonardvalve.com](http://www.leonardvalve.com).

**3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Install floor cleanouts at elevation to accommodate finished floor.
- E. Install approved portable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

**END OF SECTION**

**SECTION 15182 - HYDRONIC PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Equipment drains and overflows.
- B. Pipe hangers and supports.
- C. Unions, flanges, mechanical couplings, and dielectric connections.

**1.02 RELATED REQUIREMENTS**

- A. Section 15075 - Mechanical Identification.
- B. Section 15082 - Piping Insulation.
- C. Section 15189 - Chemical Water Treatment: Pipe cleaning.

**1.03 REFERENCE STANDARDS**

- A. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers.
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- C. ASTM B32 - Standard Specification for Solder Metal.
- D. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
- E. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric).
- F. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..

**1.04 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Welders Certificate: Include welders certification of compliance with ASME (BPV IX).
- C. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.
- D. Project Record Documents: Record actual locations of valves.
- E. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.
- F. Operation and Maintenance Manuals: Include in manuals the information listed below. For information on how to prepare and submit manuals see section 1780 (Closeout Submittals).
  - 1. Recommended spare parts
  - 2. Spare parts lists
  - 3. Maintenance instructions, including preventative and corrective maintenance
  - 4. Shop drawings and product data

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type



specified in this section, with minimum three years of documented experience.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

### PART 2 PRODUCTS

#### 2.01 EQUIPMENT DRAINS AND OVERFLOWS

- A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn; using one of the following joint types:
  - 1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.

#### 2.02 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
  - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
- B. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

#### 2.03 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

- A. Unions for Pipe 2 Inches and Under:
  - 1. Copper Pipe: Bronze, soldered joints.

### PART 3 EXECUTION

#### 3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with couplings, flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
- E. After completion, fill, clean, and treat systems. Refer to Section 15189 for additional requirements.

#### 3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space and to avoid interfere with use of space.
- D. Group piping whenever practical at common elevations.

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- E. Sleeve pipe passing through partitions, walls and floors.
- F. Pipe Hangers and Supports:
  - 1. Install in accordance with ASME B31.9.

**END OF SECTION**

**SECTION 15186 - REFRIGERANT PIPING AND SPECIALTIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Piping.
- B. Moisture and liquid indicators.
- C. Valves.
- D. Filter-driers.

**1.02 RELATED REQUIREMENTS**

- A. Section 15080 - Mechanical Insulation

**1.03 REFERENCE STANDARDS**

- A. AHRI 710 - Performance Rating of Liquid-Line Driers; Air-Conditioning, Heating, and Refrigeration Institute.
- B. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers.
- C. ASME B16.26 - Cast Copper Alloy Fittings For Flared Copper Tubes; The American Society of Mechanical Engineers.
- D. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; The American Society of Mechanical Engineers.
- E. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers (ANSI/ASME B31.9).
- F. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
- G. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric).
- H. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
- I. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..

**1.04 SYSTEM DESCRIPTION**

- A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.
- C. Liquid Indicators:
  - 1. Use line size liquid indicators in main liquid line leaving condenser.
  - 2. If receiver is provided, install in liquid line leaving receiver.
  - 3. Use line size on leaving side of liquid solenoid valves.

- D. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.
- E. Filter-Driers:
  - 1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.

#### 1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.
- C. Shop Drawings: Indicate schematic layout of system, including equipment, critical dimensions, and sizes.
- D. Design Data: Submit design data indicating pipe sizing. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.
- E. Manufacturer's Installation Instructions: Indicate support, connection requirements, and isolation for servicing.
- F. Submit welders certification of compliance with ASME (BPV IX).
- G. Project Record Documents: Record exact locations of equipment and refrigeration accessories on record drawings.
- H. Maintenance Data: Include instructions for changing cartridges, assembly views, spare parts lists.
- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01600 - Product Requirements, for additional provisions.
  - 2. Extra Filter-Dryer Cartridges: One of each type and size.
  - 3. Refrigeration Oil Test Kits: One, each containing everything required to conduct one test.
  - 4. Extra Refrigerant: One container of refrigerant, pounds size.
- J. Operation and Maintenance Manuals: Include in manuals the information listed below. For information on how to prepare and submit manuals see section 1780 (Closeout Submittals).
  - 1. Recommended spare parts
  - 2. Spare parts lists
  - 3. Operating instructions
  - 4. Maintenance instructions, including preventative and corrective maintenance.
  - 5. Copies of warranties
  - 6. Wiring diagrams
  - 7. Inspection procedures
  - 8. Shop drawings and product data

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store piping and specialties in shipping containers with labeling in place.
- B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.
- C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until

connected into system.

## **PART 2 PRODUCTS**

### **2.01 PIPING**

- A. Copper Tube to 7/8 inch OD: ASTM B88 (ASTM B88M), Type K (A), annealed.
  - 1. Fittings: ASME B16.26 cast copper.
  - 2. Joints: Flared.
- B. Pipe Supports and Anchors:
  - 1. Provide hangers and supports that comply with MSS SP-58.
    - a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
  - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron adjustable swivel, split ring.
  - 3. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
  - 4. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
  - 5. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

### **2.02 MOISTURE AND LIQUID INDICATORS**

- A. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

### **2.03 FILTER-DRIERS**

- A. Performance:
  - 1. Flow Capacity - Liquid Line: As indicated in schedule, minimum, rated in accordance with AHRI 710.
  - 2. Pressure Drop: 2 psi, maximum, when operating at full connected evaporator capacity.
  - 3. Design Working Pressure: 350 psi, minimum.
- B. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.
- C. Construction: UL listed.
  - 1. Connections: As specified for applicable pipe type.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

### **3.02 INSTALLATION**

- A. Install refrigeration specialties in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain

gradient.

- C. Install piping to conserve building space and avoid interference with use of space.
- D. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.
- G. Provide clearance for installation of insulation and access to valves and fittings.
- H. Flood piping system with nitrogen when brazing.

### 3.03 FIELD QUALITY CONTROL

- A. Test refrigeration system in accordance with ASME B31.5.
- B. Pressure test system with dry nitrogen to 200 psi. Perform final tests at 27 inches vacuum and 200 psi using halide torch. Test to no leakage.

**END OF SECTION**

**SECTION 15410 - PLUMBING FIXTURES**

**PART 1 GENERAL**

1.01 SECTION INCLUDES (See Plumbing Fixture Schedule on Drawing P0.0)

1.02 Owner purchases the following equipment and supplies to the contractor for installation by the contractor. WC-1, WC-2, L-2A MSB-1 and SK-1. Fittings and trim are to be owner furnished and contractor installed.

- A. Water closets.
- B. Lavatories.
- C. Service sinks.
- D. Electric water coolers.
- E. Showers.
- F. Faucets.

1.03 RELATED REQUIREMENTS

- A. Section 15145 - Plumbing Piping.
- B. Section 15146 - Plumbing Specialties.
- C. Section 15430 - Plumbing Equipment.

1.04 REFERENCE STANDARDS

- A. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration.
- B. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; The American Society of Mechanical Engineers.
- C. ASME A112.18.1 - Plumbing Supply Fittings; The American Society of Mechanical Engineers.
- D. ASME A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use); The American Society of Mechanical Engineers.
- E. ISSFA-2 - Classification and Standards for Solid Surfacing Material; International Solid Surface Fabricators Association

1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Manufacturer's Instructions: Indicate installation methods and procedures.
- D. Maintenance Data: Include fixture trim exploded view and replacement parts lists.
- E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

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- F. Operation and Maintenance Manuals: Include in manuals the information listed below. For information on how to prepare and submit manuals see section 1780 (Closeout Submittals).
  - 1. Recommended spare parts
  - 2. Spare parts lists
  - 3. Operating instructions
  - 4. Maintenance instructions, including preventative and corrective maintenance.
  - 5. Copies of warranties
  - 6. Shop drawings and product data

**1.06 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience, and service facility within 100 miles of Project.
- C. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

**1.07 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

**1.08 REGULATORY REQUIREMENTS**

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

**1.09 DELIVERY, STORAGE, AND HANDLING**

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

**1.10 WARRANTY**

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for electric water cooler.

**PRODUCTS**

**2.01 MANUFACTURERS**

- A. Plumbing Fixtures (Water Closets and Lavatories)
  - 1. American Standard; U.S. Plumbing Products
  - 2. Crane
  - 3. Kohler Co.
  - 4. Eljer Co.
- B. Faucets:
  - 1. American Standard
  - 2. Chicago Faucet
  - 3. T & S Brass



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4. Delta Faucet Co.

C. Supplies and P-traps:

1. American Standard
2. Kohler Co.
3. T & S Brass
4. McGuire Manufacturing Co.

D. ADA Trim Insulation

1. McGuire ProWrap
2. Plumberex
3. Tru Boro

2.02 ELECTRIC WATER COOLERS

A. Electric Water Cooler Manufacturers:

1. Tri Palm International/Oasis: [www.tripalmint.com](http://www.tripalmint.com).
2. Elkay Manufacturing Company: [www.elkay.com](http://www.elkay.com).
3. Haws Corporation: [www.hawsc.com](http://www.hawsc.com).

2.03 MOP SERVICE BASIN

A. MSB: Mop Basin Manufacturers:

1. Fiat
2. Stern Williams

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

3.02 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

- A. Install components level and plumb.
- B. Install and secure fixtures in place with wall supports and bolts.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.05 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING

- A. Clean plumbing fixtures and equipment.

3.07 SCHEDULES

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A. Fixture Heights: Install fixtures to heights above finished floor as indicated.

1. Water Closet:
  - a. Standard: 15 inches to top of bowl rim.
  - b. Accessible: 18 inches to top of seat.
2. Water Closet Flush Valves:
  - a. Standard: 11 inches min. above bowl rim.
  - b. Recessed: 10 inches min. above bowl rim.
3. Lavatory: ( See Architectural Drawings.)
4. Drinking Fountain:
  - a. Child: 30 inches to top of basin rim.
  - b. Standard Adult: 40 inches to top of basin rim.
  - c. Accessible: 36 inches to top of spout.

B. Fixture Rough-In

1. Water Closet (Flush Valve Type):
  - a. Cold Water: 1 Inch.
  - b. Waste: 4 Inch.
  - c. Vent: 2 Inch.
2. Lavatory:
  - a. Hot Water: 1/2 Inch.
  - b. Cold Water: 1/2 Inch.
  - c. Waste: 1-1/2 Inch.
  - d. Vent: 1-1/4 Inch.
3. Service Sink:
  - a. Hot Water: 1/2 Inch.
  - b. Cold Water: 1/2 Inch.
  - c. Waste: 3 Inch.
  - d. Vent: 1-1/2 Inch.
4. Water Cooler:
  - a. Cold Water: 1/2 Inch.
  - b. Waste: 1-1/4 Inch.
  - c. Vent: 1-1/4 Inch.
5. Shower:
  - a. Hot Water: 1/2 Inch.
  - b. Cold Water: 1/2 Inch.
  - c. Waste: 1-1/2 Inch.
  - d. Vent: 1-1/4 Inch.

**END OF SECTION**

**SECTION 15430 - PLUMBING EQUIPMENT**

PART 1 GENERAL

1.01 SECTION INCLUDES

1.02 Water heater and pump shall be owner furnished and contractor installed.

- A. Water heaters.
- B. Pumps.
  - 1. Circulators.

1.03 RELATED REQUIREMENTS

- A. Section 15073 - Vibration and Seismic Control.

1.04 REFERENCE STANDARDS

- A. ASME (BPV VIII, 1) - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; The American Society of Mechanical Engineers.

1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittals procedures.
- B. Shop Drawings:
  - 1. Indicate dimensions, size of tappings, and performance data.
  - 2. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.
- C. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- E. Operation and Maintenance Manuals: Include in manuals the information listed below. For information on how to prepare and submit manuals see section 1780 (Closeout Submittals).
- F. Safety instructions
- G. Recommended spare parts
- H. Spare parts lists
- I. Operating instructions
- J. Maintenance instructions, including preventative and corrective maintenance.
- K. Copies of warranties
- L. Wiring diagrams
- M. Shop drawings and product data

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

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**1.07 CERTIFICATIONS**

- A. Water Heaters: NSF approved.
- B. Electric Water Heaters: UL listed and labeled to UL 174 or UL 1453.
- C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

**1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

**1.09 WARRANTY**

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for domestic water heaters.

**PART 2 PRODUCTS**

**2.01 WATER HEATER MANUFACTURERS**

- A. A.O. Smith Water Products Co: [www.hotwater.com](http://www.hotwater.com).
- B. Bock Water Heaters, Inc: [www.bockwaterheaters.com](http://www.bockwaterheaters.com).
- C. Reco
- D. Rheem Manufacturing Company: [www.rheem.com](http://www.rheem.com).
- E. Substitutions: See Section 01600 - Product Requirements.

**2.02 COMMERCIAL ELECTRIC WATER HEATERS**

- A. Type: Factory-assembled and wired, electric, vertical storage.
- B. Tank: Glass lined welded steel; 4 inch diameter inspection port, thermally insulated with minimum 2 inches glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish.
- C. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 180 degrees F, flanged or screw-in nichrome elements, high temperature limit thermostat.
- D. Accessories: Provide:
  - 1. Water connections: Brass.
  - 2. Drain Valve.
  - 3. Temperature and Pressure Relief Valve: ASME labelled.
- E. Tank: Welded steel ASME labelled pressure vessel; glass lining, mounted on steel channel base with lifting lugs, insulated with 2 inch glass fiber; enclosed with 16 gage steel jacket; baked enamel finish.
- F. Heating Elements: Flange-mounted immersion elements; individual elements sheathed with Incoloy corrosion-resistant metal alloy, rated less than 75 Watts per square inch.

**2.03 IN-LINE CIRCULATOR PUMPS**

- A. Manufacturers:
  - 1. Armstrong Pumps Inc: [www.armstrongpumps.com](http://www.armstrongpumps.com).
  - 2. ITT Bell & Gossett: [www.bellgossett.com](http://www.bellgossett.com).

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3. PACO
  4. SIHI Group: [www.sterlingsihi.com](http://www.sterlingsihi.com).
  5. Substitutions: See Section 01600 - Product Requirements.
- B. Casing: Bronze, rated for 125 psig working pressure, with stainless steel rotor assembly.
- C. Impeller: Bronze.
- D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.
- E. Seal: Carbon rotating against a stationary ceramic seat.
- F. Drive: Flexible coupling.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.

**END OF SECTION**

**SECTION 15731 - SMALL SPLIT-SYSTEM HEATING AND COOLING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Air-source heat pumps.
- B. Air cooled condensing units.
- C. Controls.

**1.02 RELATED REQUIREMENTS**

**1.03 REFERENCE STANDARDS**

- A. AHRI 210/240 - Standard for Performance Rating of Unitary Air Conditioning and Air-Source Heat Pump Equipment; Air-Conditioning, Heating, and Refrigeration Institute.
- B. AHRI 270 - Sound Rating of Outdoor Unitary Equipment; Air-Conditioning, Heating, and Refrigeration Institute.
- C. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; Air-Conditioning, Heating, and Refrigeration Institute.
- D. ASHRAE Std 23.1 - Methods of Testing for Rating Positive Displacement Refrigerant Compressors and Condensing Units; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc..
- E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association.
- F. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Mitsubishi.
- B. Daikin.
- C. Sanyo.
- D. Substitutions: See Section 01600 - Product Requirements.

**2.02 SYSTEM DESIGN**

- A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
  - 1. Heating and Cooling: Air-source electric heat pump located in outdoor unit with evaporator coil in central ducted indoor unit.
  - 2. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.
- B. Performance Requirements: See Drawings for additional requirements.
- C. Electrical Characteristics:

1. 240 volts, single phase, 60 Hz.

### 2.03 INDOOR UNITS FOR DUCTED SYSTEMS

- A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating and cooling element(s), controls, and accessories; wired for single power connection with control transformer.
  1. Air Flow Configuration: Horizontal.
- B. Supply Fan: Direct-driven with DC brushless motor
- C. Filter: Polypropylene honeycomb type
- D. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
  1. Construction and Ratings: In accordance with AHRI 210/240 and UL listed.
  2. Manufacturers: System manufacturer.
- E. Condensate removal: lifts to 21-11/16"

### 2.04 OUTDOOR UNITS

- A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
  1. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23 and UL listed.
- B. Air Cooled Condenser: ARI 520; Aluminum fin and copper tube coil, with direct drive axial propeller fan resiliently mounted, galvanized fan guard.
- C. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gage ports, thermometer well (in liquid line).
  1. Provide thermostatic expansion valves.
- D. Operating Controls:
  1. Control by room thermostat to maintain room temperature setting.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.
- B. Verify that proper power supply is available and in correct location.

### 3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.
- B. Install in accordance with NFPA 90A and NFPA 90B.

**END OF SECTION**

**SECTION 15735 - PACKAGED AIR CONDITIONING UNITS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Packaged unit.
- B. Unit controls.

**1.02 RELATED REQUIREMENTS**

**1.03 REFERENCE STANDARDS**

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilation Systems; National Fire Protection Association.
- B. ANSI/AHRI Standard 340/360 performance rating of commercial and industrial unitary air-conditioning and heat pump equipment.
- C. UL Standard 1995/CSA C22.2 No. 236, Safety Standard for Heating and Cooling Equipment.
- D. ASHRAE 15, Safety Standard for Mechanical Refrigeration.
- E. ASHRAE 90.1, Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.

**1.04 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
- C. Shop Drawings: Indicate capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
- D. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start-up instructions.
- E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- F. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01600 - Product Requirements, for additional provisions.
  - 2. Extra Filters: One set for each unit.
- H. Operation and Maintenance Manuals: Include in manuals the information listed below. For information on how to prepare and submit manuals see section 1780 (Closeout Submittals).
  - 1. Recommended spare parts
  - 2. Spare parts lists
  - 3. Operating instructions
  - 4. Maintenance instructions, including preventative and corrective maintenance.



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5. Copies of warranties
6. Wiring diagrams
7. Shop drawings and product data

**1.05 WARRANTY**

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Provide a three year warranty from the equipment startup to include parts, refrigerant, and labor. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided manufacturer's written instructions for installation, operation and maintenance have been followed. Warranty excludes parts associated with routine maintenance, such as belts and air filters.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Aaon.
- B. Substitutions: See Section 01600 - Product Requirements.

**2.02 AIR CONDITIONING UNITS**

- A. General Description
  1. Packaged rooftop unit shall include compressor, evaporator coil, filters, supply fan, dampers, air-cooled condenser coils, condenser fan, reheat coil, electric heater, and unit controls.
  2. Unit shall be factory assembled and tested including leak testing of the DX coils, pressure testing of the refrigeration circuit, and run testing of the completed unit. Run test report shall be supplied with the unit in the service compartment's literature pocket.
  3. Unit shall have decals and tags to indicate lifting and rigging, service areas and caution areas for safety and to assist service personnel.
  4. Unit components shall be labeled, including refrigeration system components and electrical and controls components.
  5. Estimated sound power levels (dB) shall be shown on the unit ratings sheet.
  6. Installation, Operation and Maintenance manual shall be supplied within the unit.
  7. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment's hinged access door.
  8. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment's hinged access door.
- B. Construction
  1. All cabinet walls, access doors, and roof shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.
  2. Unit insulation shall have a minimum thermal resistance R-value of 13. Foam insulation shall have a minimum density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D-1929 for a minimum flash ignition temperature of 610°F.
  3. Unit construction shall be double wall with G90 galvanized steel on both sides and a thermal break. Double wall construction with a thermal break prevents moisture accumulation on the insulation, provides a cleanable interior, prevents heat transfer through the panel, and prevents exterior condensation on the panel.
  4. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Cabinet leakage shall not exceed 1% of total airflow when tested at 3 times the minimum external

static pressure provided in AHRI Standard 210/240. Panel deflection shall not exceed L/240 ratio at 125% of design static pressure, at a maximum 8 inches of positive or negative static pressure, to reduce air leakage. Deflection shall be measured at the midpoint of the panel height and width. Continuous sealing shall be included between panels and between access doors and openings to reduce air leakage. Piping and electrical conduit through cabinet panels shall include sealing to reduce air leakage.

5. Roof of the air tunnel shall be sloped to provide complete drainage. Cabinet shall have rain break overhangs above access doors.
6. Access to filters, dampers, cooling coil, reheat coil, heater, compressor, and electrical and controls components shall be through hinged access doors with quarter turn, lockable handles. Full length stainless steel piano hinges shall be included on the doors.
7. Exterior paint finish shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.
8. Units shall include double sloped 304 stainless steel drain pans.
9. Unit shall be provided with left side horizontal discharge and return air openings. All openings through the unit shall have upturned flanges of at least 1/2 inch around the opening.
10. Unit shall include lifting lugs on the top of the unit.

**C. Electrical**

1. Unit shall be provided with factory installed and factory wired, non-fused disconnect switch.
2. Unit shall be provided with phase and brown out protection which shuts down all motors in the unit if the electrical phases are more than 10% out of balance on voltage, the voltage is more than 10% under design voltage or on phase reversal.

**D. Supply Fans**

1. Unit shall include direct drive, unhooded, backward curved, plenum supply fans.
2. Blowers and motors shall be dynamically balanced and mounted on rubber isolators.
3. Motor shall be inverter rated efficiency ODP with ball bearings rated for 200,000 hours service with external lubrication points.
4. Variable frequency drive shall be factory wired and mounted in the unit. Fan motor shall be inverter rated efficiency.

**E. Cooling Coils**

1. Evaporator Coils
  - a. Coils shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and aluminum end casings. Fin design shall be sine wave rippled.
  - b. Coil shall be 6 row high capacity
  - c. Coils shall be helium leak tested.
  - d. Coils shall be furnished with factory installed thermostatic expansion valves.

**F. Refrigeration System**

1. Unit shall be factory charged with R-410A refrigerant.
2. Compressors shall be scroll type with thermal overload protection and carry a 5 year non-prorated warranty, from the date of original equipment shipment from the factory.
3. Compressors shall be mounted in an isolated service compartment which can be accessed without affecting unit operation. Lockable hinged compressor access doors shall be fabricated of double wall, rigid polyurethane foam injected panels to prevent the

transmission of noise outside the cabinet.

4. Compressors shall be isolated from the base pan with the compressor manufacturer's recommended rubber vibration isolators, to reduce any transmission of noise from the compressors into the building area.
5. Each refrigeration circuit shall be equipped with thermostatic expansion valve type refrigerant flow control.
6. Each refrigeration circuit shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant safety controls, Schrader type service fittings on both the high pressure and low pressure sides and a factory installed replaceable core liquid line filter driers.
7. Unit shall include a variable capacity scroll compressor on the refrigeration circuit which shall be capable of modulation from 10-100% of its capacity.
8. Refrigeration circuit shall be provided with hot gas reheat coil, modulating valves, electronic controller, supply air temperature sensor and a control signal terminal which allow the unit to have a dehumidification mode of operation, which includes supply air temperature control to prevent supply air temperature swings and overcooling of the space.
9. Refrigeration circuit shall include adjustable compressor lockouts.

**G. Condensers**

1. Air-Cooled Condenser
  - a. Condenser fans shall be a vertical discharge, axial flow, direct drive fans.
  - b. Coils shall be designed for use with R-410A refrigerant.
  - c. Condenser coils shall be multi-pass and fabricated from aluminum microchannel tubes.
  - d. Coils shall be designed for a minimum of 10°F of refrigerant sub-cooling.
  - e. Coils shall be helium leak tested.
  - f. Condenser fans shall be high efficiency electrically commutated motor driven with multiple speeds which are controlled with a fan cycle switch based on head pressure and allow matching condenser airflow with cooling capacity steps.

**H. Electric Heating**

1. Unit shall include an electric heater consisting of electric heating coils, fuses and a high temperature limit switch, with capacities as shown on the plans.
2. Electric heating coils shall be located in the reheat position downstream of the cooling coil.
3. Electric heater shall have full modulation capacity controlled by an SCR (Silicon Controlled Rectifier). A 0-10 VDC heating control signal shall be field provided to control the amount of heating.

**I. Filters**

1. Unit shall include 2 inch thick, pleated panel filters with an ASHRAE efficiency of 30% and MERV rating of 8, upstream of the cooling coil.

**J. Outside Air/Economizer**

1. Unit shall include 0-100% economizer consisting of a motor operated outside air damper and return air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 15 CFM of leakage per sq. ft. of damper area when subjected to 2 inches w.g. air pressure differential across the damper. Unit shall include outside air opening bird screen, outside air hood with rain lip and barometric relief dampers.
2. Damper assembly shall be controlled by spring return DDC actuator.

**K. Controls**

1. Factory Installed and Factory Provided Controller
  - a. Unit controller shall be capable of controlling all features and options of the unit. Controller shall be factory installed in the unit controls compartment and factory tested.
  - b. Controller shall be capable of stand alone operation with unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling available without dependence on a building management system.
  - c. Controller shall have an onboard clock and calendar functions that allow for occupancy scheduling.
  - d. Controller shall include non-volatile memory to retain all programmed values without the use of a battery, in the event of a power failure.
  - e. Constant Volume Controller
    - 1) Unit shall modulate cooling with constant airflow to meet space temperature cooling loads.
    - 2) With modulating hot gas reheat, unit shall modulate cooling and hot gas reheat as efficiently as possible, to meet space humidity loads and prevent supply air temperature swings and overcooling of the space.
    - 3) Unit shall modulate heating with constant airflow to meet space temperature heating loads. Modulating heating capacity shall modulate based on supply air temperature.
  - f. Unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling shall be accomplished with connection to interface module with LCD screen and input keypad, interface module with touch screen, or with connection to PC with free configuration software. Controller shall be capable of connection with other factory installed and factory provided unit controllers with individual unit configuration, setpoint adjustment, sensor status viewing, and occupancy scheduling available from a single unit. Connection between unit controllers shall be with a modular cable. Controller shall be capable of communicating and integrating with a LonWorks or BACnet network.
  - g. Building Static Pressure Sensor will modulate outdoor air damper to provide a slight positive pressure in the space when the exhaust fan turns on.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings.
- B. Verify that proper power supply is available.

**3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NFPA 90A.

**3.03 SYSTEM STARTUP**

- A. Prepare and start equipment. Adjust for proper operation.

**3.04 CLOSEOUT ACTIVITIES**

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- A. Demonstrate operation to Owner's maintenance personnel.

**END OF SECTION**

**SECTION 15810 - DUCTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal ductwork.
- B. Duct cleaning.

1.02 RELATED REQUIREMENTS

- A. Section 15086 - Duct Insulation: External insulation and duct liner.
- B. Section 15820 - Duct Accessories.
- C. Section 15950 - Testing, Adjusting, and Balancing.

1.03 REFERENCE STANDARDS

- A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association.
- E. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association.
- F. SMACNA (DCS) - HVAC Duct Construction Standards.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for duct materials.
- C. Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for 250 cfm pressure class and higher systems.
- D. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual.
- E. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.
- F. Operation and Maintenance Manuals: Include in manuals the information listed below. For information on how to prepare and submit manuals see section 1780 (Closeout Submittals).
  - 1. Shop drawings and product data

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 REGULATORY REQUIREMENTS

- A. Construct ductwork to NFPA 90A standards.

#### 1.07 FIELD CONDITIONS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

### PART 2 PRODUCTS

#### 2.01 DUCT ASSEMBLIES

#### 2.02 MATERIALS

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90/Z275 coating.
- B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
  - 1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
  - 2. VOC Content: Not more than 250 g/L, excluding water.
  - 3. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E84.
- C. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.
- D. Low Pressure Supply (System with Cooling Coils): 2 inch w.g. pressure class, galvanized steel.
- E. Return and Relief: 1 inch w.g. pressure class, galvanized steel.
- F. General Exhaust: 1 inch w.g. pressure class, galvanized steel.

#### 2.03 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards and as indicated.
- B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.
- D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- E. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA HVAC Duct Construction Standards.
- F. Clean shop fabricated ductwork of debris, oil and grease. Cover ends of ductwork with temporary closure material and tape. Protect ductwork from entry of dust and debris during shop storage, shipment and temporary storage at the job site.
- G. Wipe the inside of all ductwork to remove the debris, oil, grease, etc. Once ductwork is clean, cover with plastic or metal temporary closure material. Seal tight so that no water, moisture or debris can enter the ductwork. Protect ductwork from entry of dust and debris during shop

storage, shipment and temporary storage at the job site.

#### 2.04 MANUFACTURED DUCTWORK AND FITTINGS

- A. Flexible Ducts: Two ply vinyl film supported by helically wound spring steel wire.
  - 1. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
  - 2. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
  - 3. Maximum Velocity: 4000 fpm.
  - 4. Temperature Range: -10 degrees F to 160 degrees F.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA HVAC Duct Construction Standards.
- B. Install in accordance with manufacturer's instructions.
- C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- D. Flexible Ducts: Connect to metal ducts with adhesive.
- E. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- F. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- G. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- H. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.
- I. Use double nuts and lock washers on threaded rod supports.
- J. Leave temporary closures in place until ready for installation. At no time during the installation of the ductwork shall there be any openings that are not protected by temporary closures except for the section that is being installed at that time.
- K. Provide temporary closures on the face of all grilles, registers and diffusers.
- L. At exterior wall louvers, seal duct to louver frame and install blank-out panels.
- M. Seal all joints with sealant.
- N. Provide pressure testing on all isolation exhaust ductwork.

#### 3.02 CLEANING

- A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that could be harmed by excessive dirt with temporary filters, or bypass during cleaning.
- B. Ductwork Seal Class:



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1. Supply (Heating Systems): Class A
2. Return and Relief: Class A.
3. General Exhaust: Class A.

**END OF SECTION**

**SECTION 15820 - DUCT ACCESSORIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Air turning devices/extractors.
- B. Backdraft dampers - metal.
- C. Duct test holes.
- D. Flexible duct connections.
- E. Volume control dampers.

**1.02 RELATED REQUIREMENTS**

- A. Section 15073 - Vibration and Seismic Controls for HVAC Piping and Equipment.
- B. Section 15810 - Ducts.

**1.03 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.
- C. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers.
- D. Manufacturer's Installation Instructions: Provide instructions for fire dampers.
- E. Operation and Maintenance Manuals: Include in manuals the information listed below. For information on how to prepare and submit manuals see section 1780 (Closeout Submittals).
  - 1. Spare parts lists
  - 2. Operating instructions
  - 3. Maintenance instructions, including preventative and corrective maintenance.
  - 4. Copies of warranties
  - 5. Wiring diagrams
  - 6. Shop drawings and product data

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Protect dampers from damage to operating linkages and blades.

**PART 2 PRODUCTS**

**2.01 AIR TURNING DEVICES/EXTRACTORS**

- A. Manufacturers:
  - 1. Krueger: [www.krueger-hvac.com](http://www.krueger-hvac.com).
  - 2. Ruskin Company: [www.ruskin.com](http://www.ruskin.com).
  - 3. Titus: [www.titus-hvac.com](http://www.titus-hvac.com).

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4. Substitutions: See Section 01600 - Product Requirements.

- B. Multi-blade device with radius blades attached to pivoting frame and bracket, steel construction, with push-pull operator strap.

**2.02 BACKDRAFT DAMPERS - METAL**

- A. Gravity Backdraft Dampers, Size 18 x 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

**2.03 DUCT TEST HOLES**

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

**2.04 FLEXIBLE DUCT CONNECTIONS**

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.
- B. Flexible Duct Connections: Fabric crimped into metal edging strip.
  - 1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
    - a. Net Fabric Width: Approximately 2 inches wide.
- C. Maximum Installed Length: 14 inch.

**2.05 VOLUME CONTROL DAMPERS**

- A. Manufacturers:
  - 1. Nailor Industries Inc: [www.nailor.com](http://www.nailor.com).
  - 2. Ruskin Company: [www.ruskin.com](http://www.ruskin.com).
  - 3. Pottorff.
  - 4. Substitutions: See Section 01600 - Product Requirements.
- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.
- C. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.
  - 1. Fabricate for duct sizes up to 6 x 30 inch.
  - 2. Blade: 24 gage, minimum.
- D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- F. Quadrants:
  - 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
  - 2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
  - 3. Where rod lengths exceed 30 inches provide regulator at both ends.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards. Refer to Section 15810 for duct construction and pressure class.
- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct test holes where indicated and required for testing and balancing purposes.
- D. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- E. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- F. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- G. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

**END OF SECTION**

**SECTION 15831 - AIR CURTAINS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Air curtains.

**1.02 RELATED REQUIREMENTS**

- A. Section 16155 - Equipment Wiring: Connection to building power.

**1.03 SUBMITTALS**

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's descriptive literature for products specified in this section; indicate options specified.
- C. Manufacturer's instructions: Printed installation instructions for each product specified.
- D. Shop Drawings: Indicate installation and connection details for air curtains.
- E. Operation and Maintenance Manuals: Include in manuals the information listed below. For information on how to prepare and submit manuals see section 1780 (Closeout Submittals).
  - 1. Local representative
  - 2. Recommended spare parts
  - 3. Spare parts lists
  - 4. Operating instructions
  - 5. Maintenance instructions, including preventative and corrective maintenance.
  - 6. Copies of warranties
  - 7. Wiring diagrams
  - 8. Shop drawings and product data

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Store products of this section in manufacturer's unopened packaging until installation.
- B. Maintain dry, heated storage area for products of this section until installation of products.

**1.05 WARRANTY**

- A. Supply manufacturer's standard warranty against defects in product workmanship and materials.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Berner International Corp.: [www.berner.com](http://www.berner.com).
- B. MARS Air Systems: [www.marsair.com](http://www.marsair.com).
- C. Substitutions: See Section 01600 - Product Requirements.

**2.02 AIR CURTAINS**

- A. Product Description: Self-contained electrically-operated air curtain for mounting at head of door openings.
  - 1. Maximum Mounting Height: 7 feet.

- B. Motor Fan Assembly: Design for easy removal, assembly, repair and maintenance.
  - 1. Motor: Totally enclosed air over (TEAO) cooled motor with sealed lifetime pre-lubricated ball bearings, motor starter and thermal overload protection.
  - 2. Electrical Characteristics: 115V AC, single phase; 2.4 Amp (units up to 48 inches wide) or 2.6 Amp (units 60 to 72 inches wide) full load per motor/fan.
  - 3. Fans: Forward curved centrifugal type, double width, and double inlet design, directly driven to an electric motor.
  - 4. Provide resilient isolation dampening mountings between motor frame and motor mounting pan.
  - 5. Factory balanced blower wheel assembly statically and dynamically.
  
- C. Housing: Self contained one-piece type with sufficient strength for mounting from pre-punched mounting holes at both ends to adjacent walls or ceiling without intermediate support.
  - 1. Size:
    - a. Unheated: 10-3/4 inches deep by 8 inches high (including discharge nozzle) by width of unit.
  - 2. Mounting:
    - a. Unheated Inside Mount.
  - 3. Material:
    - a. Provide 18 and 20 gauge electro or hot dipped galvanized steel sheet housing conforming to ASTM A 591 and/or ASTM A 653.
  - 4. Air Inlet Grille and/or Filters: Provide air inlet grille and/or filters specified.
  - 5. Discharge: Provide integral discharge nozzle specified.
  - 6. Finish and Color: Provide with, no VOC, corrosion resistant polyurethane powder coated finish for sheet steel housings.
    - a. Custom color as selected by the Architect.
  
- D. Insect Control Air Curtains: Models for Concession Stand Heights to 4 feet (1219 mm) or Customer Entry Heights to 7 feet (2134 mm) certified to NSF/ANSI Standard 37.
  - 1. Discharge Nozzle: Wedge-shaped discharge outlet nozzle with adjustable air foil vanes with a plus/minus 40 degree sweep front to back.
  - 2. Air Velocity at Nozzle:
    - a. 1800 feet/min
  - 3. Air Speed at Floor:
    - a. Customer entry doors require a minimum of 600 fpm (3.05 m/s) at 3 feet (914 mm) from floor.
  - 4. Air Inlet Grille and Filters:
    - a. Location: Front.
    - b. Speed: 625 cu ft/min (295 L/s), minimum, per motor/fan assembly.
    - c. Type: Fixed air intake grille.

### 2.03 COMPONENTS

- A. Door-Activated Limit switch(s): Provide, field installed 115-Volts, 20 amps limit switch to control air curtain(s) as follows; Automatic on/off control, activates air curtain when door is opened and turns off when door is closed. Provide limit switch for direct control one 1 HP or up to two 1/2 HP single phase motors without a separate control panel.
  - 1. Type: Combination plunger/roller switch for swing and sliding doors.
    - a. Provide limit switches with NEMA 1 (20 amps) ratings in locations indicated.
  - 2. Operation for Unheated Units: Automatic on/off control, on when door is opened, off when door is closed.

3. Provide mounting hardware as required for the opening.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify that required utilities are in correct location and are of correct capacities for specified products.
- B. Verify that mounting surfaces have sufficient strength to support units.
- C. Verify that space is ready for installation of units.
- D. Verify clearances required to maintain the units.
- E. Verify openings to receive air curtains are plumb, level, square, accurately aligned, correctly located, and in tolerance.

#### 3.02 INSTALLATION

- A. Install air curtains in accordance with shop drawings and manufacturer's printed installation instructions.
- B. Maintain clearances required to maintain the units.
- C. Ensure proper connection to utilities.
- D. Install air curtains plumb, level, square, true to line, and weathertight, without warp or rack.
- E. Anchor air curtains securely in place to supports.
- F. Install electrical power as specified in Section 16100.
- G. Install door limit switches and adjust for correct operation.

**END OF SECTION**

**SECTION 15833 - CENTRIFUGAL FANS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Inline centrifugal fans.
- B. Motors and drives.
- C. Fan accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 15086 - Duct Insulation.
- B. Section 15820 - Duct Accessories: Backdraft dampers.

**1.03 REFERENCE STANDARDS**

- A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; American Bearing Manufacturers Association, Inc..
- B. AMCA 99 - Standards Handbook; Air Movement and Control Association International, Inc..
- C. AMCA (DIR) - [Directory of] Products Licensed Under AMCA International Certified Ratings Program; Air Movement and Control Association International, Inc..
- D. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; Air Movement and Control Association International, Inc..
- E. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association.
- F. SMACNA (DCS) - HVAC Duct Construction Standards.

**1.04 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on centrifugal fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.
- C. Shop Drawings: Indicate assembly of centrifugal fans and accessories including fan curves with specified operating point clearly plotted, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.
- D. Manufacturer's Instructions: Include complete installation instructions.
- E. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01600 - Product Requirements, for additional provisions.
  - 2. Extra Fan Belts: One set for each individual fan.
- G. Operation and Maintenance Manuals: Include in manuals the information listed below. For information on how to prepare and submit manuals see section 1780 (Closeout Submittals).
  - 1. Recommended spare parts



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2. Spare parts lists
3. Operating instructions
4. Maintenance instructions, including preventative and corrective maintenance.
5. Copies of warranties
6. Wiring diagrams
7. Shop drawings and product data

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Protect motors, shafts, and bearings from weather and construction dust.

**1.07 FIELD CONDITIONS**

- A. Permanent fans may not be used for ventilation during construction.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Loren Cook Company: [www.lorencook.com](http://www.lorencook.com).
- B. PennBarry: [www.pennbarry.com](http://www.pennbarry.com).
- C. Greenheck: [www.greenheck.com](http://www.greenheck.com).
- D. Substitutions: See Section 01600 - Product Requirements.

**2.02 WHEEL AND INLET**

- A. Wheel shall be centrifugal backward inclined, constructed of 100 percent aluminum, including a precision machined cast aluminum hub. An aerodynamic aluminum inlet cone shall be provided for maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-05, Balance Quality and Vibration Levels for Fans

**2.03 HOUSING**

- A. The fan shall be of bolted construction utilizing corrosion resistant fasteners. Housing shall be minimum 18 gauge galvanized steel with integral duct collars. Bolted access doors shall be provided on three sides, sealed with closed cell neoprene gasketing. Housing shall be pre-drilled to accommodate universal mounting feet for vertical or horizontal installation. Unit shall bear an engraved aluminum nameplate. Nameplate shall indicate design CFM and static pressure. Unit shall be shipped in ISTA Certified Transit Tested Packaging.

**2.04 MOTOR**

- A. Motor (EC): Motor shall be an electronically commutated motor rated for continuous duty and furnished either with internally mounted potentiometer speed controller with leads for connection to 0-10 VDC external controller.

**2.05 ACCESSORIES**

- A. Disconnect Switch

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B. Motorized Backdraft Damper

C. Birdscreen

**PART 3 EXECUTION**

**3.01 INSTALLATION**

A. Install in accordance with manufacturer's instructions.

B. Install fans with resilient mountings and flexible electrical leads. Refer to Section 15073.

**END OF SECTION**

**SECTION 15850 - AIR OUTLETS AND INLETS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Diffusers.
- B. Registers/grilles.
- C. Louvers.

**1.02 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.
- C. Project Record Documents: Record actual locations of air outlets and inlets.
- D. Operation and Maintenance Manuals: Include in manuals the information listed below. For information on how to prepare and submit manuals see section 1780 (Closeout Submittals).
  - 1. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
  - 2. Shop drawings and product data

**1.03 QUALITY ASSURANCE**

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
- B. Test and rate louver performance in accordance with AMCA 500-L.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Krueger: [www.krueger-hvac.com](http://www.krueger-hvac.com).
- B. Price Industries: [www.price-hvac.com](http://www.price-hvac.com).
- C. Titus: [www.titus-hvac.com](http://www.titus-hvac.com).
- D. Substitutions: See Section 01600 - Product Requirements.

**2.02 WALL SLOT DIFFUSERS**

- A. Type: Continuous 1 inch wide slot, 1 slots wide, with adjustable vanes for left, right, or vertical discharge.
- B. Fabrication: Aluminum extrusions with factory clear lacquer finish.
- C. Color: To be selected by Architect from manufacturer's standard range.

- D. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket, mitered end border.
- E. Plenum: Integral, galvanized steel, insulated.

#### 2.03 WALL SUPPLY REGISTERS/GRILLES

- A. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, vertical face, single deflection.
- B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.
- C. Fabrication: Steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory baked enamel finish.
- D. Color: To be selected by Architect from manufacturer's standard range.
- E. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

#### 2.04 WALL EXHAUST AND RETURN REGISTERS/GRILLES

- A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with spring or other device to set blades, vertical face.
- B. Frame: 1-1/4 inch margin with countersunk screw mounting.
- C. Fabrication: Steel frames and blades, with factory baked enamel finish.
- D. Color: To be selected by Architect from manufacturer's standard range.

#### 2.05 LOUVERS

- A. Type: 4 inch deep with blades on 37-1/2 degree slope, heavy channel frame, 1/2 inch square mesh screen over exhaust and 1/2 inch square mesh screen over intake.
- B. Color: To be selected by Architect from manufacturer's standard range.
- C. Fabrication: 12 gage thick extruded aluminum, welded assembly, with factory prime coat finish.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

**END OF SECTION**

**SECTION 15940 - HVAC SEQUENCE OF OPERATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.
- B. Sequence of operation for:
  - 1. Packaged Roof Top Unit
  - 2. Exhaust Fan

**1.02 RELATED SECTIONS**

- A. Section 16155 - Equipment Wiring: Electrical characteristics and wiring connections.

**1.03 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.
- C. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.
  - 1. Label with settings, adjustable range of control and limits.
  - 2. Include flow diagrams for each control system, graphically depicting control logic.
  - 3. Include draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.
- D. Project Record Documents: Record actual locations of components and setpoints of controls, including changes to sequences made after submission of shop drawings.

**PART 3 EXECUTION**

**2.01 PACKAGED ROOF TOP UNIT**

- A. The packaged roof top unit shall be controlled by the factory installed controller.
  - 1. During occupied mode the building static pressure sensor shall sense the drop in pressure when the exhaust fan turns on and automatically adjust the outside air to maintain a positive pressure in the building. 1/4" sensing tubing shall be supplied and installed by the mechanical contractor to the area with the greatest pressure drop.
  - 2. In unoccupied mode the outside air damper shall be closed and the unit will run as required to maintain unoccupied space temperatures and humidities.

**2.02 EXHAUST FAN**

- A. The exhaust fan shall be controlled by an occupancy sensor. See electrical drawings and specifications for occupancy sensor requirements.

**END OF SECTION**

**SECTION 15950 - TESTING, ADJUSTING, AND BALANCING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Testing, adjustment, and balancing of air systems.

**1.02 REFERENCE STANDARDS**

- A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council.
- B. ASHRAE Std 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc..
- C. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems; National Environmental Balancing Bureau.
- D. SMACNA (TAB) - HVAC Systems Testing, Adjusting, and Balancing; Sheet Metal and Air Conditioning Contractors' National Association.

**1.03 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
- D. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
  - 1. Submit under provisions of Section 01400.
  - 2. Revise TAB plan to reflect actual procedures and submit as part of final report.
  - 3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
  - 4. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
  - 5. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
  - 6. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
  - 7. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
  - 8. Include the following on the title page of each report:
    - a. Name of Testing, Adjusting, and Balancing Agency.
    - b. Address of Testing, Adjusting, and Balancing Agency.
    - c. Telephone number of Testing, Adjusting, and Balancing Agency.
    - d. Project name.
    - e. Project location.
    - f. Project Architect.

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- g. Project Engineer.
  - h. Project Contractor.
  - i. Project altitude.
  - j. Report date.
- E. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.
- F. TAB Agency Qualifications: Company specializing in the testing, adjusting, and balancing of systems specified in this Section with minimum three years documented experience certified by AABC.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 GENERAL REQUIREMENTS**

- A. Perform total system balance in accordance with one of the following:
  - 1. AABC MN-1, AABC National Standards for Total System Balance.
  - 2. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
  - 3. Maintain at least one copy of the standard to be used at project site at all times.
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- D. TAB Agency Qualifications:
  - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
  - 2. Having minimum of three years documented experience.
  - 3. Certified by one of the following:
    - a. AABC, Associated Air Balance Council: [www.aabchq.com](http://www.aabchq.com); upon completion submit AABC National Performance Guaranty.
    - b. NEBB, National Environmental Balancing Bureau: [www.nebb.org](http://www.nebb.org).
- E. TAB Supervisor Qualifications: Certified by same organization as TAB agency.

**3.02 EXAMINATION**

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
  - 1. Systems are started and operating in a safe and normal condition.
  - 2. Temperature control systems are installed complete and operable.
  - 3. Proper thermal overload protection is in place for electrical equipment.
  - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
  - 5. Duct systems are clean of debris.
  - 6. Fans are rotating correctly.
  - 7. Air coil fins are cleaned and combed.
  - 8. Air outlets are installed and connected.

- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C. Beginning of work means acceptance of existing conditions.

### 3.03 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

### 3.04 RECORDING AND ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

### 3.05 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check



leakage.

- K. Where modulating dampers are provided, take measurements and balance at extreme conditions.
- L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

### 3.06 SCOPE

- A. Test, adjust, and balance the following:
  - 1. Air Handling Units
  - 2. Fans

### 3.07 MINIMUM DATA TO BE REPORTED

- A. Electric Motors:
  - 1. Manufacturer
  - 2. Model/Frame
  - 3. HP/BHP
  - 4. Phase, voltage, amperage; nameplate, actual, no load
  - 5. RPM
  - 6. Service factor
  - 7. Starter size, rating, heater elements
  - 8. Sheave Make/Size/Bore
- B. Air Moving Equipment:
  - 1. Location
  - 2. Manufacturer
  - 3. Model number
  - 4. Serial number
  - 5. Arrangement/Class/Discharge
  - 6. Air flow, specified and actual
  - 7. Return air flow, specified and actual
  - 8. Outside air flow, specified and actual
  - 9. Supply air temperature
  - 10. Total static pressure (total external), specified and actual
  - 11. Inlet pressure
  - 12. Discharge pressure
  - 13. Sheave Make/Size/Bore
  - 14. Number of Belts/Make/Size
  - 15. Fan RPM
- C. Return Air/Outside Air:
  - 1. Identification/location
  - 2. Design air flow
  - 3. Actual air flow
  - 4. Design return air flow
  - 5. Actual return air flow
  - 6. Design outside air flow
  - 7. Actual outside air flow
  - 8. Return air temperature
  - 9. Outside air temperature

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10. Required mixed air temperature
  11. Actual mixed air temperature
  12. Design outside/return air ratio
  13. Actual outside/return air ratio
- D. Exhaust Fans:
1. Location
  2. Manufacturer
  3. Model number
  4. Serial number
  5. Air flow, specified and actual
  6. Total static pressure (total external), specified and actual
  7. Inlet pressure
  8. Discharge pressure
  9. Sheave Make/Size/Bore
  10. Number of Belts/Make/Size
  11. Fan RPM
- E. Duct Traverses:
1. System zone/branch
  2. Duct size
  3. Area
  4. Design velocity
  5. Design air flow
  6. Test velocity
  7. Test air flow
  8. Duct static pressure
  9. Air temperature
  10. Air correction factor

**END OF SECTION**

**SECTION 16010 - GENERAL ELECTRICAL REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Work included in these specifications and included on the drawings shall include furnishing all labor, materials, supplies, and equipment to perform all work required including cutting, channeling, chasing, excavating and backfilling, demolition (if any) to install a complete and working electrical system(s) in accordance with these sections of the specifications and the accompanying drawings. This shall include all required preparation work, demolition, raceways, coordination, etc. required to install the electrical system.
- B. The electrical work shall include, but in no way be limited to the following:
  - 1. Power System Raceways
  - 2. Empty Raceways
    - a. Data Systems
    - b. CATV System
  - 3. Electrical Distribution System
  - 4. Lighting Systems
    - a. Interior
    - b. Exterior
  - 5. Power System
    - a. Interior
    - b. Exterior
  - 6. Wiring Devices
  - 7. Utility Service Entrances
    - a. Power
  - 8. Connection and/or Installation of Devices Furnished Under Other Divisions of the Project Manual

**1.02 RELATED SECTIONS**

- A. Drawings and specifications including General Conditions, Supplementary Conditions and Division 1 specification sections, apply to work of this and all sections in Division 16. Division 16 General Provisions described in this section apply to all sections of Division 16.
- B. It is recognized that separate sub-contracts may be instituted by the General Contractor or the Division 16 Contractor with other contractors and/or suppliers. It is the responsibility of the Division 16 Contractor to completely inform, coordinate and advise those subs as to all of the other requirements, conditions and information associated with providing and installing the total job.

**1.03 SUBSTITUTION AND THE "OR EQUAL" CLAUSE**

- A. Where a manufacturer and/or model number is noted in a specification, that manufacturer and/or model number shall be the equipment used on the project. Substitutions may be allowed for some/all of the specified equipment where approved by the Architect/Engineer per the process as outlined in this section of the specifications. When an item, piece of equipment, method, etc. is specified or called for on the drawings or in the specifications, it shall establish a standard of quality which shall be used to evaluate all substitutions. It is not the intent of this specification to limit competition in any way, however; in some evaluations the decision of equality comes down to personal opinion. In all evaluations, the opinion and decision of the

engineer shall be final and binding to all parties.

- B. All substitutions to the specified equipment manufacturer, make, or model, shall be approved before bid. Request to substitute and material, item, or method for a specified material, item, or method shall be made in writing and submitted so as to be received by the engineer at least ten (10) days before bid date. All approved request shall be noted in an addendum. Only the specified materials and items noted in the addendum as approved equals shall be used on the project.
- C. All submittals to request to substitute shall clearly describe the product. Request to substitute shall include catalog descriptive material, engineering data, and also list areas where the requested material exceeds or falls short of the specification for the specified material. Include samples (To be retained in the project file by the Engineer) of the item.
- D. Incomplete submittals, or submittals that require the Engineer to spend considerable time researching the item, will not be considered for approval. The burden of proof that an item is equal to the specified item is on the party requesting the substitution. In all evaluations, the opinion and decision of the engineer shall be final and binding to all parties.
- E. Request to substitute or obtain approval to substitute for an item or material that has been previously turned down, will not be considered.
- F. When approval to substitute an item for the specified item is granted, the approval does not relieve the contractor from compliance with all system functions or equipment characteristics.
- G. When a substituted item requires additional work for another contractor or subcontractor to adjust his work to accommodate the substituted item, the contractor who made the substitution shall pay all cost for accommodation of the substituted item.
- H. As with any substituted item, it is the responsibility of the contractor making the substitution to make the item fit, function, and act as the specified item. If, in the opinion of the engineer, the substituted item does not comply, function, fit, or perform to the standards of the specified item, the contractor shall remove the substituted item and install the specified item, at no cost to the Owner.
- I. Contractor prices shall be based on only the specified items, materials, or methods (or approved equals). There shall be no increase in contract cost when a non-approved item is used in pricing and is not approved by the engineer.

#### 1.04 REFERENCES

- A. The Contractor is responsible for obtaining all required permits and complying with all National (NEC, SBC, NFPA), State, County, and Municipal codes and regulations. This shall include, but not be limited to, the following:
  - 1. NFPA 70 - National Electrical Code; National Fire Protection Association.
  - 2. Federal Occupational Safety and Health Act (OSHA)
  - 3. NFPA 101 (Life Safety Code)
  - 4. Americans with Disabilities Act (ADA).
  - 5. International Building Code (IBC).
- B. Unless noted otherwise, the contractor shall comply with the latest edition and update of any and all codes and standards.
- C. Compliance with Underwriters Laboratories - All products installed under the contract shall

have the Underwriters Laboratories (UL) label where such marking is available. Products which are not UL labeled will not be acceptable if labeled products are available from another approved manufacturer.

- D. The above listed requirements are required of the electrical contractor by this contract whether these requirements are shown on the drawings, mentioned in the specifications or not.
- E. All work and equipment installed that does not comply with the codes and standards noted above shall be corrected and/or replaced (at engineer's option) at no cost to the Owner.
- F. The contractor(s) shall submit all items necessary to obtain all required permits to the appropriate Federal/State/County/City agencies, obtain all required permits, and pay for any and all required fees.

#### 1.05 DEFINITIONS

- A. Concealed - Embedded in masonry or other construction. Installed under floor slabs, crawl spaces, above ceilings, in walls, in chases, or shafts. Not visible.
- B. Exposed - Installed in such a manner that it can be seen. All exposed materials shall be installed in a neat manner. If in the engineer's opinion the installed materials are not installed in a neat manner, it shall be removed and reinstalled (at the Contractor's expense) to the satisfaction of the engineer, all at no increase cost to the Owner.
- C. Furnish - When used in the Division 16 plans and/or specifications the word "furnish" shall mean to purchase a piece of equipment or material and to have said equipment/material transported to the project site (or other location if so directed). All items to be furnished shall include any and all mounting hardware, support, and accessory required for installation and proper operation. Unless otherwise noted, when a piece of equipment or material is to be furnished by the contractor, it shall also be installed.
- D. Provide - When used in the Division 16 plans and/or specifications the word "provide" shall mean to furnish and install complete and ready for use. This shall include any and all options, accessories, and mounting/installation hardware required for a complete and operating system element of the electrical system.
- E. Install - When used in the Division 16 plans and/or specifications the word "install" shall mean to unload and transport to the installation point of the job site the equipment/material. Any and all mounting hardware (whether specified or called for by name / model number, or not) shall be included. Perform every operation necessary, including any and all final adjustments, etc. required for proper operation.
- F. Controlled – When used in the Division 16 plans and/or specifications, the word “controlled” shall mean to provide operating voltage by means of, but not limited to, feeders, disconnect, breakers, etc. to make the equipment/system operate and/or controlled.

#### 1.06 COORDINATION OF WORK IN OTHER SECTIONS

- A. The Division 16000 contractor is responsible for including any and all work related to the electrical that is noted in any part of the specifications or any part of the drawings, including Divisions 1, 15 and any other sections.
- B. If any piece of equipment is shown on any part of the drawings ("A" (Architectural) drawings, "M" (Mechanical) drawings, "P" (Plumbing) drawings, or "E" (Electrical) drawings), it is the responsibility of the Division 16 Contractor to furnish and install electrical service as required to

that equipment. Electrical service shall comply with all requirements of the equipment shop drawings and all codes.

- C. The Division 16 Contractor will supply power to equipment at the voltage indicated on the Division 16 drawings. The Division 16 Contractor and all other contractors will be held responsible for coordinating the equipment voltages, control equipment, wiring, and locations and type of terminations/connections and/or disconnects required to comply with the National Electrical Code, Standard Building Code, all local codes, and the equipment manufacturer's requirements. If equipment is furnished to the project at a voltage other than that shown on the Division 16 drawings, the contractor supplying the equipment and all other subcontractors will be held responsible for making any necessary adjustments to correct the conflict, to the satisfaction of the Electrical Engineer.

**1.07 INTERPRETATION OF THE DRAWINGS AND SPECIFICATIONS (CONTRACT DOCUMENTS):**

- A. Refer to the section of the specifications which cover General Conditions, Division 1, and Instructions to bidders. These sections and their requirements are a part of this contract and are binding on this section of the work.
- B. Electrical Drawings are diagrammatic in nature except where specific dimensions, or specific details are shown on the electrical, mechanical, or architectural drawings. The Electrical Contractor shall refer to other drawings for exact locations of equipment, building dimensions, architectural details and conditions affecting the electrical work; however, field measurements take precedence over dimensioned drawings. The Electrical Contractor shall provide all labor and materials and all incidental elements; junction and pull boxes, filters, pull wires, connectors, support materials, fuses, disconnect switches, lamps, and labels, to install, connect, start-up and result in a complete and working system in accordance with the drawings and specifications. Unless noted otherwise on the plans or in these specifications, all final connections are the responsibility of the Division 16 Contractor.
- C. In order to show on the drawings the electrical work required under this contract, it is necessary to utilize symbols and schematic diagrams/details. These symbols and schematic diagrams/details do not have any dimensional significance nor do they delineate every item required for the intended installations. The work shall be installed in accordance with the intent diagrammatically expressed on the drawings, and in conformity with the dimensions indicated on the final architectural and structural working drawings and on equipment shop drawings. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for complete work are excluded.
- D. When the details of specific and/or general installation requirements show specific dimensioning and/or positioning requirements of the items to be installed, these dimensions shall be field coordinated and followed. It is the intent of these details to only establish the general feasibility of the work required. These details in no way delete, reduce, or substitute the requirement of field coordination for the indicated work.
- E. The contractor is responsible for coordinating the installation of all electrical work with the work of other contractors and/or trades. This contractor shall refer to the other drawings (demolition, site, civil, architectural, kitchen, structural, plumbing, mechanical, etc.) to assure that the installed electrical work is installed in a coordinated fashion. Conflicts on installation work due to the lack of proper coordination of this contractor shall result in the work being removed and coordinated and properly reinstalled at no increase cost to the Owner. Report to

the Engineer any and all discrepancies that the contractor(s) find in the field between the electrical drawings and the other drawings.

- F. The installation of any and all equipment/systems is subject to clarification as indicated in the review comments of the Engineer on the shop drawings. The contractor shall be aware that if the equipment of an approved equal manufacturer is to be installed, the equipment, controls, functions, conduit routing, power requirements, etc. may be different. It is the responsibility of the electrical contractor to coordinate the installation requirements of the equipment to be installed with the electrical plans of the specified. If there are any additional equipment, power service, conduit, conductors, controls, etc. required to install the approved equal equipment, these additional requirements shall be furnished and installed at no additional cost to the Owner.
- G. The electrical drawings are such that the electrical service to equipment furnished and installed under other sections of the contract documents (examples, but not limited to: elevators, kitchen equipment, HVAC equipment, water heaters, fans, pumps, motors, etc) is coordinated for the specified equipment only. If the equipment installed under other divisions of the contract documents is not the specified equipment and is an approved equal to the specified equipment, it is possible that the equipment will require different electrical service/interface than that shown on the electrical plans for the specified equipment. In this case, it is the responsibility of the approved equal installing contractor / manufacturer to coordinate the electrical service/interface requirements with the electrical contractor. If the electrical service/interface requirements of the substituted equipment are greater than the specified equipment and result in an increased electrical cost, it is the responsibility of the furnishing/installing contractor to pay the electrical contractor for the increase in electrical cost.
- H. Submission of a proposal and ultimate acceptance of an agreement or contract for execution of this section of work will be construed as evidence that the Electrical Contractor and each interested Subcontractor and/or vendor has carefully read and accepts all conditions set forth in each Division under specification Divisions titled "Instructions To Bidders" and Division 1, "General Conditions", in so far as such conditions may affect both the bidding for and execution of this section of work.

#### 1.08 ELECTRICAL SYSTEMS

- A. All electrical systems shown on the plans or specified in the specifications shall have equipment furnished and installed so that the system is a complete and functioning system that complies with the intent of the specifications, whether each and every element of each and every system is specified or not. Any and all equipment, options, and system elements necessary for proper operation shall be furnished and installed, whether specifically called for (specified by name or catalog number) or not.
- B. The wiring, connections, and support elements shown on the plans or noted in the specifications is for a complete and workable system(s). Any deviations from the wiring shown due to a particular manufacturer's requirements shall be made at no cost to either the contract or to the Owner. Changes in electrical service to equipment due to substitutions of equipment by any contractors shall be at the cost of that contractor.

#### 1.09 SPECIAL ELECTRICAL REQUIREMENTS

- A. Provide all wiring, connectors, fittings, connections, and all accessories for the complete installation of, and final connections to, equipment furnished under other divisions of the specifications and where indicated on the electrical drawings or otherwise specified.

- B. The Electrical Contractor shall coordinate with all other contractors the electrical service provided as shown on the electrical plans with respect to voltage, phase, and ampacity. This coordination shall take place before any equipment is ordered and is for the purpose of the contractor providing equipment that requires electrical connection ordering the correct equipment to match the electrical service provided. Any changes in the characteristics of the circuits that serve any electrically operated equipment shall be made at no additional cost to the Owner.
- C. Make all final connections to all equipment, provided under the electrical contract and equipment provided under other sections, except where noted on the plans to provide "rough-in only". Where connections are to be made by someone other than the Division 16 contractor, coordinate with the equipment supplier to determine the rough-in requirements. In the case where rough-in is installed now but equipment unknown or is to be installed in the future, install outlet box sized for the conductors installed, install conductors and leave 8" of pigtails for each conductor. Tape all conductors, leave a note in the box as to the panel the circuit is connected, and install a cover plate over the outlet box. In the panel that the circuit terminates, do not connect the circuit to a breaker, tag the circuit with information as to the location of the outlet box, and leave enough pigtail in the panel so that connection can be made to any breaker space in the panel.
- D. The Electrical Contractor is hereby alerted that certain features of control, other functions, or systems may be specified in this division by performance, and as such, all elements of wiring or other materials and devices for the complete installation may not be shown on the drawings. The Electrical Contractor shall provide for the final and complete installation of all features called for by drawings or specifications.
- E. Note that the Mechanical Division includes furnishing all motors for equipment furnished and installed by Division 15. The Division 16 work shall include furnishing and installing power wiring from the electrical system through the motor starters to the final connection to the motors.
- F. Where equipment is prewired, the power wiring shall extend to the power terminals of the pre-wired equipment. Control wiring for the mechanical equipment and temperature control wiring is covered under Division 15 and is not a part of Division 16 unless specifically noted.
- G. All safety disconnect switches shall be provided under Division 16 except where the Division 15 equipment is equipped with factory installed disconnects. Where the switch designation calls for the switch to be fused, the electrical contractor shall furnish and install fuses that are sized in accordance to the equipment nameplate of the equipment served.
- H. In order to comply with the seismic codes, all recessed light fixtures shall be supported with four (4) hanger wires which shall be tied to the structure.

#### 1.10 DIMENSIONS ON DRAWINGS, IN FIELD, VERIFICATION

- A. The contractor shall be responsible for visiting the site in order to become familiar with existing conditions and coordinating the required work as needed. No increase in contract cost will be considered due to the contractor not being aware of existing conditions.
- B. Do not scale drawings. Confirm all dimensions in the field. Coordinate all installations with shop drawings and other contractors work. Where discrepancies are found on the contract documents, the contractor shall include in the project cost any and all materials, items and labor required to make any and all changes required to install the work correctly. Where



discrepancies are found on the project the contractor shall stop work in that area and contact the engineer.

#### 1.11 SUBMITTALS

- A. Unless otherwise noted, Submittals (formerly/also referred to as “shop drawings”) shall be made in accordance with requirements as stated in Division 1. Submittals shall be submitted to the Engineer on all equipment within thirty (30) days of contract award. If submittals are not received within the thirty day time limit the specified equipment shall be used (no exceptions).
- B. The Contractor shall not purchase any materials or equipment prior to the receipt of approved submittals from the Engineer. Any commitment to purchase or contract to purchase equipment or materials made between the Contractor and an equipment supplier and/or manufacturer before the receipt of approved submittals from the Engineer shall be at the risk of the Contractor. If submittals are not approved, any restocking charge or cancellation charge by a manufacturer and/or supplier shall be the responsibility of the Contractor and not reflect as an increase cost to the Owner
- C. Submittals shall contain all the necessary information required to prove that the equipment will fit and function correctly. Submittals shall be bound together and submitted as a complete package for each section. The Contractor shall review each submittal to confirm that the submittal meets the Contractor's requirements before the submittal is made to the Engineer.
- D. For some equipment/systems (examples: fire alarm, nurse call, security, CCTV, cable TV, etc.), the drawings only show the system elements and do not show the interconnection of these elements on a riser diagram. For equipment/systems such as these, the manufacturer shall include with the submittals a wiring/conduit riser diagram for the system.
- E. It is not unreasonable to expect a 14 to 21 day (or possibly longer) submittal turnaround from the Engineer. Therefore it is imperative that the Contractor comply with the 30 day requirement outlined in paragraph A. If the project is a "Fast Track" type project, it may be necessary to have submittals reviewed in a very short time period. In such cases, the contractor shall note on the cover sheet of the submittal the date in which submittals must be returned. Every effort will be made to comply with this date, but close coordination between Contractor and Engineer shall be required.
- F. The engineer reserves the right to refuse any equipment that in his opinion will not function as well as the specified equipment. The opinion of the engineer shall be final and shall bind all parties. The Engineer has the right to require the contractor to use the specified equipment if the second shop drawing submittal is not approved.
- G. Submittal review is only for verifying the conformance with the design concept of the project and compliance with the information given in the Contract Documents. The contractor is responsible for dimensions to be confirmed and correlated at the job site; for information that pertains solely to the fabrication processes or to techniques of construction; and for coordination of the work of all trades.
- H. The Contractor shall review the submittals and make note of all dimensions of the equipment and shall make the necessary adjustments in equipment locations as required to install the equipment. **THE CONTRACTOR SHALL NOT INSTALL ANY EQUIPMENT OR PROVIDE ELECTRICAL ROUGH-INS BEFORE APPROVED SUBMITTALS ARE RETURNED BY THE ENGINEER AND DIMENSIONS ARE APPROVED.**
- I. Approval to substitute material, equipment, devices, processes, or any item as an "as/an equal"

to the specified item does not relieve the Contractor of the full responsibility to make the substituted material, fit, function or appear as required in the Drawings and Specifications. Contractor shall assume full responsibility for the satisfactory adaptability of a substituted item to those items specified or shown on the drawings.

- J. Required submittals are listed with each section of the electrical specifications.

#### 1.12 RECORD DRAWINGS

- A. The electrical contractor shall keep a set of construction drawings during the length of the project on which he shall note any and all changes from the original drawings. This record set of drawings shall be updated daily.
- B. At the end of the project and after final inspection, the contractor shall obtain (at the contractor's cost) a set of reverse, erasable Mylar sepias. On this set of sepias, he will transfer all changes from the set of construction drawings, mark the actual installed depths of all buried electrical conduit or cable, and show the measured horizontal distance from permanent construction (building walls). Of special importance is the requirement to note the actual location of all service entrances, riser conduits, and where conduit stub-outs are installed. After all information has been transferred, the contractor shall submit three (3) sets to the engineer for approval. After these drawings have been approved, they shall be marked "RECORD DRAWINGS". Only then will final approval and payment be approved.
- C. After the "RECORD DRAWINGS" have been approved by the Engineer, the contractor shall have one set of blueprints made from the "Record Drawings" sepias. The contractor shall wall mount a 4" PVC tube with screw on cap in the main electrical room and place the set of blueprints in this tube.

#### 1.13 CHANGE ORDERS

- A. A. Change orders will not be issued for relocating electrical equipment or rerouting conduit and wiring. This section of the electrical specifications require that relocating of electrical equipment or rerouting of conduit/wiring be done at no additional cost to the Owner.
- B. B. When change orders are required for electrical work, the unit material and unit labor method shall be used. Unit values for material shall be contractors' net cost from distributor. Unit values for labor hours shall not be greater than those listed in the latest addition of Means mechanical/electrical cost data. Sales tax is to be added to materials and workman's compensation insurance is to be added to labor. Overhead and profit markup is to be added to the materials and labor subtotal per the instructions in Division 1..
- C. C. To calculate a credit for deleted work, the identical method of calculations shall be used for deleted work that is used for new work. No money will be allowed for lost scheduling time or estimation time. The Engineer agrees to expedite change orders as rapidly as possible to avoid construction delay. The contractor may be required to estimate a number of alternatives for change orders in order to arrive at the lowest cost for change orders.
- D. D. There shall be no additional cost for the contractor to estimate multiple alternatives for consideration.

#### 1.14 QUALITY ASSURANCE

- A. The contractor performing the electrical work shall employ craftsmen who are thoroughly experienced and trained in the installation of electrical systems and general installation

coordination. All work shall be done in the highest level of standards for the trade. Any work installed at a level that is less than the highest level of standards for the trade shall be removed and reinstalled in the manner described above at NO additional cost to the Owner.

- B. All equipment shall be installed in compliance with the manufacturer's published installation recommendations and requirements, with any and all required accessories and mounting hardware, and/or as approved by the Engineer. The manufacturer's published installation requirements and recommendations shall become a part of the Owner's Manual (See Paragraph 1.15)

#### 1.15 OPERATING AND MAINTENANCE MANUALS:

- A. Provide manuals as specified under Division 1. Use multiple binders if a single binder would exceed 2.5" in thickness; arrange the data in the same sequence as the specification section; delete or mark through unapplicable data.
- B. Provide tab pages to separate each major item or closely related group of items with typed item names on the tabs. Supply a table of contents at the beginning of each volume listing all items, the manufacturers and the name, address and phone number of the nearest authorized service representative.
- C. Manuals shall include the following, in addition to operation, maintenance and lubrication instructions and parts lists:
  - 1. Power and Control Wiring Diagrams
  - 2. Schematic Diagrams
  - 3. Light Fixture Cut Sheets.
  - 4. Power Equipment Submittals

#### 1.16 DELIVERY, STORAGE, AND PROTECTION

- A. Where equipment is purchased by the electrical contractor to be installed in conformance with the contract documents, the contractor shall follow the following procedure as it relates to delivery, storage, and installation:
  - 1. Coordinate any and all information with any and all contractors who are to do work to accommodate the division 16 equipment/work.
  - 2. Coordinate delivery of equipment.
  - 3. Unload the equipment from delivery trucks.
  - 4. Inspect the equipment to assure correct make, model number, voltage, etc.
  - 5. Provide for safe handling and field storage up to the time of permanent placement in the project.
  - 6. Provide for any and all field assembly and internal connection as may be necessary for proper operation.
  - 7. Install in place including any and all required mounting supports, connectors, fittings, connections, and accessories required for complete system operation.
- B. Where equipment is purchased by the Owner and is to be installed by the Division 16 contractor, the Division 16 contractor shall follow the following procedure as it relates to delivery, storage, and installation:
  - 1. Coordinate equipment shop drawings with any and all contractors who are to do work to accommodate the Division 16 equipment /work.
  - 2. Coordinate delivery of equipment.
  - 3. Unload the equipment from delivery trucks.
  - 4. Inspect the equipment to assure correct make, model number, voltage, etc.

5. Inspect the equipment for any damage or corrosion. Claims that any of these items have been received in such condition that their installation will require work beyond the reasonable scope of the work will be considered only if presented in writing to the Architect/Engineer within 10 days of delivery.
6. Provide for safe handling and field storage up to the time of permanent placement in the project.
7. Provide for any and all field assembly and internal connection as may be necessary for proper operation.
8. Install in place including any and all required mounting supports, connectors, fittings, connections, controls, and accessories required for complete system operation.

#### 1.17 WARRANTY

- A. All work, equipment, and materials shall be new and without defects or blemishes, and guaranteed to be free from defects for a period of one (1) year after the final date of project acceptance as defined by the Architect (NOT THE DATE OF INSTALLATION OR START-UP). All installation and installation materials shall also be guaranteed for the one (1) year period. This shall cover such items as equipment pads, supports, leaks from around equipment installation, etc and is intended to cover everything installed or provided under this division of the contract.
- B. Manufactured pieces of equipment shall have their guarantee also backed by the equipment manufacturer.
- C. During the guarantee period there shall be no charge to the Owner for items and work done under the guarantee clause (Service calls). This shall apply to replacement equipment, equipment shipping charges, mileage, labor, all taxes, etc.

#### PART 2 PRODUCTS

##### 2.01 GENERAL:

- A. All products shall be of new manufacturer (unless the plans and/or other sections of this specification call for existing or other identified products to be used), age of less than one year, and the latest model of a manufacturer. A new product shall not be used if the manufacturer has introduced a product as a replacement. All materials and apparatus for the work shall be furnished, delivered, erected, connected and finished in every detail, and shall be so selected and arranged as to fit into the building spaces in compliance with all code requirements.
- B. All equipment that is provided by the contractor, subcontractors, or speciality subcontractor (fire alarm, sound, CCTV, signal system, etc) to be installed at the project site, shall be purchased, installed and maintained by the local (to the project site) authorized, licensed, factory distributor/installer/supplier. The contractor shall include with the submittals, verification in writing from the manufacturer, that the supplier and/or distributor is a factory authorized and licensed by the manufacturer to provide, install, and maintain (throughout the entire length of the warranty period) the equipment. THERE SHALL BE NO EXCEPTIONS TO THIS REQUIREMENT.
- C. By providing equipment to the project, a manufacturer guarantees to provide replacement parts for the equipment for a period of ten (10) years, even if the item provided goes out of manufacture.
- D. Manufacturer's catalog numbers listed are not necessarily complete. Products provided shall be a standard product which has a history of successful installation and operation for a minimum

period of two years. Prototype or custom made equipment is not acceptable unless so specified herein. Equipment shall be as described on the drawings or specifications, and shall include all accessories for a complete installation.

- E. Manufacturer's instructions shall be obtained by the Contractor and used for the installation of all equipment and devices where such manufacturer's instructions are available.
- F. Where a substituted product is used instead of the specified product, the contractor will assume any and all responsibility for the product to fit, function and perform as well as the specified product. The opinion of the engineer will be binding and shall govern all parties as to a substituted product performing as well as the specified product.
- G. Completeness: Provide all boxes, off-sets, bends, raceways, devices, raceway supports, installation brackets and supports, flexible connections, wiring connectors, labels and terminals for the complete installation and operation of all products. Each unit of product shall be assembled and installed and all surfaces shall be clean and free of dents, scratches, and abrasions or marred areas.

## 2.02 IDENTIFICATION

- A. All equipment shall be marked and/or identified so that maintenance crews can locate equipment.
- B. All equipment items; switchboards, distribution, power, receptacle and lighting panelboards, transformers, disconnects, motor control centers, switches, lighting contactors and wiring gutters, of the electrical system shall be labeled. These labels shall be engraved, black laminated plastic labels, with 1/2 inch white letters. Attach the labels to the equipment with two sheet metal screws or rivets.
- C. Circuit breakers in distribution panels (panels with hinged doors) shall be labeled by means of a typed circuit breaker directory. For all breakers serving lighting, receptacle, and HVAC circuits, the contractor shall include on the panel schedule by the breaker number the room number(s) served by the circuit. The room number(s) shall be the same number(s) as the room number(s) on the door, not the space number as shown on the plans. See Section 16160.
- D. Wire and cable identification shall be made so that all wire and cable can be identified by means of color coding as noted in Section 16120. Wiring marker for use in wire and terminal identification shall be white cloth backed with a rubber based, pressure sensitive adhesive labels. Each wire or cable in a feeder at its terminal points, and in each pull-box, junction box, and panel gutter through which it passes shall be identified. Where two or more feeders enter or leave a device or enclosure, the cable shall be tagged to indicate destination of cable run. Each common wire, common circuit or common loop of a system, fire alarm, public address system, intercom system, sound system, or TV system, shall be identified.
- E. Device plates for local toggle switches, toggle switch-type motor starters, pilot lights, and the like, whose function is not readily apparent shall be labeled suitably describing the equipment controlled or indicated. These labels shall be engraved, black laminated plastic labels, with 1/4 inch white letters. For equipment connected to the emergency power system, the labels shall be red laminated plastic with white letters. Attach the labels to the equipment cover plates with glue recommended by the manufacturer.
- F. Where used with an empty raceway for wires of a future system, each box or cabinet shall be identified on the inside by means of indelible markings indicating the system for which it is installed. Label any junction box, which includes wiring, with indelible markings on the outside

showing system and voltage.

2.03

### PART 3 EXECUTION

#### 3.01 GENERAL

- A. Before any work is started, the electrical contractor shall coordinate the work of other contractors that will affect the work of the electrical contractor. The electrical contractor shall inspect the work of all other trades to determine if the other work is ready for the electrical contractor to start his work.
- B. Any and all electrical installation shall be coordinated with other trades, contractors and the Owner.
- C. The contractor shall make himself familiar with existing conditions, site information, etc. so that conflicts are avoided.
- D. All work shall be installed per all applicable code, rules, regulations, shop drawings and manufacturer's installation recommendations.
- E. The electrical contractor shall be responsible for returning to original, pre-construction condition, any paved areas, sidewalks, planting, walls, and other areas disturbed during electrical installation work.
- F. The electrical equipment shall be installed as close as possible to the location as shown on the plans. If during the installation, it is required to install equipment in locations other than the one shown on the plans, the contractor shall make a sketch of the proposed changes, submit it to the Engineer, and after the Engineer has given approval, then proceed with the installation.
- G. Working spaces and clearances shall not be less than the required minimums in the National Electric Code (NEC) or as shown on the plans.

#### 3.02 EXAMINATION

- A. The Electrical Contractor is responsible for visiting and examining the site to determine those portions of the site or present buildings affected by this work so as to become familiar with existing conditions and difficulties that will attend the execution of the work, before submitting proposals.
- B. Submission of a proposal will be considered as evidence that such examination has been made and later claims for labor, equipment, or materials because of difficulties encountered, which could have been foreseen had such examination been made, will not be recognized.

#### 3.03 LOCATIONS OF EQUIPMENT REQUIRING ELECTRICAL SERVICE AND CONNECTIONS:

- A. Coordinate the exact installed location of equipment that requires electrical connections that is furnished and installed by other contractors. The electrical drawings try to show the correct location of all of these items, but it is the responsibility of the electrical contractor to coordinate with all other contractors to determine the exact installed location of all equipment furnished and installed by other contractors and wired by the electrical contractor. Such coordination shall include, but not limited to exact location, location of electrical connection, type of connection required, and electrical characteristics.
- B. A. Contractor shall arrange for openings in the building components to allow for admission of

electrical work as the project progresses.

- C. B. Any cut portion of the building, wall, sidewalk, paved drives, ceiling, floors, roofs, etc., to admit/install any raceway or apparatus, shall be restored in a manner such that the end product complies with the specification for that type of work. Where existing work is cut, restore to the original (pre-construction) condition. The electrical contractor shall be responsible for returning to original, pre-construction condition, any of the above noted areas or other areas disturbed during electrical installation work.
- D. C. Structural, load bearing, or supporting device shall not be cut without approval in writing from the Architect.

#### 3.04 TRENCHING, EXCAVATING, BACKFILLING, AND RESURFACING:

- A. The Electrical Contractor shall review the work to be done on the site with respect to the required trenching, excavating, backfilling, and resurfacing. He shall also review and coordinate the work to be done in the same areas by all other contractors. The Electrical Contractor shall review and become familiar with pre-construction conditions and grades and the post-construction grades.
- B. The Electrical Contractor shall furnish and install the electrical systems as shown on the plans and shall perform the work as required to install these systems. All depths of work to be installed underground are referenced to the finished grades, not the pre-construction grades. Coordinate all existing and finished grades.
- C. Excavate only to the depth as required to install the work shown. If rock is encountered, excavate to a depth of 6" below the required depth. Pitch all electrical conduits away from the building.
- D. All backfill work shall be compacted. Compaction shall be after every 12" of backfill depth. Compact to a degree equal to 80% of the pre-construction earth.
- E. Any cut portion of the building, wall, sidewalk, paved drives, floors, etc., to admit/install any raceway or apparatus, shall be restored in a manner such that the end product complies with the specification for that type of work. Where existing work is cut, restore to the original (pre-construction) condition. The electrical contractor shall be responsible for returning to original, pre-construction condition, any of the above noted areas or other areas disturbed during electrical installation work.

#### 3.05 EXAMINATION OF EXISTING CONDITIONS:

- A. The Electrical Contractor is responsible for visiting and examining the site to determine those portions of the site or present buildings affected by this work so as to become familiar with existing conditions and difficulties that will attend the execution of the work, before submitting proposals.
- B. Submission of a proposal will be considered as evidence that such examination has been made and later claims for labor, equipment, or materials because of difficulties encountered, which could have been foreseen had such examination been made, will not be recognized.

#### 3.06 LOCATIONS OF OUTLET BOXES FOR EQUIPMENT AND GENERAL WIRING:

- A. All outlets for lighting, power, and equipment, not specifically dimensioned are located diagrammatically on the drawings.

- B. Lighting fixtures shall be located in accordance with reflected ceiling plans or tile pattern outlines. If neither is indicated, lighting fixtures shall be symmetrical within the space in which they are located. The Contractor shall be responsible for coordinating with the architectural and mechanical plans and to the shop drawing of the equipment to be installed for the exact location of the outlets required for equipment installation.
- C. Lighting fixture and convenience outlets shall be located so that they will be symmetrical with architectural details.
- D. Equipment outlets shall be located so as to serve the equipment directly. It is the Contractor's responsibility to coordinate outlet location with equipment so that all outlets are accessible and disconnect switches have clearance for operation.
- E. Where outlets are shown to be installed over casework or counters, the Contractor shall be responsible for coordinating the outlet box installation with the architectural details so that the bottom of the box is installed 6" above the counter/casework. Where a back splash is to be installed on the counter/casework, install the bottom of the box 6" above the top of the back splash.
- F. If so directed by the Architect / Engineer / Owner, any outlet box may be moved 10 feet in any direction without any additional cost to the Owner.

**3.07 PAINTING:**

- A. Exposed conduit, ungalvanized troughs, metal frames and support racks and wooden surfaces provided under this section shall be painted. Paint color shall match and be the same paint as the room finish paint unless noted elsewhere on the plans or in the specifications. Clean surfaces completely of all oil, wax, rust and old paint prior to repainting. Paint shall be applied to backup boards before switches, troughs, and devices are installed. Paint shall include a primer and two coats of finished paint. Touch-up scratched, or marred surfaces of lighting fixtures and equipment with paint obtained from the equipment manufacturer especially for that purpose.

**3.08 CLEANING:**

- A. At completion of the work the Contractor shall clean all exposed elements of the electrical system so that all markings deteriorating the original finish appearance are removed. All lighting fixtures, lenses, and reflectors shall be cleaned inside and out and all lamps shall be left clear of dust, dirt, and grime.
- B. The Contractor shall specifically examine the interiors of panelboard cans, equipment cabinets, lighting fixtures, junction boxes, and like components where conduit and wire connections have been made, and all resulting wire ends, insulation cuttings, knock-out plugs, metal filings and any other trash shall be removed so that interiors and exteriors are left free of all debris.

**END OF SECTION**



**SECTION 16060 - GROUNDING AND BONDING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground rod electrodes.

**1.02 SYSTEM DESCRIPTION**

- A. Furnish all labor, materials, services, equipment and appliances required in conjunction with a grounding system as indicated in the Contract Documents.
- B. Ground the electrical service system neutral at service entrance equipment to metallic water service and to supplementary grounding electrodes.
- C. Ground each separately-derived system neutral to separate grounding electrode.
- D. Provide communications system grounding conductor at point of service entrance.
- E. Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing systems.

**1.03 RELATED REQUIREMENTS**

- A. Section 16123 - Building Wire and Cable: Additional requirements for conductors for grounding and bonding, including conductor color coding.

**1.04 REFERENCE STANDARDS**

- A. IEEE 81 - Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association.
- C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; National Electrical Manufacturers Association.
- D. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association.
- E. NFPA 70 - National Electrical Code; National Fire Protection Association.
- F. UL 467 - Grounding and Bonding Equipment.

**1.05 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Verify exact locations of underground metal water service pipe entrances to building.
  - 2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.

3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.06 SUBMITTALS

- A. See Section 01300 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
- C. Indicate layout of ground ring, location of system grounding electrode connections, and routing of grounding electrode conductor.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.07 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

1.09 TEST:

- A. Measure ground grid resistance with earth test megger and install additional ground rods and conductors as required until resistance to is a maximum of 5 ohms.

1.10 RECORD DRAWINGS:

- A. Show on the "RECORD DRAWINGS" the location of the ground field, location of step down transformer grounds, and the columns that are grounded. Provide dimensions from building landmarks such as faces of columns and corners of buildings.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

- A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- D. Grounding System Resistance:
  1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
  2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.

- E. Grounding Electrode System:
1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
    - a. Provide continuous grounding electrode conductors without splice or joint.
    - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
  2. Metal Underground Water Pipe(s):
    - a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
    - b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
    - c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
  3. Concrete-Encased Electrode:
    - a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
  4. Ground Rod Electrode(s):
    - a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
    - b. Space electrodes not less than 10 feet from each other and any other ground electrode.
    - c. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
  5. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
- F. Service-Supplied System Grounding:
1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
  2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.
- G. Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
  2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
  3. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
  4. Terminate branch circuit equipment grounding conductors on solidly bonded equipment

- ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
5. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

## 2.02 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
  1. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.
  2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in addition to requirements of Section 16123:
  1. Use insulated copper conductors unless otherwise indicated.
    - a. Exceptions:
      - 1) Use bare copper conductors where installed underground in direct contact with earth.
      - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
- C. Connectors for Grounding and Bonding:
  1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
  2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
  3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
  4. Manufacturers - Mechanical and Compression Connectors:
    - a. Burndy: [www.burndy.com](http://www.burndy.com).
    - b. Harger Lightning & Grounding: [www.harger.com](http://www.harger.com).
    - c. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).
    - d. Substitutions: See Section 01600 - Product Requirements.
  5. Manufacturers - Exothermic Welded Connections:
    - a. Cadweld, a brand of Erico International Corporation: [www.erico.com](http://www.erico.com).
    - b. Substitutions: See Section 01600 - Product Requirements.
- D. Ground Rod Electrodes:
  1. Comply with NEMA GR 1.
  2. Material: Copper-bonded (copper-clad) steel.
  3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.
  4. Manufacturers:
    - a. Erico International Corporation: [www.erico.com](http://www.erico.com).
    - b. Galvan Industries, Inc: [www.galvanelectrical.com](http://www.galvanelectrical.com).
    - c. Harger Lightning & Grounding: [www.harger.com](http://www.harger.com).

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as shown on the drawings.
- C. Verify that conditions are satisfactory for installation prior to starting work.

**3.02 GENERAL INSTALLATION REQUIREMENTS**

- A. Install products in accordance with manufacturer's instructions.
- B. Install grounding and bonding system components in a neat and workmanlike manner in accordance with NECA 1.
- C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
  - 1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.
- D. Make grounding and bonding connections using specified connectors.
  - 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
  - 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
  - 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
  - 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  - 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- E. Ground electrical work in accordance with NEC Article 250, local codes as specified herein, and as shown on the drawings.
- F. Provide a separate, insulated equipment grounding conductor in feeder and branch circuits. Terminate each end on a grounding lug, bus, or bushing.
- G. Connect grounding electrode conductors to metal water pipe using a suitable ground clamp. Make connections to flanged piping at street side of flange. Provide bonding jumper around water meter.
- H. Supplementary Grounding Electrode: Use driven ground rod on exterior of building.
- I. Provide grounding and bonding at metering equipment.
- J. Install ground cables continuous between connections. Splices will not be allowed except where indicated on the drawings. Connections made by the CADWELD(R) Process are not considered splices. Where ground cables pass through floor slabs, building walls, etc., and are not in metallic enclosures, provide the sleeves of approved nonmetallic material.
- K. Install equipment grounding conductors in raceway with feeder conductors.
- L. Ground interior lighting fixtures with grounding conductor to rigid metal raceways serving them. Flexible metal conduit shall have a ground wire installed with the power conductors.
- M. Where connections are made to motors or equipment with flexible metal conduit, grounding conductor shall be stranded copper conductor within the conduit, bonded to the equipment and to the rigid metal raceway system. Size conductor in accordance with NEC Table 250-94 or as shown on the plans.

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- N. At each convenience outlet, install a grounding clip attached to the outlet box and leave a sufficient length of #12 wire with green colored insulation to connect to the grounding terminal of the receptacle. Grounding clip shall be equal to Steel City Type G. This requirement may be deleted if automatic grounding clip receptacle meeting NEC Article 250-74, Exception No. 2, is used.

**3.03 COMMUNICATION SYSTEMS GROUNDING:**

- A. Telephone System - Provide one No. 4 AWG THW to ground bus from each telephone equipment room. Leave 12" pigtail at telephone board.
- B. Television Distribution System - Provide one No. 6 AWG THW in ½ inch conduit to nearest ground bus.

**3.04 FIELD QUALITY CONTROL**

- A. Provide field inspection in accordance with Section 01400. Inspect grounding and bonding system conductors and connections for tightness and proper installation
- B. Inspect and test in accordance with NETA STD ATS except Section 4.
- C. Perform inspections and tests listed in NETA STD ATS, Section 7.13.
- D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

**3.05 COORDINATION**

- A. Coordinate the work under this section with the work under other divisions of the specifications.

**END OF SECTION**

**SECTION 16123 - BUILDING WIRE AND CABLE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Single conductor building wire.
- B. Armored cable.
- C. Metal-clad cable.
- D. Wiring connectors.
- E. Electrical tape.
- F. Wire pulling lubricant.

**1.02 RELATED REQUIREMENTS**

- A. Section 16060 - Grounding and Bonding: Additional requirements for grounding conductors and grounding connectors.
- B. Section 16075 - Electrical Identification: Identification products and requirements.

**1.03 REFERENCE STANDARDS**

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire.
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes.
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation.
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape.
- F. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association.
- G. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); National Electrical Contractors Association.
- H. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; National Electrical Manufacturers Association (ANSI/NEMA WC 70/ICEA S-95-658).
- I. NFPA 70 - National Electrical Code; National Fire Protection Association.
- J. UL 4 - Armored Cable.
- K. UL 44 - Thermoset-Insulated Wires and Cables.
- L. UL 83 - Thermoplastic-Insulated Wires and Cables.
- M. UL 486A-486B - Wire Connectors.

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- N. UL 486C - Splicing Wire Connectors.
- O. UL 486D - Sealed Wire Connector Systems.
- P. UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables.
- Q. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape.
- R. UL 1569 - Metal-Clad Cables.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  - 2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
  - 3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- B. NEMA WC 3 - Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
- C. NEMA WC 5 - Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

**1.05 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures and Section 16010.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency.
- D. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

**1.06 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

**PART 2 PRODUCTS**

**2.01 CONDUCTOR AND CABLE APPLICATIONS**

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated,



permitted, or required.

- C. Nonmetallic-sheathed cable is not permitted.
- D. Underground feeder and branch-circuit cable is not permitted.
- E. Armored cable is permitted only as follows:
  - 1. Where not otherwise restricted, may be used:
    - a. Where concealed above exposed wood T&G ceilings for final connections from junction boxes to luminaires.
    - b. Where concealed in hollow stud walls and above accessible ceilings for branch circuits up to 20 A.
  - 2. In addition to other applicable restrictions, may not be used:
    - a. Where not approved for use by the authority having jurisdiction.
    - b. Where exposed to view, except in dedicated electrical, communications, and mechanical rooms where not subject to damage.
    - c. For damp, wet, or corrosive locations.
- F. Metal-clad cable is permitted only as follows:
  - 1. Where not otherwise restricted, may be used:
    - a. Where concealed above exposed T&G ceilings for final connections from junction boxes to luminaires.
    - b. Where concealed in hollow stud walls and above accessible ceilings for branch circuits up to 20 A.
  - 2. In addition to other applicable restrictions, may not be used:
    - a. Where not approved for use by the authority having jurisdiction.
    - b. Where exposed to view, except in dedicated electrical, communications, and mechanical rooms where not subject to damage.
    - c. Where exposed to damage.
    - d. For damp, wet, or corrosive locations, do not use.
- G. Use conductor not smaller than 12 AWG for power and lighting circuits and all other wiring where the voltage is greater than 48 volts.

## 2.02 CONDUCTOR AND CABLE MANUFACTURERS

- A. Cerro Wire LLC: [www.cerrowire.com](http://www.cerrowire.com).
- B. Southwire Company: [www.southwire.com](http://www.southwire.com).
- C. Substitutions: See Section 01600 - Product Requirements.

## 2.03 ALL CONDUCTORS AND CABLES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose indicated.
- C. Provide new conductors and cables manufactured not more than one year prior to installation.
- D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- E. Comply with NEMA WC 70.

- F. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- G. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- H. Conductors for Grounding and Bonding: Also comply with Section 16060.
- I. Conductor Material:
  - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
  - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
- J. Minimum Conductor Size:
  - 1. Branch Circuits: 12 AWG.
  - 2. Control Circuits: 14 AWG.
- K. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- L. Conductor Color Coding:
  - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
  - 2. Color Coding Method: Integrally colored insulation.
    - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
  - 3. Color Code:
    - a. 240/120 V, 1 Phase, 3 Wire System:
      - 1) Phase A: Black.
      - 2) Phase B: Red.
      - 3) Neutral/Grounded: White.
    - b. Equipment Ground, All Systems: Green.

#### 2.04 SINGLE CONDUCTOR BUILDING WIRE

- A. Manufacturers:
  - 1. Copper Building Wire:
    - a. Cerro Wire LLC: [www.cerrowire.com](http://www.cerrowire.com).
    - b. Encore Wire Corporation: [www.encorewire.com](http://www.encorewire.com).
    - c. Southwire Company: [www.southwire.com](http://www.southwire.com).
    - d. Substitutions: See Section 01600 - Product Requirements.
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:
  - 1. Feeders and Branch Circuits:
    - a. Size 10 AWG and Smaller: Solid.
    - b. Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
  - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

- a. Installed Underground: Type XHHW-2.

#### 2.05 ARMORED CABLE

- A. Manufacturers:
1. AFC Cable Systems Inc: [www.afcweb.com](http://www.afcweb.com).
  2. Encore Wire Corporation: [www.encorewire.com](http://www.encorewire.com).
  3. Southwire Company: [www.southwire.com](http://www.southwire.com).
  4. Substitutions: See Section 01600 - Product Requirements.
- B. Description: NFPA 70, Type AC cable listed and labeled as complying with UL 4, and listed for use in classified firestop systems to be used.
- C. Conductor Stranding:
1. Size 10 AWG and Smaller: Solid.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation: Type THHN.
- F. Grounding: Combination of interlocking armor and integral bonding wire.
1. Provide additional full-size integral insulated equipment grounding conductor for redundant grounding.
- G. Armor: Steel, interlocked tape.
- H. Description: NFPA 70, Type AC, ACT.

#### 2.06 METAL-CLAD CABLE

- A. Manufacturers:
1. AFC Cable Systems Inc: [www.afcweb.com](http://www.afcweb.com).
  2. Encore Wire Corporation: [www.encorewire.com](http://www.encorewire.com).
  3. Southwire Company: [www.southwire.com](http://www.southwire.com).
- B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
- C. Conductor Stranding:
1. Size 10 AWG and Smaller: Solid.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- F. Grounding: Full-size integral equipment grounding conductor.
- G. Armor: Steel, interlocked tape.

#### 2.07 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 16060.
- C. Wiring Connectors for Splices and Taps:

1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
  2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
- D. Wiring Connectors for Terminations:
1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
  2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
  3. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
  4. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
- E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
1. Manufacturers:
    - a. 3M: [www.3m.com](http://www.3m.com).
    - b. Ideal Industries, Inc: [www.idealindustries.com](http://www.idealindustries.com).
    - c. NSI Industries LLC: [www.nsiindustries.com](http://www.nsiindustries.com).
    - d. Substitutions: See Section 01600 - Product Requirements.
- H. Mechanical Connectors: Provide bolted type or set-screw type.
1. Manufacturers:
    - a. Burndy: [www.burndy.com](http://www.burndy.com).
    - b. IlSCO: [www.ilSCO.com](http://www.ilSCO.com).
    - c. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).
    - d. Substitutions: See Section 01600 - Product Requirements.
- I. Compression Connectors: Provide circumferential type or hex type crimp configuration.
1. Manufacturers:
    - a. Burndy: [www.burndy.com](http://www.burndy.com).
    - b. IlSCO: [www.ilSCO.com](http://www.ilSCO.com).
    - c. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).
    - d. Substitutions: See Section 01600 - Product Requirements.

## 2.08 WIRING ACCESSORIES

- A. Electrical Tape:
1. Manufacturers:
    - a. 3M: [www.3m.com](http://www.3m.com).
    - b. Plymouth Rubber Europa: [www.plymouthrubber.com](http://www.plymouthrubber.com).
    - c. Substitutions: See Section 01600 - Product Requirements.
  2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.

3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
- B. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
  1. Manufacturers:
    - a. 3M: [www.3m.com](http://www.3m.com).
    - b. American Polywater Corporation: [www.polywater.com](http://www.polywater.com).
    - c. Ideal Industries, Inc: [www.idealindustries.com](http://www.idealindustries.com).
    - d. Substitutions: See Section 01600 - Product Requirements.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that conditions are satisfactory for installation prior to starting work.

#### 3.02 PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

#### 3.03 INSTALLATION

- A. Circuiting Requirements:
  1. Unless dimensioned, circuit routing indicated is diagrammatic.
  2. When circuit destination is indicated and routing is not shown, determine exact routing required.
  3. Arrange circuiting to minimize splices.
  4. Include circuit lengths required to install connected devices within 10 ft of location shown.
- B. Install products in accordance with manufacturer's instructions.
- C. Install conductors and cable in a neat and workmanlike manner in accordance with NECA 1.
- D. Install armored cable (Type AC) in accordance with NECA 120.
- E. Install metal-clad cable (Type MC) in accordance with NECA 120.
- F. Installation in Raceway:
  1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
  2. Pull all conductors and cables together into raceway at same time.
  3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
  4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports

and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

- H. Terminate cables using suitable fittings.
  - 1. Armored Cable (Type AC):
    - a. Use listed fittings and anti-short, insulating bushings.
    - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
  - 2. Metal-Clad Cable (Type MC):
    - a. Use listed fittings.
    - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
- I. Install conductors with a minimum of 12 inches of slack at each outlet.
- J. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- K. Make wiring connections using specified wiring connectors.
  - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
  - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
  - 3. Do not remove conductor strands to facilitate insertion into connector.
  - 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminants. Do not use wire brush on plated connector surfaces.
  - 5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  - 6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- L. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
- M. Insulate ends of spare conductors using vinyl insulating electrical tape.
- N. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.
- O. Where a circuit home run is shown on the plans without any conductor or raceway identification, it shall be a minimum of 2 # 12, 1 # 12 Ground, ½" Conduit. Where a overcurrent device is shown for the circuit, size the conductor and raceway to match the overcurrent device rating.
- P. Use no wire smaller than 12 AWG for power and lighting circuits, and no smaller than 14 AWG for control wiring.
- Q. Place an equal number of conductors for each phase of a circuit in same raceway or cable.
- R. Make conductor lengths for parallel circuits equal.
- S. Support cables above accessible ceiling, using spring metal clips or metal cable ties to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels. Provide

brdile rings or drive rings.

- T. Thoroughly clean conductor surfaces before installing lugs and connectors.
- U. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise. Splice or tap only in accessible junction boxes or other electrical enclosures.
- V. Use a power distribution block as manufactured by IlSCO (sized for the size and number of conductors, and splice type) for splices and taps, 6 AWG and larger. Power distribution block shall be installed in a junction box, sized per NEC.
- W. Apply electrical tape to the ends of spare conductors and otherwise secure conductors to prevent accidental contact with persons or enclosures.

#### 3.04 CONDUCTOR/CABLE IDENTIFICATION

- A. Each wire or cable in a feeder at its terminal points, and in each pull box, junction box, and panel gutter through which it passes shall be identified to show the circuit number of the breaker to which it connects. Each common wire, common circuit to common loop of a system, fire alarm, sound system, TV system, or any signal system conductor, shall be identified. Refer to Section 16075 - IDENTIFICATION for additional instructions.

#### 3.05 FIELD QUALITY CONTROL

- A. Inspect wire and cable for physical damage and proper connection.
- B. Torque test conductor connections and terminations to manufacturer's recommended values.
- C. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.
- D. Correct deficiencies and replace damaged or defective conductors and cables.

**END OF SECTION**

**SECTION 16131 - CONDUIT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Galvanized steel rigid metal conduit (RMC).
- B. Flexible metal conduit (FMC).
- C. Liquidtight flexible metal conduit (LFMC).
- D. Electrical metallic tubing (EMT).
- E. Rigid polyvinyl chloride (PVC) conduit.
- F. Conduit fittings.

**1.02 RELATED REQUIREMENTS**

- A. Section 16123 - Building Wire and Cable: Metal clad cable (Type MC) and armored cable (Type AC), including uses permitted.
- B. Section 16060 - Grounding and Bonding.
- C. Section 16138 - Boxes.
- D. Section 16075 - Electrical Identification: Identification products and requirements.
- E. Section 16210 - Electrical Utility Services: Additional requirements for electrical service conduits.
- F. Section 02315 - Excavation.
- G. Section 02316 - Fill and Backfill: Bedding and backfilling.

**1.03 RELATED WORK**

- A. Cutting and Patching.
- B. Trenching: Excavation and backfill for conduit and utilities on site.

**1.04 DESCRIPTION OF WORK**

- A. Unless otherwise noted on the drawings or specified elsewhere in Division 16, route all conductors in conduit. The electrical plans indicate the general location of circuiting, electrical devices, and/or outlet boxes. If approved by the Engineer, conduit runs may be modified at the time of construction to adapt to the construction conditions, but in no case shall a circuit be combined with another circuit or modified.

**1.05 VOICE/DATA SYSTEM RACEWAYS**

- A. Furnish a complete system of raceways, outlet boxes, backboards, grounds, etc., to accommodate the Owner furnished voice/data system wiring and outlets.
- B. Outlet boxes shall be minimum 4" x 4" x 2-1/2" with single gang opening.

**1.06 ADDITIONAL EMPTY RACEWAY SYSTEMS**

- A. Refer to the Division 16 drawings and specifications and the drawings and specifications of the



system(s) being considered for the full extent of raceway requirements.

- B. Unless otherwise noted all pull boxes, device or outlet boxes, and enclosures shall be furnished installed by the Division 16 Contractor. Special backboxes such as equipment cabinets, control unit backboxes and wiring racks shall be furnished by the System Contractor and installed by the Division 16 Contractor.
- C. The power requirements for the listed systems shall be provided by the Division 16 Contractor.

#### 1.07 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC).
- B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT).
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association.
- D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); National Electrical Contractors Association.
- E. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); National Electrical Contractors Association.
- F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association (ANSI/NEMA FB 1).
- G. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; National Electrical Manufacturers Association.
- H. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; National Electrical Manufacturers Association.
- I. NFPA 70 - National Electrical Code; National Fire Protection Association.
- J. UL 1 - Flexible Metal Conduit.
- K. UL 360 - Liquid-Tight Flexible Steel Conduit.
- L. UL 514B - Conduit, Tubing, and Cable Fittings.
- M. UL 651 - Schedule 40 and 80 Rigid PVC Conduit and Fittings.
- N. UL 797 - Electrical Metallic Tubing-Steel.
- O. UL 1653 - Electrical Nonmetallic Tubing.

#### 1.08 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  - 2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
  - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
  - 4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.

5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.09 SUBMITTALS

- A. See Section 01300 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.
- C. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch (53 mm) trade size and larger.
- D. Project Record Documents: Accurately record actual routing of conduits larger than 2 inches. Show not only conduit routing but all pull boxes in the raceway system.

1.10 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, consult engineer.
- C. Underground:
  1. Under Slab on Grade: Use rigid PVC conduit.
  2. Exterior, Direct-Buried: Use rigid PVC conduit.
  3. Exterior, Embedded Within Concrete: Use rigid PVC conduit.
  4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
  5. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.
  6. Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches on either side of where conduit emerges or use PVC-coated galvanized steel rigid metal conduit.
- D. Embedded Within Concrete:
  1. Within Slab on Grade: Not permitted.
  2. Within Concrete Walls Above Ground: Use rigid PVC conduit.

3. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from concrete.
- E. Concealed Within Masonry Walls: Use rigid PVC conduit.
- F. Concealed Within Hollow Stud Walls: Use electrical metallic tubing (EMT).
- G. Concealed Above Accessible Ceilings: Use electrical metallic tubing (EMT).
- H. Exposed, Interior, Not Subject to Physical Damage: Use electrical metallic tubing (EMT).
- I. Exposed, Exterior: Use PVC-coated galvanized steel rigid metal conduit.
- J. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
- K. Connections to Vibrating Equipment:
  1. Dry Locations: Use flexible metal conduit.
  2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
  3. Maximum Length: 6 feet unless otherwise indicated.
  4. Vibrating equipment includes, but is not limited to:
    - a. Motors.
    - b. HVAC Equipment.

## 2.02 CONDUIT REQUIREMENTS

- A. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- B. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.
- C. Minimum Conduit Size, Unless Otherwise Indicated:
  1. Branch Circuits: 1/2 inch (16 mm) trade size.
  2. Flexible Connections to Luminaires: 3/8 inch (12 mm) trade size.
  3. Underground, Interior: 3/4 inch (21 mm) trade size.
  4. Underground, Exterior: 1 inch (27 mm) trade size.
- D. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

## 2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

## 2.04 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Manufacturers:
  1. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).
  2. Robroy Industries: [www.robroy.com](http://www.robroy.com).
  3. Substitutions: See Section 01600 - Product Requirements.
- B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.
- C. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil.

- D. PVC-Coated Fittings:
  - 1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
  - 2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
  - 3. Material: Use steel or malleable iron.
  - 4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil.
- E. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil.
- F. Description: NEMA RN 1; galvanized rigid steel conduit with external PVC coating, 20 mil thick.
- G. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit. Install insulated bushings at all conduit terminations to prevent abrasion of conductors but does not reduce the integrity of the grounding system.

#### 2.05 FLEXIBLE METAL CONDUIT (FMC)

- A. Manufacturers:
  - 1. AFC Cable Systems, Inc: [www.afcweb.com](http://www.afcweb.com).
  - 2. Electri-Flex Company: [www.electriflex.com](http://www.electriflex.com).
  - 3. International Metal Hose: [www.metalhose.com](http://www.metalhose.com).
  - 4. Substitutions: See Section 01600 - Product Requirements.
- B. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- C. Fittings:
  - 1. Manufacturers:
    - a. Bridgeport Fittings Inc: [www.bptfittings.com](http://www.bptfittings.com).
    - b. O-Z/Gedney, a brand of Emerson Industrial Automation: [www.emersonindustrial.com](http://www.emersonindustrial.com).
    - c. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).
    - d. Substitutions: See Section 01600 - Product Requirements.
  - 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 3. Material: Use steel or malleable iron.
- D. Fittings: NEMA FB 1. Fittings shall be two-screw, double clamp malleable iron, hot dipped galvanized.

#### 2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Manufacturers:
  - 1. AFC Cable Systems, Inc: [www.afcweb.com](http://www.afcweb.com).
  - 2. Electri-Flex Company: [www.electriflex.com](http://www.electriflex.com).
  - 3. International Metal Hose: [www.metalhose.com](http://www.metalhose.com).
  - 4. Substitutions: See Section 01600 - Product Requirements.
- B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- C. Fittings:
  - 1. Manufacturers:

- a. Bridgeport Fittings Inc: [www.bptfittings.com](http://www.bptfittings.com).
- b. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).
- c. Substitutions: See Section 01600 - Product Requirements.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
4. Fittings shall be of the type that uses a threaded grounding cone, a steel, nylon or plastic compression ring, insulated throat, and a gland for tightening. Fittings shall be made of steel, have insulated throats and have a male thread and locknut or male bushing with a ring seal. Each connector shall provide a low resistance ground connection between the flexible conduit and the outlet box, conduit or other equipment to which it is connected.

#### 2.07 ELECTRICAL METALLIC TUBING (EMT)

- A. Manufacturers:
  1. Allied Tube & Conduit: [www.alliedeg.com](http://www.alliedeg.com).
  2. Republic Conduit: [www.republic-conduit.com](http://www.republic-conduit.com).
  3. Wheatland Tube Company: [www.wheatland.com](http://www.wheatland.com).
  4. Substitutions: See Section 01600 - Product Requirements.
- B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- C. Fittings:
  1. Manufacturers:
    - a. Bridgeport Fittings Inc: [www.bptfittings.com](http://www.bptfittings.com).
    - b. O-Z/Gedney, a brand of Emerson Industrial Automation: [www.emersonindustrial.com](http://www.emersonindustrial.com).
    - c. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).
    - d. Substitutions: See Section 01600 - Product Requirements.
  2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  3. Material: Use steel or malleable iron.
  4. Connectors and Couplings: Use compression (gland) or set-screw type.
    - a. Do not use indenter type connectors and couplings.
- D. Description: ANSI C80.3 [; galvanized tubing.]
- E. EMT connections shall be made tight to boxes and cabinets using insulated throat ferrous metal fittings specifically designed for use with EMT conduit. Use insulating insert at all joints to prevent any abrasion of wires during installation.
- F. For EMT installation encased in concrete, join EMT with moisture proof type fittings so as to be completely sealed against intrusion of moisture.

#### 2.08 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Manufacturers:
  1. Cantex Inc: [www.cantexinc.com](http://www.cantexinc.com).
  2. Carlon, a brand of Thomas & Betts Corporation: [www.carlon.com](http://www.carlon.com).
  3. JM Eagle: [www.jmeagle.com](http://www.jmeagle.com).
  4. Substitutions: See Section 01600 - Product Requirements.
- B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC

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2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

- C. Fittings:
1. Manufacturer: Same as manufacturer of conduit to be connected.
  2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that field measurements are as shown on drawings.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

**3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in a neat and workmanlike manner in accordance with NECA 1.
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.
- E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- F. Conduit Support:
  1. Secure and support conduits in accordance with NFPA 70 and Section 16070 using suitable supports and methods approved by the authority having jurisdiction.
  2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- G. Connections and Terminations:
  1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
  2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
  3. Use suitable adapters where required to transition from one type of conduit to another.
  4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
  5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
  6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
  7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- H. Penetrations:
  1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
  2. Make penetrations perpendicular to surfaces unless otherwise indicated.

3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.

I. Underground Installation:

1. Provide trenching and backfilling in accordance with Sections 02315 and 02316.
2. Minimum Cover, Unless Otherwise Indicated or Required:
  - a. Underground, Exterior: 24 inches.
  - b. Under Slab on Grade: 12 inches to bottom of slab.
3. Provide underground warning tape in accordance with Section 16075 along entire conduit length for service entrance where not concrete-encased.

J. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:

1. Where conduits pass from outdoors into conditioned interior spaces.
2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

K. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

L. Provide grounding and bonding in accordance with Section 16060.

**3.03 FIELD QUALITY CONTROL**

- A. See Section 01400 - Quality Requirements, for additional requirements.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.
- D. Correct deficiencies and replace damaged or defective conduits.

**3.04 CLEANING**

- A. Clean interior of conduits to remove moisture and foreign matter.

**3.05 PROTECTION**

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.
- B. Route conduit through roof openings for piping and ductwork where possible; otherwise, route

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through roof jack with pitch pocket.

- C. All outdoor conduit shall be installed a minimum of 24" below grade.
- D. Maintain 6" clearance between conduit and other piping system. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.
- E. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 1-1/2 inch size.
- F. Use PVC-coated rigid steel factory elbows for bends in plastic conduit runs longer than 150 feet, or in plastic conduit runs that have more than two bends regardless of length.
- G. For terminating threaded conduit into a device or box without a threaded opening, use a locknut on both sides of the device, box, or enclosure with the conduit end fitted with an insulating bushing.
- H. Where rigid steel conduit is to be installed in a concrete pour installation, all connectors, fittings, and couplings shall be rated as "Concrete Tight". All terminations shall be furnished with a nylon bushing.
- I. The outside diameter of any conduit buried in concrete shall not exceed one-third the thickness of the structural slab, wall or beam in which it is placed. Conduit shall be located within the middle of the member.
- J. Where rigid steel conduit does not terminate in a box or other device, and stubs up, install an insulated metallic bushing.
- K. Where called for on the plans, or if required by code, to provide a positive bonding and grounding of conduit to the enclosure or box, or for bonding and grounding of multiple or single rigid metal conduits, the conduit end shall be equipped with an insulated metallic grounding and bonding bushing.
- L. Where called for on the plans, or if required by code, to provide a grounding bonding jumper inside or outside of a raceway or an enclosure, use a grounding and bonding adapter locknut. Where the installation calls for the bonding jumper to be installed inside the conduit, use an insulated grounding and bonding bushing.
- M. Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations. Where installation of conduit is in a corrosive environment hubs shall be PVC coated type.
- N. Where conduit penetrates fire-rated walls and floors, seal opening around conduit with fire stop material.
- O. Use flexible metal conduit in short runs where the installation of non flexible conduit is not possible or recommended, for final connection to vibrating equipment and transformers, and from outlet boxes to recessed lighting fixtures. Slack shall be included as required. Furnish with ground conductor for line and load connections. Minimum size shall be 1/2" with the exception of 3/8" light fixture whips no more than 6' long.
- P. Liquid tight flexible conduit shall be used for connections to motors, and for final connection to all kitchen equipment. Furnish with ground conductor for line and load connections.
- Q. Provide suitable nylon pull cord in each empty conduit except sleeves and nipples. The nylon pull cord shall be rated for 200 pounds of pull force.



- R. If obstructions are encountered which prevent installation of the pull wire and/or conductors, the blocked section of raceway shall be removed and replaced. Any cutting or patching involved in such replacement will be included as a part of the electrical scope of work and included in the contract.
- S. Install a ground wire in all conduit sized where noted on the drawings and where not noted sized per the applicable requirements of the NEC.

### 3.06 CONDUIT SIZES

- A. Size conduit for conductor type installed; ½ inch minimum size except all voice and data conduit shall be minimum ¾".
- B. For all sizes of conduit larger than 1-1/2 inches, use factory elbows, unless otherwise specified herein. In smaller sizes, field bends will be permitted but care must be taken not to damage the conduit. The radius of the inner curve of any bend shall not be less than that permitted by the NEC.
- C. Where conduit sizes are not shown on the drawings, provide conduit sizes in accordance with the 2002 National Electric Code and equipment manufacturers' recommendations.
- D. Minimum sizes of conduits where size is not shown on the plans shall be as follows:
  - 1. 

Area Of Installation	Minimum Size
a. Framed walls	½"
b. Above accessible ceilings	½"
c. Concealed in floor slabs	¾"
d. In grade	¾"
e. Cast in concrete	¾"
f. Exposed	¾"
g. Flexible conduit	½"
- E. The outside diameter of any conduit buried in concrete shall not exceed one-third the thickness of the structural slab, wall or beam in which it is placed. Conduit shall be located within the middle of the member.

### 3.07 CONDUIT SUPPORTS

- A. Arrange supports to prevent misalignment during wiring installation.
- B. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- C. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.
- D. Fasten conduit supports to building structure and surfaces under provisions of Section 16070.
- E. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
- F. Do not attach conduit to ceiling support wires.
- G. Support conduit maximum 5' on center.

### 3.08 CONDUIT STUB-UPS:

- A. Arrange in parallel and as close as possible to adjacent wall. All stub-ups shall be terminated

with a plastic or nylon or plastic bushing. Top of stub-up shall be 5" above finished floor.

**3.09 CONDUIT SLEEVES AND OPENINGS THROUGH WATERPROOF WALLS, FLOORS AND MEMBRANES**

- A. For exterior non-membrane openings, furnish and install cast iron pipe sleeves for conduits passing through non-membrane waterproofed exterior walls, footings, roofs or beams. Sleeves through exterior walls below grade shall have continuously welded center flange buried in construction. Make conduit watertight in sleeve with oakum packing and caulked lead joints on both sides of wall.
- B. For interior membrane openings, furnish and install cast iron sleeves passing through interior membrane water proofed floors with integral flashing flange and clamping ring. Adjust sleeves to floor construction with galvanized steel or wrought iron pipe nipples top and bottom, extending two inches above finished floor. Clamp sleeves to flashing with clamping device.
- C. For exterior membrane openings, furnish and install cast iron sleeves passing through exterior membrane waterproofed walls, floors and roof with integral flashing flange and clamping ring, modified for the required thickness. Make conduit watertight in sleeve with oakum packing and caulked lead joint.

**3.10 CONDUIT SLEEVES AND OPENINGS THROUGH FIRE RATED WALLS, FLOORS AND MEMBRANES**

- A. Sleeves in slab or in fire rated walls shall be packed with incombustible compound and caulked at ends with an incombustible compound. Provide a watertight seal at top of sleeves in slab. Seal off excess areas of floor openings around conduit and cable risers at each floor slab.

**3.11 CUTTING OF HOLES:**

- A. All holes through floor slabs shall be cut with a diamond core drill.

**END OF SECTION**

**SECTION 16138 - BOXES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.
- C. Floor boxes.

1.02 RELATED REQUIREMENTS

- A. Section 08310 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- B. Section 16060 - Grounding and Bonding.
- C. Section 16070 - Hangers and Supports.
- D. Section 16131 - Conduit:
  - 1. Conduit bodies and other fittings.
  - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- E. Section 16210 - Electrical Utility Services: Metering transformer cabinets.
- F. Section 16140 - Wiring Devices:
  - 1. Wall plates.
  - 2. Floor box service fittings.
  - 3. Additional requirements for locating boxes for wiring devices.
- G. Section 16010 - General Electrical Requirements
- H. Section 16075 - Electrical Identification

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; National Electrical Contractors Association.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association (ANSI/NEMA FB 1).
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association (ANSI/NEMA OS 1).
- E. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; National Electrical Manufacturers Association (ANSI/NEMA OS 2).
- F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association.
- G. NFPA 70 - National Electrical Code; National Fire Protection Association.
- H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations.

- I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations.
- J. UL 514A - Metallic Outlet Boxes.
- K. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
  - 4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
  - 5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
  - 6. Coordinate the work with other trades to preserve insulation integrity.
  - 7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
  - 8. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

#### 1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

### PART 2 PRODUCTS

#### 2.01 BOXES

- A. General Requirements:
  - 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
  - 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
  - 3. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.
  - 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
  - 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
  - 1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
  - 2. Use nonmetallic boxes where exposed rigid PVC conduit is used.
  - 3. Use suitable masonry type boxes where flush-mounted in masonry walls.
  - 4. Use raised covers suitable for the type of wall construction and device configuration where required.
  - 5. Use shallow boxes where required by the type of wall construction.

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6. Do not use "through-wall" boxes designed for access from both sides of wall.
  7. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
  8. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
  9. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
  10. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes.
  11. Minimum Box Size, Unless Otherwise Indicated:
    - a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
    - b. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
  12. Wall Plates: Comply with Section 16140.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
  2. NEMA 250 Environment Type, Unless Otherwise Indicated:
    - a. Indoor Clean, Dry Locations: Type 1, painted steel.
    - b. Outdoor Locations: Type 3R, painted steel.
  3. Junction and Pull Boxes Larger Than 100 cubic inches:
    - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
    - b. Boxes 6 square feet and Larger: Provide sectionalized screw-cover or hinged-cover enclosures.
  4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
    - a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
    - b. Back Panels: Painted steel, removable.
    - c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.
  5. Manufacturers:
    - a. Cooper B-Line, a division of Cooper Industries: [www.cooperindustries.com](http://www.cooperindustries.com).
    - b. Hoffman, a brand of Pentair Technical Products: [www.hoffmanonline.com](http://www.hoffmanonline.com).
    - c. Hubbell Incorporated; Wiegmann Products: [www.hubbell-wiegmann.com](http://www.hubbell-wiegmann.com).
    - d. Substitutions: See Section 01600 - Product Requirements.
- D. Floor Boxes:
1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 16140; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
  2. Use cast iron floor boxes within slab on grade.
  3. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).
  4. Manufacturer: Same as manufacturer of floor box service fittings.
- E. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel with shapes, volume, size, as required for the specific installation. Boxes shall have mounting holes, with knockouts in bottom and sides.
1. Luminaire and Equipment Supporting Boxes: 4 inch octagon shape for surface or pendant

type rated for weight of equipment supported; include 1/2 inch male fixture studs where required.

- F. Cast Boxes: NEMA FB 1, Type FD, aluminum deep style. Provide gasketed cover by box manufacturer. Provide threaded hubs.
  - 1. RAIN TIGHT outlet boxes shall be corrosion resistant, cast metal, and rated by NEMA as being RAIN TIGHT. Boxes shall have threaded conduit holes for connection of electrical conduit and shall be of the type, size, shape, depth, etc for the specific application. Face plates shall be cast metal, gasketed, watertight covers for each specific application. Entire unit, outlet box and cover plate shall be rated as NEMA 3R.
- G. Covers: Brass with tapered screws for flush fit.
- H. Carpet Ring: Furnish in carpeted areas.
- I. Hinged Enclosures: For an box with a dimension that exceeds 12 inches and as specified in Section 16139.
  - 1. UL listed: RAIN TIGHT
  - 2. UL Listed: RAIN TIGHT

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify that field measurements are as shown on drawings.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

#### 3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- E. Box Locations:
  - 1. Locate boxes to be accessible. Provide access panels in accordance with Section 08310 as required where approved by the Architect.
  - 2. Unless dimensioned, box locations indicated are approximate.
  - 3. Locate boxes as required for devices installed under other sections or by others.
    - a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 16140.
  - 4. Locate boxes so that wall plates do not span different building finishes.
  - 5. Locate boxes so that wall plates do not cross masonry joints.
  - 6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
  - 7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
  - 8. Locate junction and pull boxes as indicated, as required to facilitate installation of

- conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 16131.
9. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
    - a. Concealed above accessible suspended ceilings.
    - b. Electrical rooms.
    - c. Mechanical equipment rooms.
- F. Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 16070 using suitable supports and methods approved by the authority having jurisdiction.
  2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
  3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
  4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.
- G. Install boxes plumb and level.
- H. Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
  2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
  3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.
- I. Install boxes as required to preserve insulation integrity.
- J. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.
- K. Close unused box openings.
- L. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- M. Provide grounding and bonding in accordance with Section 16060.
- N. Junctions and pull boxes are not generally shown on the plans. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 70.
1. Adjust box locations up to 10 feet if required to accommodate intended purpose. Review the Contract Documents, especially Architectural Elevations and millwork shop drawings to determine appropriate locations for boxes.
- O. Use gang box where more than one device is mounted together. Do not use sectional box. Use barriers to separate wiring of different voltages.
- P. Set floor boxes level with finished flooring material.

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Q. Install plugs, and other inserts to cover all unused conduit openings.

R. Mark all boxes on the outside as to the circuit/system they serve.

**3.03 CLEANING**

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

**3.04 PROTECTION**

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

**END OF SECTION**



**SECTION 16140 - WIRING DEVICES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall switches.
- B. Receptacles.
- C. Wall plates.
- D. Floor box service fittings.

1.02 RELATED REQUIREMENTS

- A. Section 16060 - Grounding and Bonding.
- B. Section 16138 - Boxes.
- C. Section 16145 - Lighting Control Devices: Devices for automatic control of lighting, including occupancy sensors, in-wall time switches, and in-wall interval timers.
- D. Section 16575 - Network Lighting Controls - Lutron: Lighting controls, to match accessory receptacles and wallplates specified in this section.

1.03 REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; Federal Specification.
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Federal Specification.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; National Electrical Contractors Association.
- E. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association.
- F. NEMA WD 5 - Specific-Purpose Wiring Devices.
- G. NEMA WD 6 - Wiring Device -- Dimensional Requirements; National Electrical Manufacturers Association.
- H. NFPA 70 - National Electrical Code; National Fire Protection Association.
- I. UL 498 - Attachment Plugs and Receptacles.
- J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices.
- K. UL 943 - Ground-Fault Circuit-Interrupters.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.

2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
5. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

**B. Sequencing:**

1. Do not install wiring devices until final surface finishes and painting are complete.

**1.05 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures and Section 16010 - General Electrical Requirements.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
- C. Samples: One for each type and color of device and wall plate specified.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Operation and Maintenance Data:
  1. GFI Receptacles: Include information on status indicators and testing procedures and intervals.
- F. Project Record Documents: Record actual installed locations of wiring devices.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  1. See Section 01600 - Product Requirements, for additional provisions.
  2. Extra Wall Plates: One of each style, size, and finish.

**1.06 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

**1.07 DELIVERY, STORAGE, AND PROTECTION**

- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

**1.08 SUBSTITUTIONS:**

- A. Request to use equipment and materials other than those specified shall comply with Paragraph 1.09 of Section 16010 as well as with Division 1.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Hubbell Incorporated; : [www.hubbell-wiring.com](http://www.hubbell-wiring.com).

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- B. Leviton Manufacturing Company, Inc; : [www.leviton.com](http://www.leviton.com).
- C. Lutron Electronics Company, Inc: [www.lutron.com](http://www.lutron.com).
- D. Pass & Seymour, a brand of Legrand North America, Inc; : [www.legrand.us](http://www.legrand.us)
- E. Substitutions: See Section 01600 - Product Requirements.

**2.02 APPLICATIONS**

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. Provide weather resistant GFI receptacles with specified weatherproof covers for all receptacles installed outdoors or in damp or wet locations.
- C. Provide GFI protection for all receptacles installed within 6 feet of sinks.
- D. Provide GFI protection for all receptacles installed in kitchens.
- E. Provide GFI protection for all receptacles serving electric drinking fountains.
- F. Unless noted otherwise, do not use combination switch/receptacle devices.
- G. For flush floor service fittings, use tile rings for installations in tile floors.
- H. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

**2.03 ALL WIRING DEVICES**

- A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- B. Finishes:
  - 1. Wiring Devices Installed in Finished Spaces: White with white stainless steel wall plate unless otherwise indicated.
  - 2. Wiring Devices Installed in Unfinished Spaces: White with aluminum wall plate unless otherwise indicated.
  - 3. Wiring Devices Installed in Wet or Damp Locations: White with specified weatherproof cover unless otherwise indicated.
  - 4. Clock Hanger and TV Receptacles: White with stainless steel wall plate.
  - 5. Flush Floor Box Service Fittings: White wiring devices with aluminum cover and ring/flange.

**2.04 WALL SWITCHES**

- A. Manufacturers:
  - 1. Hubbell Incorporated; : [www.hubbell-wiring.com](http://www.hubbell-wiring.com).
  - 2. Leviton Manufacturing Company, Inc; : [www.leviton.com](http://www.leviton.com).
  - 3. Pass & Seymour, a brand of Legrand North America, Inc; : [www.legrand.us](http://www.legrand.us)
  - 4. Substitutions: See Section 01600 - Product Requirements.
- B. All Wall Switches: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
  - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

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- C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.
- D. Switch Types: Single pole, double pole, 3-way, and 4-way.

**2.05 RECEPTACLES**

- A. Manufacturers:
  - 1. Hubbell Incorporated; : [www.hubbell-wiring.com](http://www.hubbell-wiring.com).
  - 2. Leviton Manufacturing Company, Inc; : [www.leviton.com](http://www.leviton.com).
  - 3. Lutron Electronics Company, Inc: [www.lutron.com](http://www.lutron.com).
  - 4. Pass & Seymour, a brand of Legrand North America, Inc; : [www.legrand.us](http://www.legrand.us)
  - 5. Substitutions: See Section 01600 - Product Requirements.
  - 6. Source Limitations: Where wall controls are furnished as part of lighting control system as specified in Section 16575, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.
- B. All Receptacles: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
  - 1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
  - 2. NEMA configurations specified are according to NEMA WD 6.
- C. Convenience Receptacles:
  - 1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
- D. GFI Receptacles:
  - 1. All GFI Receptacles: Provide with feed-through protection, light to indicate ground fault tripped condition and loss of protection, and list as complying with UL 943, class A.
    - a. Provide test and reset buttons of same color as device.
  - 2. Standard GFI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
- E. Clock Hanger and TV Receptacles: Single, 15A, 125V, NEMA 5-15R.

**2.06 WALL PLATES**

- A. Manufacturers:
  - 1. Hubbell Incorporated; : [www.hubbell-wiring.com](http://www.hubbell-wiring.com).
  - 2. Leviton Manufacturing Company, Inc; : [www.leviton.com](http://www.leviton.com).
  - 3. Lutron Electronics Company, Inc: [www.lutron.com](http://www.lutron.com).
  - 4. Pass & Seymour, a brand of Legrand North America, Inc; : [www.legrand.us](http://www.legrand.us)
  - 5. Substitutions: See Section 01600 - Product Requirements.
  - 6. Source Limitations: Where wall controls are furnished as part of lighting control system as specified in Section 16575, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.
- B. All Wall Plates: Comply with UL 514D.
  - 1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
  - 2. Size: Oversized; .

3. Screws: Metal with slotted heads finished to match wall plate finish.
- C. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.
- D. Aluminum Wall Plates: Smooth satin finish, clear anodized, factory-coated to inhibit oxidation.
- E. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected.

#### 2.07 FLOOR BOX SERVICE FITTINGS

- A. Manufacturers:
  1. Hubbell Incorporated; : [www.hubbell-wiring.com](http://www.hubbell-wiring.com).
  2. Thomas & Betts Corporation; : [www.tnb.com](http://www.tnb.com).
  3. Wiremold, a brand of Legrand North America, Inc; : [www.legrand.us](http://www.legrand.us)
  4. Substitutions: See Section 01600 - Product Requirements.
- B. Description: Service fittings compatible with floor boxes provided under Section 16138 with all components, adapters, and trims required for complete installation.

#### 2.08 ACCESS FLOOR BOXES

- A. Manufacturers:
  1. Hubbell Incorporated: [www.hubbell-wiring.com](http://www.hubbell-wiring.com).
  2. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).
  3. Wiremold, a brand of Legrand North America, Inc: [www.legrand.us](http://www.legrand.us)
  4. Substitutions: See Section 01600 - Product Requirements.
- B. Description: Metallic multi-service box suitable for mounting in access floor system specified in Section 10270.
- C. Configuration:
  1. Power: Two standard convenience duplex receptacle(s).

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that floor boxes are adjusted properly.
- F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- G. Verify that openings in access floor are in proper locations.
- H. Verify that conditions are satisfactory for installation prior to starting work.

#### 3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### 3.03 INSTALLATION

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 16138 as required for installation of wiring devices provided under this section.
  - 1. Mounting Heights: Unless otherwise indicated, as follows:
    - a. Wall Switches: 48 inches above finished floor.
    - b. Receptacles: 18 inches above finished floor or 6 inches above counter.
  - 2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
  - 3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
  - 4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
- E. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- F. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- G. Provide GFI receptacles with integral GFI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
- H. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- I. Install wall switches with OFF position down.
- J. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- K. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- L. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- M. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

- N. Quadraplex outlets shall be two outlets installed in a common outlet box with a common wall plate.

**3.04 FIELD QUALITY CONTROL**

- A. Perform field inspection, testing, and adjusting in accordance with Section 01400.
- B. Inspect each wiring device for damage and defects.
- C. Operate each wall switch with circuit energized to verify proper operation.
- D. Test each receptacle to verify operation and proper polarity.
- E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- F. Correct wiring deficiencies and replace damaged or defective wiring devices.

**3.05 ADJUSTING**

- A. Adjust devices and wall plates to be flush and level.

**3.06 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

**END OF SECTION**

**SECTION 16145 - LIGHTING CONTROL DEVICES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Occupancy sensors.
- B. Outdoor motion sensors.
- C. In-wall time switches.
- D. Outdoor photo controls.

**1.02 RELATED REQUIREMENTS**

- A. Section 16060 - Grounding and Bonding.
- B. Section 16138 - Boxes.
- C. Section 16140 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, fan speed controllers, and wall plates.

**1.03 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; National Electrical Contractors Association.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- D. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Fluorescent Ballasts; National Electrical Manufacturers Association.
- E. NFPA 70 - National Electrical Code; National Fire Protection Association.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
  - 2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.
  - 3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
  - 4. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.
- B. Sequencing:
  - 1. Do not install lighting control devices until final surface finishes and painting are complete.

**1.05 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.



1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.
- C. Shop Drawings:
  1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.
- D. Samples:
  1. Occupancy Sensors: One for each type and color specified.
- E. Field Quality Control Reports.
- F. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- G. Operation and Maintenance Data: Include detailed information on device programming and setup.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  1. See Section 01600 - Product Requirements, for additional provisions.
- I. Project Record Documents: Record actual installed locations and settings for lighting control devices.

#### 1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

#### 1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

#### 1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

#### 1.09 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for all occupancy sensors.

### PART 2 PRODUCTS

#### 2.01 ALL LIGHTING CONTROL DEVICES

- A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

**2.02 OCCUPANCY SENSORS**

- A. Manufacturers:
  - 1. Lutron Electronics Company, Inc: [www.lutron.com](http://www.lutron.com).
  - 2. WattStopper: [www.wattstopper.com](http://www.wattstopper.com).
  - 3. Substitutions: See Section 01600 - Product Requirements.
  
- B. All Occupancy Sensors:
  - 1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
  - 2. Sensor Technology:
    - a. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
  - 3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
  - 4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
  - 5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
  - 6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
  - 7. Turn-Off Delay: Field adjustable, up to a maximum time delay setting of not less than 15 minutes and not more than 30 minutes.
  - 8. Sensitivity: Field adjustable.
  - 9. Compatibility: Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
  - 10. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on the drawings.
  - 11. Wireless Sensors:
    - a. RF Range: 30 feet through typical construction materials.
    - b. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of CFR, Title 47, Part 15, for Class B application.
    - c. Power: Battery-operated with minimum ten-year battery life.
  
- C. Wall Switch Occupancy Sensors:
  - 1. All Wall Switch Occupancy Sensors:
    - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
    - b. Unless otherwise indicated or required to control the load indicated on the drawings, provide line voltage units with self-contained relay.
    - c. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
    - d. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.

- e. Provide selectable audible alert to notify occupant of impending load turn-off.
- f. Finish: Match finishes specified for wiring devices in Section 16140, unless otherwise indicated.
- g. Provide vandal resistant lenses for passive infrared (PIR) and dual technology wall switch occupancy sensors.
- 2. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.
  - a. Products:
    - 1) Lutron.
    - 2) Substitutions: See Section 01600 - Product Requirements.
- D. Ceiling Mounted Occupancy Sensors:
  - 1. All Ceiling Mounted Occupancy Sensors:
    - a. Description: Low profile occupancy sensors designed for ceiling installation.
    - b. Unless otherwise indicated or required to control the load indicated on the drawings, provide low voltage units, for use with separate compatible accessory power packs.
    - c. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
    - d. Finish: White unless otherwise indicated.
  - 2. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
    - a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
      - 1) Products:
        - (a) Lutron LOS-CDT Series
        - (b) Substitutions: See Section 01600 - Product Requirements.
    - b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
      - 1) Products:
        - (a) Lutron LOS-CDT Series
        - (b) Substitutions: See Section 01600 - Product Requirements.
- E. Power Packs for Wireless Occupancy Sensors:
  - 1. Description: Plenum rated, self-contained relay compatible with specified wireless occupancy sensors for switching of line voltage loads.
  - 2. Input Supply Voltage: Dual rated for 120/277 V ac.
  - 3. Load Rating:
    - a. General Purpose Load: Not less than 16 A.
    - b. Motor Load: Not less than 1/2 HP (120V) and 1.5 HP (277V).
  - 4. Products:
    - a. Lutron PowPak Relay Module.
    - b. Substitutions: See Section 01600 - Product Requirements.

### 2.03 OUTDOOR MOTION SENSORS

- A. Manufacturers:
  - 1. WattStopper: [www.wattstopper.com](http://www.wattstopper.com).
  - 2. Lutron.
  - 3. Substitutions: See Section 01600 - Product Requirements.
  - 4. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

- B. Description: Factory-assembled wet location listed device suitable for wall or ceiling/eave mounting, with integral swivel for field adjustment of coverage, capable of detecting motion for automatic control of load indicated.
- C. Sensor Technology: Passive Infrared (PIR) designed to detect occupancy by sensing movement of thermal energy between zones.
- D. Operation: Unless otherwise indicated, motion sensor to turn load on when motion is detected and to turn load off when no motion is detected during an adjustable turn-off delay time interval.
- E. Turn-Off Delay: Field adjustable, with time delay settings available up to 15 minutes.
- F. Integral Photocell: For dusk to dawn operation.
- G. Manual Override: Activated by switching power off to unit and then back on.
- H. Load Rating: 1,000 W incandescent and fluorescent load at 120 V ac.
- I. Coverage: Capable of detecting motion within a distance of 50 feet at a mounting height of 8 feet, with a field of view of 270 degrees.
- J. Finish: Color to be selected.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
- F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.
- G. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

#### **3.03 INSTALLATION**

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 16138 as required for installation of lighting control devices provided under this section.

1. Mounting Heights: Unless otherwise indicated, as follows:
    - a. Wall Switch Occupancy Sensors: 48 inches above finished floor.
  2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
  3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
- C. Install lighting control devices in accordance with manufacturer's instructions.
- D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- E. Install lighting control devices plumb and level, and held securely in place.
- F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 16140.
- G. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- H. Occupancy Sensor Locations:
  1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.
  2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.
- I. Outdoor Photo Control Locations:
  1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.
  2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.
- J. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.

### 3.04 FIELD QUALITY CONTROL

- A. See Section 01400 - Quality Requirements, for additional requirements.
- B. Inspect each lighting control device for damage and defects.
- C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.
- D. Correct wiring deficiencies and replace damaged or defective lighting control devices.

### 3.05 ADJUSTING

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- A. Adjust devices and wall plates to be flush and level.
- B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.
- C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.
- D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

**3.06 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

**3.07 CLOSEOUT ACTIVITIES**

- A. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.
- B. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
  - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

**END OF SECTION**

**SECTION 16155 - EQUIPMENT WIRING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Electrical connections to equipment.

**1.02 RELATED REQUIREMENTS**

- A. Section 16131 - Conduit.
- B. Section 16138 - Boxes.
- C. Section 16140 - Wiring Devices.

**1.03 REFERENCE STANDARDS**

- A. NEMA WD 6 - Wiring Devices - Dimensional Requirements; National Electrical Manufacturers Association.
- B. NFPA 70 - National Electrical Code; National Fire Protection Association.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
  - 2. Determine connection locations and requirements.
- B. Sequencing:
  - 1. Install rough-in of electrical connections before installation of equipment is required.
  - 2. Make electrical connections before required start-up of equipment.

**1.05 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

**1.06 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**PART 2 PRODUCTS**

**2.01 EQUIPMENT CONNECTIONS**

- A. General:
  - 1. Electrical Connection: Flexible conduit.
  - 2. Provide field-installed disconnect switch.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

**3.02 ELECTRICAL CONNECTIONS**

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.
- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

**END OF SECTION**



**SECTION 16210 - ELECTRICAL UTILITY SERVICES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Metering transformer cabinets.
- B. Meter bases.

**1.02 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association.
- B. NFPA 70 - National Electrical Code; National Fire Protection Association.

**1.03 SYSTEM DESCRIPTION**

- A. System Characteristics: 120/240 volts, single phase, three-wire, 60 Hertz.
- B. Service Entrance:

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Convene one week prior to commencing work of this section. Review service entrance requirements and details with Utility Company representative.

**1.05 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide ratings and dimensions of transformer cabinets and meter bases.
- C. Submit utility company-prepared drawings.

**1.06 QUALITY ASSURANCE**

- A. Utility Company:
- B. Perform work in accordance with utility company written requirements and NFPA 70.
  - 1. Maintain one copy of each document on site.
- C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. GE Industrial: [www.geindustrial.com](http://www.geindustrial.com).
- B. Square D: [www.squared.com](http://www.squared.com).
- C. Eaton.
- D. Substitutions: See Section 01600 - Product Requirements.

**2.02 COMPONENTS**

- A. Meter Base: Rated 320 amperes continuous duty with the following features:

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- B. Other Components: As required by utility company.

**PART 3 EXECUTION**

**3.01 PREPARATION**

- A. Arrange with utility company to obtain permanent electric service to the Project.
- B. Verify that field measurements are as indicated on utility company drawings.

**3.02 INSTALLATION**

- A. Install meter base as required by utility company.
- B. Install securely, in a neat and workmanlike manner, as specified in NECA 1.

**END OF SECTION**

**SECTION 16412 - ENCLOSED SWITCHES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Enclosed safety switches.
- B. Padlocks

**1.02 RELATED REQUIREMENTS**

- A. Section 16060 - Grounding and Bonding.
- B. Section 16070 - Hangers and Supports.
- C. Section 16491 - Fuses.

**1.03 SCOPE**

- A. All equipment to be installed by any contractor that requires electrical connection, that has an electric motor, or is classified by codes as requiring disconnecting means, shall have a disconnect switch or code approved disconnecting means furnished and installed by the Division 16 Contractor, whether a disconnect is shown on the plans or not.
- B. If the equipment being served is equipped with a code approved factory installed disconnecting means, then the requirement for the Division 16 Contractor to provide a disconnecting means shall be deleted. Coordinate with the equipment provider to determine if the equipment is being provided with a code approved, factory installed disconnecting means.
- C. The Division 16 Contractor shall coordinate the disconnect required and shall furnish and install the disconnect.

**1.04 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- C. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association.
- D. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association.
- E. FS W-S-865 - Switch, Box, (Enclosed), Surface-Mounted.
- F. NFPA 70 - National Electrical Code; National Fire Protection Association.
- G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations.
- H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations.
- I. UL 98 - Enclosed and Dead-Front Switches.

**1.05 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment,

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- or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
  4. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

**1.06 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements and Section 16010 - General Electrical Requirements, for submittal procedures.
- B. Product Data: Provide switch ratings and enclosure dimensions. Ratings shall include but not necessarily be limited to voltage, number of poles, voltage, amperage, horsepower and short-circuit.
- C. Project Record Documents: Record actual locations of enclosed switches.

**1.07 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

**1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Eaton Corporation; Cutler-Hammer Products: [www.eaton.com](http://www.eaton.com).
- B. General Electric Company: [www.geindustrial.com](http://www.geindustrial.com).
- C. Schneider Electric; Square D Products: [www.schneider-electric.us](http://www.schneider-electric.us).
- D. Substitutions: See Section 01600 - Product Requirements.
- E. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

**2.02 ENCLOSED SAFETY SWITCHES**

- A. Description: Quick-make, quick-break, enclosed safety switches complying with NEMA KS 1, type HD (heavy duty), and listed and labeled as complying with UL 98; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the

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following service conditions:

1. Altitude: Less than 6,600 feet.
  2. Ambient Temperature: Between -22 degrees F and 104 degrees F.
- D. Horsepower Rating: Suitable for connected load.
- E. Voltage Rating: Suitable for circuit voltage.
- F. Short Circuit Current Rating:
1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
  2. Minimum Ratings:
    - a. Switches Protected by Class H Fuses: 10,000 rms symmetrical amperes.
    - b. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.
    - c. Double Throw Switches Protected by Class R, Class J, or Class T Fuses: 100,000 rms symmetrical amperes.
- G. Provide with switch blade contact position that is visible when the cover is open.
- H. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
- I. Conductor Terminations: Suitable for use with the conductors to be installed.
- J. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.
- K. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- L. Enclosures: Comply with NEMA KS 1 and NEMA 250, and list and label as complying with UL 50 and UL 50E.
1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor Clean, Dry Locations: Type 1.
    - b. Outdoor Locations: Type 3R.
  2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
- M. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- N. Heavy Duty Switches:
1. Conductor Terminations:
    - a. Provide mechanical lugs unless otherwise indicated.
    - b. Lug Material: Copper, suitable for terminating copper conductors only.
  2. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.
- O. Fusible Switch Assemblies: NEMA KS 1, Type HD, quick-make, quick-break enclosed load interrupter knife switch.

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- P. Nonfusible Switch Assemblies: NEMA KS 1, Type HD, quick-make, quick-break, enclosed load interrupter knife switch.

**2.03 PADLOCKS:**

- A. Each disconnect switch that is accessible from floor or grade level (disconnect switches installed above ceilings do not apply) shall have a padlock. The electrical contractor shall furnish and install a padlock with each disconnect switch that is accessible from floor level or grade. The padlocks shall all be keyed alike and each padlock shall be supplied with a key. Each padlock shall be a minimum of 1.5 inches wide at the base.
- B. Spare Padlocks - Furnish to the Owner ten (10) spare indoor and ten (10) spare outdoor padlocks. Spare padlocks shall be turned over to the Owner at the time of final project inspection.
- C. Indoor padlocks shall be Master #3. Outdoor padlocks shall be Master #4. All padlocks on the project shall be keyed alike.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed safety switches.
- D. Verify that conditions are satisfactory for installation prior to starting work.

**3.02 INSTALLATION**

- A. Install enclosed switches in accordance with manufacturer's instructions.
- B. Install enclosed switches securely, in a neat and workmanlike manner in accordance with NECA 1.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required supports in accordance with Section 16070.
- E. Install enclosed switches plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 16060.
- H. Provide fuses complying with Section 16491 for fusible switches as indicated or as required by equipment manufacturer's recommendations.
- I. Coordinate with the supplier of each piece of equipment that requires a disconnect switch to determine the exact rating and type of the switch and the rating and type of fuses (if required or called for).
- J. Install disconnect switches as near as possible to the spot where indicated on Drawings.

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Contractor shall field determine the construction conditions and locate the switch in the best possible location.

- K. Install fuses in fusible disconnect switches.

**3.03 FIELD QUALITY CONTROL**

- A. Perform field inspection in accordance with Section 01400.
- B. Inspect and test in accordance with NETA STD ATS, except Section 4.
- C. Perform inspections and tests listed in NETA STD ATS, Section 7.5.1.1.
- D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

**3.04 ADJUSTING**

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

**3.05 CLEANING**

- A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**

**SECTION 16443 - PANELBOARDS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Power distribution panelboards.
- B. Lighting and appliance panelboards.
- C. Overcurrent protective devices for panelboards.

**1.02 RELATED REQUIREMENTS**

- A. Section 16060 - Grounding and Bonding.
- B. Section 16491 - Fuses: Fuses for fusible switches and spare fuse cabinets.

**1.03 REFERENCE STANDARDS**

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Federal Specification.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards; National Electrical Contractors Association.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- E. NEMA PB 1 - Panelboards; National Electrical Manufacturers Association.
- F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; National Electrical Manufacturers Association.
- G. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association.
- H. NFPA 70 - National Electrical Code; National Fire Protection Association.
- I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations.
- J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations.
- K. UL 67 - Panelboards.
- L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures.
- M. UL 869A - Reference Standard for Service Equipment.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Coordinate the work with other trades to provide walls suitable for installation of



flush-mounted panelboards where indicated.

4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

#### 1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures and Section 16010 - General Electrical Requirements.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
  1. Include characteristic trip curves for each type and rating of overcurrent protective device.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
  1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
  2. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.
- F. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

#### 1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

#### 1.08 FIELD CONDITIONS

- A. Maintain ambient temperature within the following limits during and after installation of panelboards:
  1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

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- B. Furnish one fuse puller.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Eaton Corporation; Cutler-Hammer Products; Model : www.eaton.com.
- B. General Electric Company; Model : www.geindustrial.com.
- C. Schneider Electric; Square D Products; Model : www.schneider-electric.us.
- D. Substitutions: See Section 01600 - Product Requirements.
- E. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

**2.02 ALL PANELBOARDS**

- A. Provide products listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose indicated.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  - 1. Altitude: Less than 6,600 feet.
  - 2. Ambient Temperature:
    - a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
- C. Short Circuit Current Rating:
  - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
  - 2. Listed series ratings are acceptable, except where not permitted by motor contribution according to NFPA 70.
  - 3. Label equipment utilizing series ratings as required by NFPA 70.
- D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
  - 1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
  - 2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- H. Conductor Terminations: Suitable for use with the conductors to be installed.
- I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor Clean, Dry Locations: Type 1.
  - 2. Boxes: Galvanized steel unless otherwise indicated.

- a. Provide wiring gutters sized to accommodate the conductors to be installed.
- 3. Fronts:
  - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
- 4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

### 2.03 POWER DISTRIBUTION PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
  - 1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
  - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
  - 1. Phase and Neutral Bus Material: Copper.
  - 2. Ground Bus Material: Copper.
- D. Circuit Breakers:
  - 1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.
  - 2. Provide thermal magnetic circuit breakers unless otherwise indicated.
- E. Enclosures:
  - 1. Provide surface-mounted enclosures unless otherwise indicated.

### 2.04 LIGHTING AND APPLIANCE PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
  - 1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
  - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
  - 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
  - 2. Phase and Neutral Bus Material: Copper.
  - 3. Ground Bus Material: Copper.
- D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
- E. Enclosures:
  - 1. Provide surface-mounted or flush-mounted enclosures as indicated.
  - 2. Provide clear plastic circuit directory holder mounted on inside of door.

### 2.05 OVERCURRENT PROTECTIVE DEVICES

- A. Molded Case Circuit Breakers:
  - 1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

2. Interrupting Capacity:
  - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
    - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
  - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
  - c. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.
3. Conductor Terminations:
  - a. Provide mechanical lugs unless otherwise indicated.
  - b. Lug Material: Copper, suitable for terminating copper conductors only.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
  - a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

#### 2.06 SOURCE QUALITY CONTROL

- A. Factory test panelboards according to NEMA PB 1.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

#### 3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install panelboards securely, in a neat and workmanlike manner in accordance with NECA 1 (general workmanship), NECA 407 (panelboards), and NEMA PB 1.1.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required supports in accordance with Section 16070.
- E. Install panelboards plumb.
- F. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- G. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.
- H. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard

stubbed into accessible space above ceiling and below floor.

- I. Provide grounding and bonding in accordance with Section 16060.
- J. Install all field-installed branch devices, components, and accessories.
- K. Provide filler plates to cover unused spaces in panelboards.

### 3.03 PANELBOARD DIRECTORIES

- A. Provide typed circuit directory for each circuit breaker in each panelboard.
- B. The typed directory shall include the room number location of the load served. (EXAMPLE: 36 - Lights:204,206.....14 - Receptacles:RM 115.....6 - Electric Unit Heater:173) Room numbers shall be the room numbers as on the room door, not the space numbers as shown on the plans.
- C. NOTE: THIS REQUIREMENT IS BECOMING A STANDARD BY MOST FIRE MARSHALS AND INSPECTORS.

### 3.04 FIELD QUALITY CONTROL

- A. Perform inspection, testing, and adjusting in accordance with Section 01400.
- B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.
- C. Inspect and test in accordance with NETA STD ATS, except Section 4.
- D. Correct deficiencies and replace damaged or defective panelboards or associated components.

### 3.05 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.
- C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

### 3.06 CLEANING

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**

**SECTION 16491 - FUSES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fuses.

1.02 RELATED REQUIREMENTS

- A. Section 16412 - Enclosed Switches: Fusible switches.

1.03 REFERENCE STANDARDS

- A. NEMA FU 1 - Low Voltage Cartridge Fuses; National Electrical Manufacturers Association.
- B. NFPA 70 - National Electrical Code; National Fire Protection Association.
- C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
    - a. Fusible Enclosed Switches: See Section 16412.
  - 2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
  - 3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01600 - Product Requirements, for additional provisions.
  - 2. Extra Fuses: One set(s) of three for each type and size installed.
  - 3. Fuse Pullers: One set(s) compatible with each type and size installed.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Cooper Bussmann, a division of Cooper Industries; Model : [www.cooperindustries.com](http://www.cooperindustries.com).
- B. Substitutions: See Section 01600 - Product Requirements.

2.02 FUSES

- A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose indicated.

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- B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.
- C. Provide fuses of the same type, rating, and manufacturer within the same switch.
- D. Comply with UL 248-1.
- E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.
- B. Verify that conditions are satisfactory for installation prior to starting work.

**3.02 INSTALLATION**

- A. Do not install fuses until circuits are ready to be energized.
- B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

**END OF SECTION**