

Project Manual:

CHHS OT Renovation 401 N. 4th Street Terre Haute, Indiana 47809

Owner Project Manager:



**Indiana State
University**

Department of Facilities Management
951 Sycamore Walk
Terre Haute, Indiana 47809
812-237-8100

Owner:



**Indiana State
University**

Indiana State University
210 North 7th Street
Terre Haute, Indiana 47809

arcDESIGN
architecture + interiors

R.E. Dimond
and Associates, Inc.



Consulting Engineers

Bid Number B0028833

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SECTION 00 10 10 - INSTRUCTIONS TO BIDDERS

PART 1 - GENERAL

1.1 GENERAL

- A. Bidders shall carefully read the Notice to Bidders with regard to preparation of proposals, which includes the date and place for receiving proposals. See PART 3 of this Section 00 10 10 Instructions to Bidders for a complete list of the required forms for Bidding.
- B. All Bidders shall fully inform themselves of the conditions under which the work is to be performed, the site of the work, the obstacles that may be encountered, and other relevant matters concerning the work to be performed.
- C. All Bidders shall fully inform themselves of the requirements for phased work in the project.
- D. The Contractor shall begin Work within seven (7) days after Award preparing submittals and procuring material. Actual Work shall begin on or about September 9, 2026. All Work substantially completed by December 11, 2026, with Final Completion on December 31, 2026. Final closeout shall be within sixty (60)) calendar days thereafter. A warranty walk-thru may be held eleven (11) months from the date of substantial completion
- E. No Bidder, after being awarded the contract, shall be allowed any extra compensation for reason of their failure to fully inform themselves, prior to their Bidding, of all requirements of the Contract Documents, the Drawings, and Specifications.
- F. If any Bidder for the proposed contract is in doubt as to the true meaning of any part of the Drawings, Specifications or their proposed Contract Documents, they may submit to the Owner written request for any interpretation thereof. The Bidder submitting the request will be responsible for its prompt delivery. Any interpretation of the proposed documents will be made only by an Addendum duly issued. A copy of such Addendum will be posted to the ISU Plan Room and e-mail notification sent to each registered plan holder (see 1.07 of this Section). Such Addendum, if any, issued before submission of the Bids, shall be taken into account and included in the proposal.
- G. Any Bidder may withdraw their Bid at any time prior to the scheduled time for the receipt of bids.
- H. No Bidder may withdraw their Bid or proposal for a period of One Hundred Twenty (120) calendar days after date and time set for opening Bids.
- I. It is understood that the Owner reserves the right to waive any irregularities in Bidding and to accept or reject any or all Bids.
- J. It is further understood on Bids with multiple Bid Packages the Owner reserves the right to selectively Award individual Bid Packages to multiple Prime Bidders submitting the lowest and best Bids for the individual Bid Packages.

1.2 EXAMINATION OF SITE AND BIDDING DOCUMENTS

- A. The site shall be carefully examined prior to bidding to ascertain the location of the work, existing conditions, and all other matters which may affect the work under this Contract. Each Bidder by making their Bid represents that they have visited the site and familiarized themselves with the local conditions under which the Work is to be performed.
- B. The Bidding Documents shall be carefully examined to ascertain the character, quality and quantity of the work to be performed, of materials and items to be furnished, of equipment and facilities needed during construction, of utilities and of all other matters which may affect the work under the Contract. Each Bidder by making their Bid represents that they have read and fully understands the Bidding Documents.

1.3 PRE-BID CONFERENCE

- A. There will not be an actual Pre-Bid conference. A pre-bid site visit will be held to allow Bidders' to visit the site. All questions, even if asked and answered at the pre-bid site visit, shall be submitted in writing via e-mail to the Project main contact and Owner.
- B. An Addendum will be issued confirming any information conveyed at pre-bid site visit and no verbal response tendered during pre-bid site visit shall have legal standing unless so confirmed by Addendum.
- C. Additional site visits may be arranged with the Project's Main Contact or Owner's Main Contact.

1.4 BIDDING QUESTIONS

- A. Questions regarding the Bidding Documents and Project shall be submitted in writing via e-mail to the Project main contact and Owner. An Addendum will be issued to respond to all questions received. No verbal or direct e-mail response shall have legal standing unless so confirmed by Addendum.
- B. The last day for questions to be submitted shall be three (3) business days prior to the scheduled date for the receipt of Bids. Any questions submitted after that date may not receive consideration.

1.5 EXECUTION OF AGREEMENT

- A. For all Projects the forms of agreement which the successful Bidder, as Contractor, will enter into will be an ISU Award Letter, an ISU Purchase Order and a Contract for Construction. Prior to issuance of the Purchase Order the Contractor shall provide to the Director of Purchasing the Labor and Material Performance Bond, their most current financial statement and vendor trade credit references as evidence of financial capability to perform the work and the policies of insurance or insurance certificates as required by the Contract Documents and listed in the Award Letter. All Bonds and Insurance shall have an A.M. Best rating of not less than an "A". Once all the required paperwork has been received by ISU Purchasing and the Purchase Order issued, an electronic PDF copy of the Contract for Construction Between Indiana State University and Contractor, will be e-mailed to the Contractor for their signature and return to the Department of Facilities Management Contract Administrator for forwarding to the Senior Vice President for Finance and Administration for Owner signature. A fully executed copy of this Contract will be returned to the Contractor via e-mail for their files.
- B. Time Limits for Execution of Agreement.
 - 1. The successful Bidder shall supply the required paperwork (their Financial Statement (if not supplied with their Bid), Certificate of Insurance and their Performance and Payment Bond) to the ISU Purchasing Department within ten (10) calendar days after receipt of the ISU Award Letter.
 - 2. The successful Bidder shall within seven (7) calendar days after receipt of the Contract for Construction Between Indiana State University and Contractor enter into the written Contract to perform the work in accordance with the Drawings and Specifications by signing and returning the Contract to the Department of Facilities Management Contract Administrator for forwarding to the Senior Vice President for Finance and Administration for Owner's signature and return to the Bidder.
- C. In the case a Bidder whose Bid is accepted, fails to perform their Bid by providing the required paperwork within ten (10) calendar days after receipt of the Award Letter and entering into the written Contract with the Owner within seven (7) calendar days after receipt, then this failure may be cause for their certified check, draft or Bid Bond, and the proceeds thereof, to remain the absolute property of the Owner, as liquidated damages, it being impossible to estimate the amount of damages such failure would occasion.

1.6 INDEMNIFICATION

- A. Bidders, in consideration of the privilege of Bidding, specifically waive all rights both legal and equitable which they have or might be construed to have against Indiana State University because

of any action taken in accepting or rejecting bids and proposals, for themselves, and /or for subcontractors, suppliers and/or manufacturers, who may file an action based on any such acceptance or rejection. Bidders shall be liable for any resultant reasonable attorney fees and expenses incurred by Indiana State University.

1.7 ADDENDA

- A. All Addenda for the Project will be posted on the ISU Plan Room at: <http://www.indstateplanroom.com/>. Addenda may be downloaded at no cost to registered plan holders.
- B. A Bidder must register for a free account the first time they access the ISU Plan Room website.
- C. The Bidder will receive an e-mail notifying that an Addendum is available for download from this site. The Bidder is advised to periodically check this link in the event an e-mail fails to deliver.

1.8 SUBSTITUTIONS PRIOR TO BID

- A. Requests for substitution of any material, construction, equipment and methods named or described in the Specifications, on the Drawings and any Addenda issued shall be submitted in writing to the Architect/Engineer and Owner a minimum of seven (7) calendar days prior to Bidding. Complete support documentation shall be provided that the item to be substituted is equal to or exceeds the material, construction, equipment or methods named or described in the Specifications, on the Drawings and any Addenda issued with the request for substitution. It is solely at the discretion of the Architect/Engineer and the Owner to allow any requests for substitution.
- B. Should it be determined after Award of the Bid that the Bidder based their Bid on any material, construction, equipment and methods not named or described in the Specifications, on the Drawings and any Addenda issued as approved for substitution prior to Bidding shall be disallowed and the material, construction, equipment and methods named or described in the Specifications, on the Drawings and any Addenda issued shall be provided at no additional cost to the Owner.

PART 2 - SUBCONTRACTORS, SUPPLIER AND MANUFACTURER'S BIDS TO BIDDERS

2.1 SUBCONTRACTOR, SUPPLIER AND MANUFACTURE BUNDLING OF PRICES TO PROSPECTIVE BIDDERS

- A. Subcontractors, Suppliers and Manufacturers are permitted to bundle quote prices to Bidders however these bundled prices may not be used to withhold providing individual pricing to a Bidder for bundled items when requested by a Bidder to provide individual pricing. No subcontractor or supplier shall make it a condition of their bid that another part of the project be awarded to them.
- B. Failure to provide individual pricing upon Bidder's request may be cause to disqualify a Subcontractor or Supplier and Manufacturer from Indiana State University Projects.

PART 3 - EXECUTION FORMS FOR BIDDING

3.1 BID BOND

- A. A certified or cashier's check or Bid Bond is a mandatory requirement to be submitted with the Bid and shall be based on not less than five (5) percent of the Bid amount total of the Base Bid(s) and all add Alternates.
- B. The Bid bond shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial

Management Service, Surety Bond Branch, U.S. Department of the Treasury. The Bid Bond shall be obtained from surety or insurance company that is duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. In addition to appearing on Circular 570 U.S. Dept. of the Treasury, such Surety or insurance company shall maintain an A.M. Best's Rating of not less than "A".

- C. Failure to submit an acceptable Bid Bond with the Bid shall disqualify a Bidder.

3.2 BIDDERS FINANCIAL STATEMENT

- A. With their Bid the Bidder shall submit their most current independently audited or reviewed financial statement and vendor trade credit references as evidence of financial capability to perform the work.
- B. Failure to submit the Bidder's financial statement may be cause to disqualify a Bidder.

3.3 CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION (SECTION 00 10 20 OF PROJECT MANUAL)

- A. This certificate is required by the regulations implementing Executive Order 12549 Debarment and Suspension, 34 CFR Part 85, Section 85.510, Participants' responsibilities. The regulations were published as Part V11 of the May 26, 1988 Federal Register (pages 19160-19211).
 - 1. Submit at time of Bid. Failure to submit with the Bid may be cause to disqualify a Bidder.

3.4 BIDDER'S CERTIFICATION OF AUTHORIZED EMPLOYMENT (SECTION 00 10 45 OF THE PROJECT MANUAL)

- A. Bidder must certify at time the of Bidding that they have read and understand the "Contractor's Certification of Authorized Employment" provision of the Contract Documents In Section 00 20 11 Amendments to General Conditions Article 13, subparagraph 13.1.7.3 and its subparagraphs
- B. Submit at time of Bid. Failure to submit with the Bid may be cause to disqualify a Bidder.

3.5 BID FORM (SECTION 00 20 00 OF THE PROJECT MANUAL)

- A. In order to receive consideration, make all Bids in strict accordance with the following:
 - 1. Proposals shall be submitted only on the form furnished, a copy of which is bound into and forms a part of this Project Manual, and which will become a part of the Purchase Order Contract of the successful Bidder (use a photocopy of the Bid Form herein).
 - 2. Proposals shall be completely and correctly filled out using ink or typewriter, with signatures in ink.
 - 3. Prices, except unit prices and percentages, shall be stated both in figures and in writing. In the event of a discrepancy between writing and the figures, the written amount shall govern.
 - 4. Proposals shall be signed by the Bidder, by a partner, or a duly authorized officer for a corporation, and shall give the Bidder's business address and telephone number. Failure to sign the Bid form may be cause to disqualify a Bid.
 - 5. Proposals submitted by non-Indiana corporations shall be accompanied by a certificate of existence issued by the Indiana Secretary of State.
 - 6. Any interlineation, alteration or erasure of the published Bid Form may be grounds for rejection of the proposal. Proposal shall contain no recapitulation of the work to be done.
 - 7. Proposals shall be based only on the material, construction, equipment and methods named or described in the Specifications, on the Drawings, and any Addenda issued prior to Bidding. See item 1.08 of this Sections for substitution request requirements.
- B. Modification of proposals already submitted will be accepted by letter, fax or telegram if received by the Owner prior to the date and hour set for opening of proposals.
- C. Each Bid shall be addressed to the Owner, and shall be delivered to the Office of the Director of Purchasing at the address given in the Notice to Bidders on or before the day and hour set for opening of Bids. Each Bid shall be enclosed in a sealed envelope bearing the title of the Project,

the name of the Bidder, and the date and hour of the Bid opening. It is the sole responsibility of the bidder to see that their bid is received on time.

3.6 ADDENDA

- A. Indicate receipt of Addenda on the Bid Form in the spaces provided for acknowledgement.
- B. Failure to indicate receipt may be cause to disqualify a Bid.

3.7 BID FORM - BASE BID(S)

- A. Base Bid(s) shall be based only on the material, construction, equipment and methods named or described in the Specifications, on the Drawings, and any Addenda issued prior to Bidding. See item 1.08 of this Section for substitution request requirements.
- B. On Bids with multiple Base Bid Packages the Owner reserves the right to selectively Award individual Base Bid Packages to multiple Prime Bidders submitting the lowest and best Bids for the individual Bid Packages.

3.8 BID FORM - ALTERNATE BID(S)

- A. Each Bidder, in addition to submission of the Base Bid, shall submit a Bid for any Alternate(s) as called for (if any). Failure to submit said Alternate Bid(s) shall be sufficient cause for the Owner to reject any proposal in its entirety. Also the Owner may consider the Alternate Bid in awarding of a Contract, but is under no obligation to accept any Alternate Bid.
- B. Proposals shall be based only on the material, construction, equipment and methods named or described in the Specifications, on the Drawings, and any Addenda issued prior to Bidding. See item 1.08 of this Section for substitution request requirements.

3.9 BID FORM – ALLOWANCES

- A. Allowances (if any) shall be included in the applicable Bid (Base Bid(s) or Alternate Bid(s)) as called for in the Allowance Section of the Bid Form and/or Section 01 23 60 Allowances.
- B. It is solely at the discretion of the Architect/Engineer/Owner what costs may be applied to an Allowance.
- C. Any unused portion of an Allowance shall be returned to the Owner at Contract Closeout.

3.10 COMPLIANCE WITH LAWS

- A. The Bidder shall comply with all applicable federal, state, and local laws, rules, regulations, and ordinances including but not limited to Indiana Code 5-16 and all provisions required thereby to be included herein are hereby incorporated by reference. Bidder warrants Contractor and any subcontractors shall obtain and maintain all required permissions, permits, licenses, registrations, accreditations, certifications, and approvals, and shall comply with all employment, labor, EEOC, E-verify, health, safety, and environmental statutes, rules, or regulations related to the products and services offered under this agreement. Bidder and any principals of the Contractor certify compliance with the requirements of Indiana Code § 5-16-1-9 Application of Indiana Code 5-22-16.5 (e.g. Company has not and will not participate in any investments or activities in Iran and refrains from engaging in any new investments or activities in Iran).
- B. Submission of the signed Bid Form indicates compliance.

3.11 NON-COLLUSION AFFIDAVIT

- A. The Bidder, by its officers and agents or representatives present at the time of filing their bid, being duly sworn, say on their oaths that neither they nor any of them have in any way, directly or indirectly, entered into any arrangement or agreement with any other bidder, or with any public office of the State of Indiana, of any county or municipality or other public offices whereby such affiance or either of them, has paid or is to pay to such other bidder or public officer any sum of

money, or has given or is to give to such other bidders or public officer anything of value whatever, or such affiance or either of them has not, directly or indirectly entered into any arrangement or agreement with any other bidder or bidders, which tends to or does lessen or destroy free competition in letting of the contract sought for by the attached bids; that no inducement of any form or character other than which appears upon the face of the bid will be suggested, offered, paid, or delivered to any person whomsoever to influence the acceptance of the said bid or awarding of the contract, nor has this bidder any agreement or understanding of any kind whatsoever, with any person whomsoever to pay, deliver to, or share with any other person in any way or manner, any of the proceeds of the contract sought by this bid.

- B. Submission of the signed Bid Form indicates compliance.

3.12 NON-DISCRIMINATION

- A. The Bidder and its Subcontractors, if any, shall not discriminate against any employee or applicant for employment, to be employed in the performance of this Contract, with respect to their hire, tenure, terms, conditions or privileges of employment or any matter directly or indirectly related to employment because of their sex, race, natural origin, ancestry or religion or disability as prohibited under the Americans with Disabilities Act. Breach of this covenant may be regarded as a material breach of the Contract.
- B. Submission of the signed Bid Form indicates compliance.

3.13 CERTIFICATION OF UNITED STATES STEEL PRODUCTS

- A. The Bidder certifies that the Bidder and all Subcontractors will comply with the statutory obligations to use steel products made in the United States.
- B. Submission of the signed Bid Form indicates compliance.

3.14 BID FORM - APPENDIX A SUBCONTRACTOR AND SUPPLIER/MANUFACTURERS LISTS

- A. The Prime Contractor (Bidder) shall list all Subcontractors and Suppliers/Manufacturers called for in Appendix A of the Bid Form at the time of Bid Submission. Failure to provide this information may be sufficient cause to disallow a Bid.
- B. The Prime Contractor (Bidder) shall use the Subcontractors, Suppliers, Materials and Equipment as listed in the Bid Form Appendix "A" submitted at the time of Bid. It is the Prime Contractor's (Bidder's) responsibility to assure they have listed the correct Subcontractors, Suppliers, Materials and Equipment on their Bid Form. THERE SHALL BE NO CHANGES PERMITTED TO THESE LISTS.
 - 1. Exception: If the Owner determines the Subcontractors, Suppliers, Materials or Equipment are not acceptable, the Owner shall notify the Prime Contractor (Bidder) in writing within two (2) working days after receipt of Bids of the unacceptable Subcontractor(s), Supplier(s), Material(s) and/or Equipment(s).

3.15 BID FORM - APPENDIX B COMPREHENSIVE SUBCONTRACTOR AND SUPPLIER/MANUFACTURER LIST

- A. The comprehensive subcontractor and Supplier/Manufacturer list shall be submitted by the two apparent low Bidders by 4:30pm on the day Bids are received. The A/E or Owner may request other Bidders to submit the list.
- B. Submit via e-mail to:
 - 1. Greg Miller, arcDESIGN gmliller@arcdesign.us
 - 2. Dale Warner, R.E. Dimond and Associates dale.warner@redimond.com
 - 3. Bryan Duncan, ISU Department of Facilities Management bryan.duncan@indstate.edu
- C. Failure to submit within the time given may be cause to disallow the Bid.

3.16 BID FORM - APPENDIX C UNIT PRICES

- A. Each Bidder shall submit pricing for Unit Prices as called for (if any) in Appendix B. Failure to submit said pricing may be sufficient cause for the Owner to reject any proposal in its entirety. Also the Owner may consider the Unit Pricing in awarding of a Contract.
- B. Unit Prices shall be based only on the material, construction, equipment and methods named or described in the Specifications, on the Drawings, and any Addenda issued prior to Bidding.
- C. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

3.17 BID FORM - APPENDIX D

- A. By 2:00pm on the next business day after receipt of Bids the Bidder shall submit, a wage rate schedule for the workers of the Prime Bidder and all major Subcontractors involved in the Work. The wage rate shall include the worker's hourly rate plus all fringe benefits to be paid to the worker.
- B. A major Subcontractor is defined as any Subcontractor whose portion of the Bid is in excess of \$250,000 or 20% of the total Bid whichever is less.
- C. Failure to submit this wage rate schedule within the allotted time may be sufficient cause to disallow a Bid. The wage rates provided may be used as a basis for Award of the Bid.
- D. The Owner reserves the right to require certified payroll records to be provided to verify the wage rates listed on the wage rate schedule are accurate.

END OF SECTION 00 10 10 00 10 10

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SECTION 00 10 10 - INSTRUCTIONS TO BIDDERS

PART 1 - GENERAL

1.1 GENERAL

- A. Bidders shall carefully read the Notice to Bidders with regard to preparation of proposals, which includes the date and place for receiving proposals. See PART 3 of this Section 00 10 10 Instructions to Bidders for a complete list of the required forms for Bidding.
- B. All Bidders shall fully inform themselves of the conditions under which the work is to be performed, the site of the work, the obstacles that may be encountered, and other relevant matters concerning the work to be performed.
- C. The successful Bidder shall begin Work within seven (7) days after Award preparing submittals and procuring material. Actual Work shall begin on or about September 8, 2026. All work shall be Substantially Complete by December 31, 2026.
- D. No Bidder, after being awarded the contract, shall be allowed any extra compensation for reason of their failure to fully inform themselves, prior to their Bidding, of all requirements of the Contract Documents, the Drawings, and Specifications.
- E. If any Bidder for the proposed contract is in doubt as to the true meaning of any part of the Drawings, Specifications or their proposed Contract Documents, they may submit to the Owner written request for any interpretation thereof. The Bidder submitting the request will be responsible for its prompt delivery. Any interpretation of the proposed documents will be made only by an Addendum duly issued. A copy of such Addendum will be posted to the ISU Plan Room and e-mail notification sent to each registered plan holder (see 1.07 of this Section). Such Addendum, if any, issued before submission of the Bids, shall be taken into account and included in the proposal.
- F. Any Bidder may withdraw their Bid at any time prior to the scheduled time for the receipt of bids.
- G. No Bidder may withdraw their Bid or proposal for a period of One Hundred Twenty (120) calendar days after date and time set for opening Bids.
- H. It is understood that the Owner reserves the right to waive any irregularities in Bidding and to accept or reject any or all Bids.
- I. It is further understood on Bids with multiple Bid Packages the Owner reserves the right to selectively Award individual Bid Packages to multiple Prime Bidders submitting the lowest and best Bids for the individual Bid Packages.

1.2 EXAMINATION OF SITE AND BIDDING DOCUMENTS

- A. The site shall be carefully examined prior to bidding to ascertain the location of the work, existing conditions, and all other matters which may affect the work under this Contract. Each Bidder by making their Bid represents that they have visited the site and familiarized themselves with the local conditions under which the Work is to be performed.
- B. The Bidding Documents shall be carefully examined to ascertain the character, quality and quantity of the work to be performed, of materials and items to be furnished, of equipment and facilities needed during construction, of utilities and of all other matters which may affect the work under the Contract. Each Bidder by making their Bid represents that they have read and fully understands the Bidding Documents.

1.3 PRE-BID CONFERENCE

- A. There will not be an actual Pre-Bid conference. A pre-bid site visit will be held to allow Bidders' to visit the site. All questions, even if asked and answered at the pre-bid site visit, shall be submitted in writing via e-mail to the Project main contact and Owner.

- B. An Addendum will be issued confirming any information conveyed at pre-bid site visit and no verbal response tendered during pre-bid site visit shall have legal standing unless so confirmed by Addendum.
- C. Additional site visits may be arranged with the Project's Main Contact or Owner's Main Contact.

1.4 BIDDING QUESTIONS

- A. Questions regarding the Bidding Documents and Project shall be submitted in writing via e-mail to the Project main contact and Owner. An Addendum will be issued to respond to all questions received. No verbal or direct e-mail response shall have legal standing unless so confirmed by Addendum.
- B. The last day for questions to submitted shall be three (3) business days prior to the scheduled date for the receipt of Bids. Any questions submitted after that date may not receive consideration.

1.5 EXECUTION OF AGREEMENT

- A. For all Projects the forms of agreement which the successful Bidder, as Contractor, will enter into will be an ISU Award Letter, an ISU Purchase Order and a Contract for Construction. Prior to issuance of the Purchase Order the Contractor shall provide to the Director of Purchasing the Labor and Material Performance Bond, their most current financial statement and vendor trade credit references as evidence of financial capability to perform the work and the policies of insurance or insurance certificates as required by the Contract Documents and listed in the Award Letter. All Bonds and Insurance shall have an A.M. Best rating of not less than an "A". Once all the required paperwork has been received by ISU Purchasing and the Purchase Order issued, an electronic PDF copy of the Contract for Construction Between Indiana State University and Contractor, will be e-mailed to the Contractor for their signature and return to the Department of Facilities Management Contract Administrator for forwarding to the Senior Vice President for Finance and Administration for Owner signature. A fully executed copy of this Contract will be returned to the Contractor via e-mail for their files.
- B. Time Limits for Execution of Agreement.
 - 1. The successful Bidder shall supply the required paperwork (their Financial Statement (if not supplied with their Bid), Certificate of Insurance and their Performance and Payment Bond) to the ISU Purchasing Department within ten (10) calendar days after receipt of the ISU Award Letter.
 - 2. The successful Bidder shall within seven (7) calendar days after receipt of the Contract for Construction Between Indiana State University and Contractor enter into the written Contract to perform the work in accordance with the Drawings and Specifications by signing and returning the Contract to the Department of Facilities Management Contract Administrator for forwarding to the Senior Vice President for Finance and Administration for Owner's signature and return to the Bidder.
- C. In the case a Bidder whose Bid is accepted, fails to perform their Bid by providing the required paperwork within ten (10) calendar days after receipt of the Award Letter and entering into the written Contract with the Owner within seven (7) calendar days after receipt, then this failure may be cause for their certified check, draft or Bid Bond, and the proceeds thereof, to remain the absolute property of the Owner, as liquidated damages, it being impossible to estimate the amount of damages such failure would occasion.

1.6 INDEMNIFICATION

- A. Bidders, in consideration of the privilege of Bidding, specifically waive all rights both legal and equitable which they have or might be construed to have against Indiana State University because of any action taken in accepting or rejecting bids and proposals, for themselves, and /or for subcontractors, suppliers and/or manufacturers, who may file an action based on any such acceptance or rejection. Bidders shall be liable for any resultant reasonable attorney fees and expenses incurred by Indiana State University.

1.7 ADDENDA

- A. All Addenda for the Project will be posted on the ISU Plan Room at: <http://www.indstateplanroom.com/>. Addenda may be downloaded at no cost to registered plan holders.
- B. A Bidder must register for a free account the first time they access the ISU Plan Room website.
- C. The Bidder will receive an e-mail notifying that an Addendum is available for download from this site. The Bidder is advised to periodically check this link in the event an e-mail fails to deliver.

1.8 SUBSTITUTIONS PRIOR TO BID

- A. Requests for substitution of any material, construction, equipment and methods named or described in the Specifications, on the Drawings and any Addenda issued shall be submitted in writing to the Architect/Engineer and Owner a minimum of seven (7) calendar days prior to Bidding. Complete support documentation shall be provided that the item to be substituted is equal to or exceeds the material, construction, equipment or methods named or described in the Specifications, on the Drawings and any Addenda issued with the request for substitution. It is solely at the discretion of the Architect/Engineer and the Owner to allow any requests for substitution.
- B. Should it be determined after Award of the Bid that the Bidder based their Bid on any material, construction, equipment and methods not named or described in the Specifications, on the Drawings and any Addenda issued as approved for substitution prior to Bidding shall be disallowed and the material, construction, equipment and methods named or described in the Specifications, on the Drawings and any Addenda issued shall be provided at no additional cost to the Owner.

PART 2 - SUBCONTRACTORS, SUPPLIER AND MANUFACTURER'S BIDS TO BIDDERS

2.1 SUBCONTRACTOR, SUPPLIER AND MANUFACTURE BUNDLING OF PRICES TO PROSPECTIVE BIDDERS

- A. Subcontractors, Suppliers and Manufacturers are permitted to bundle quote prices to Bidders however these bundled prices may not be used to withhold providing individual pricing to a Bidder for bundled items when requested by a Bidder to provide individual pricing. No subcontractor or supplier shall make it a condition of their bid that another part of the project be awarded to them.
- B. Failure to provide individual pricing upon Bidder's request may be cause to disqualify a Subcontractor or Supplier and Manufacturer from Indiana State University Projects.

PART 3 - EXECUTION FORMS FOR BIDDING

3.1 BID BOND

- A. A certified or cashier's check or Bid Bond is a mandatory requirement to be submitted with the Bid and shall be based on not less than five (5) percent of the Bid amount total of the Base Bid(s) and all add Alternates.
- B. The Bid bond shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. The Bid Bond shall be obtained from surety or insurance company that is duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. In addition to appearing on Circular 570 U.S. Dept. of the Treasury, such Surety or insurance company shall maintain an A.M. Best's Rating of not less than "A".

- C. Failure to submit an acceptable Bid Bond with the Bid shall disqualify a Bidder.

3.2 BIDDERS FINANCIAL STATEMENT

- A. With their Bid the Bidder shall submit their most current independently audited or reviewed financial statement and vendor trade credit references as evidence of financial capability to perform the work.
- B. Failure to submit the Bidder's financial statement may be cause to disqualify a Bidder.

3.3 CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION (SECTION 00 10 20 OF PROJECT MANUAL)

- A. This certificate is required by the regulations implementing Executive Order 12549 Debarment and Suspension, 34 CFR Part 85, Section 85.510, Participants' responsibilities. The regulations were published as Part V11 of the May 26, 1988 Federal Register (pages 19160-19211).
 - 1. Submit at time of Bid. Failure to submit with the Bid may be cause to disqualify a Bidder.

3.4 BIDDER'S CERTIFICATION OF AUTHORIZED EMPLOYMENT (SECTION 00 10 45 OF THE PROJECT MANUAL)

- A. Bidder must certify at time the of Bidding that they have read and understand the "Contractor's Certification of Authorized Employment" provision of the Contract Documents In Section 00 20 11 Amendments to General Conditions Article 13, subparagraph 13.1.7.3 and its subparagraphs
- B. Submit at time of Bid. Failure to submit with the Bid may be cause to disqualify a Bidder.

3.5 BID FORM (SECTION 00 20 00 OF THE PROJECT MANUAL)

- A. In order to receive consideration, make all Bids in strict accordance with the following:
 - 1. Proposals shall be submitted only on the form furnished, a copy of which is bound into and forms a part of this Project Manual, and which will become a part of the Purchase Order Contract of the successful Bidder (use a photocopy of the Bid Form herein).
 - 2. Proposals shall be completely and correctly filled out using ink or typewriter, with signatures in ink.
 - 3. Prices, except unit prices and percentages, shall be stated both in figures and in writing. In the event of a discrepancy between writing and the figures, the written amount shall govern.
 - 4. Proposals shall be signed by the Bidder, by a partner, or a duly authorized officer for a corporation, and shall give the Bidder's business address and telephone number. Failure to sign the Bid form may be cause to disqualify a Bid.
 - 5. Proposals submitted by non-Indiana corporations shall be accompanied by a certificate of existence issued by the Indiana Secretary of State.
 - 6. Any interlineation, alteration or erasure of the published Bid Form may be grounds for rejection of the proposal. Proposal shall contain no recapitulation of the work to be done.
 - 7. Proposals shall be based only on the material, construction, equipment and methods named or described in the Specifications, on the Drawings, and any Addenda issued prior to Bidding. See item 1.08 of this Sections for substitution request requirements.
- B. Modification of proposals already submitted will be accepted by letter, fax or telegram if received by the Owner prior to the date and hour set for opening of proposals.
- C. Each Bid shall be addressed to the Owner, and shall be delivered to the Office of the Director of Purchasing at the address given in the Notice to Bidders on or before the day and hour set for opening of Bids. Each Bid shall be enclosed in a sealed envelope bearing the title of the Project, the name of the Bidder, and the date and hour of the Bid opening. It is the sole responsibility of the bidder to see that their bid is received on time.

3.6 ADDENDA

- A. Indicate receipt of Addenda on the Bid Form in the spaces provided for acknowledgement.
- B. Failure to indicate receipt may be cause to disqualify a Bid.

3.7 BID FORM - BASE BID(S)

- A. Base Bid(s) shall be based only on the material, construction, equipment and methods named or described in the Specifications, on the Drawings, and any Addenda issued prior to Bidding. See item 1.08 of this Section for substitution request requirements.
- B. On Bids with multiple Base Bid Packages the Owner reserves the right to selectively Award individual Base Bid Packages to multiple Prime Bidders submitting the lowest and best Bids for the individual Bid Packages.

3.8 BID FORM - ALTERNATE BID(S)

- A. Each Bidder, in addition to submission of the Base Bid, shall submit a Bid for any Alternate(s) as called for (if any). Failure to submit said Alternate Bid(s) shall be sufficient cause for the Owner to reject any proposal in its entirety. Also the Owner may consider the Alternate Bid in awarding of a Contract, but is under no obligation to accept any Alternate Bid.
- B. Proposals shall be based only on the material, construction, equipment and methods named or described in the Specifications, on the Drawings, and any Addenda issued prior to Bidding. See item 1.08 of this Section for substitution request requirements.

3.9 BID FORM – ALLOWANCES

- A. Allowances (if any) shall be included in the applicable Bid (Base Bid(s) or Alternate Bid(s)) as called for in the Allowance Section of the Bid Form and/or Section 01 23 60 Allowances.
- B. It is solely at the discretion of the Architect/Engineer/Owner what costs may be applied to an Allowance.
- C. Any unused portion of an Allowance shall be returned to the Owner at Contract Closeout.

3.10 COMPLIANCE WITH LAWS

- A. The Bidder shall comply with all applicable federal, state, and local laws, rules, regulations, and ordinances including but not limited to Indiana Code 5-16 and all provisions required thereby to be included herein are hereby incorporated by reference. Bidder warrants Contractor and any subcontractors shall obtain and maintain all required permissions, permits, licenses, registrations, accreditations, certifications, and approvals, and shall comply with all employment, labor, EEOC, E-verify, health, safety, and environmental statutes, rules, or regulations related to the products and services offered under this agreement. Bidder and any principals of the Contractor certify compliance with the requirements of Indiana Code § 5-16-1-9 Application of Indiana Code 5-22-16.5 (e.g. Company has not and will not participate in any investments or activities in Iran and refrains from engaging in any new investments or activities in Iran).
- B. Submission of the signed Bid Form indicates compliance.

3.11 NON-COLLUSION AFFIDAVIT

- A. The Bidder, by its officers and agents or representatives present at the time of filing their bid, being duly sworn, say on their oaths that neither they nor any of them have in any way, directly or indirectly, entered into any arrangement or agreement with any other bidder, or with any public office of the State of Indiana, of any county or municipality or other public offices whereby such affiance or either of them, has paid or is to pay to such other bidder or public officer any sum of money, or has given or is to give to such other bidders or public officer anything of value whatever, or such affiance of affiance or either of them has not, directly or indirectly entered into any arrangement or agreement with any other bidder or bidders, which tends to or does lessen or destroy free competition in letting of the contract sought for by the attached bids; that no

inducement of any form or character other than which appears upon the face of the bid will be suggested, offered, paid, or delivered to any person whomsoever to influence the acceptance of the said bid or awarding of the contract, nor has this bidder any agreement or understanding of any kind whatsoever, with any person whomsoever to pay, deliver to, or share with any other person in any way or manner, any of the proceeds of the contract sought by this bid.

- B. Submission of the signed Bid Form indicates compliance.

3.12 NON-DISCRIMINATION

- A. The Bidder and its Subcontractors, if any, shall not discriminate against any employee or applicant for employment, to be employed in the performance of this Contract, with respect to their hire, tenure, terms, conditions or privileges of employment or any matter directly or indirectly related to employment because of their sex, race, natural origin, ancestry or religion or disability as prohibited under the Americans with Disabilities Act. Breach of this covenant may be regarded as a material breach of the Contract.
- B. Submission of the signed Bid Form indicates compliance.

3.13 CERTIFICATION OF UNITED STATES STEEL PRODUCTS

- A. The Bidder certifies that the Bidder and all Subcontractors will comply with the statutory obligations to use steel products made in the United States.
- B. Submission of the signed Bid Form indicates compliance.

3.14 BID FORM - APPENDIX A SUBCONTRACTOR AND SUPPLIER/MANUFACTURERS LISTS

- A. The Prime Contractor (Bidder) shall list all Subcontractors and Suppliers/Manufacturers called for in Appendix A of the Bid Form at the time of Bid Submission. Failure to provide this information may be sufficient cause to disallow a Bid.
- B. The Prime Contractor (Bidder) shall use the Subcontractors, Suppliers, Materials and Equipment as listed in the Bid Form Appendix "A" submitted at the time of Bid. It is the Prime Contractor's (Bidder's) responsibility to assure they have listed the correct Subcontractors, Suppliers, Materials and Equipment on their Bid Form. THERE SHALL BE NO CHANGES PERMITTED TO THESE LISTS.
 - 1. Exception: If the Owner determines the Subcontractors, Suppliers, Materials or Equipment are not acceptable, the Owner shall notify the Prime Contractor (Bidder) in writing within two (2) working days after receipt of Bids of the unacceptable Subcontractor(s), Supplier(s), Material(s) and/or Equipment(s).

3.15 BID FORM - APPENDIX B COMPREHENSIVE SUBCONTRACTOR AND SUPPLIER/MANUFACTURER LIST

- A. The comprehensive subcontractor and Supplier/Manufacturer list shall be submitted by the two apparent low Bidders by 4:30pm on the day Bids are received. The A/E or Owner may request other Bidders to submit the list.
- B. Submit via e-mail to:
 - 1. Greg Miller, arcDESIGN [gmiller@arcdesign.us](mailto:gmill@arcdesign.us)
 - 2. Navy Lohse, arcDESIGN nlohse@arcdesign.us
 - 3. Dale Warner, R.E. Dimond and Associates dale.warner@redimond.com
 - 4. Bryan Duncan, ISU Department of Facilities Management bryan.duncan@indstate.edu
- C. Failure to submit within the time given may be cause to disallow the Bid.

3.16 BID FORM - APPENDIX C UNIT PRICES

- A. Each Bidder shall submit pricing for Unit Prices as called for (if any) in Appendix B. Failure to submit said pricing may be sufficient cause for the Owner to reject any proposal in its entirety. Also the Owner may consider the Unit Pricing in awarding of a Contract.
- B. Unit Prices shall be based only on the material, construction, equipment and methods named or described in the Specifications, on the Drawings, and any Addenda issued prior to Bidding.
- C. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

3.17 BID FORM - APPENDIX D

- A. By 2:00pm on the next business day after receipt of Bids the Bidder shall submit, a wage rate schedule for the workers of the Prime Bidder and all major Subcontractors involved in the Work. The wage rate shall include the worker's hourly rate plus all fringe benefits to be paid to the worker.
- B. A major Subcontractor is defined as any Subcontractor whose portion of the Bid is in excess of \$250,000 or 20% of the total Bid whichever is less.
- C. Failure to submit this wage rate schedule within the allotted time may be sufficient cause to disallow a Bid. The wage rates provided may be used as a basis for Award of the Bid.
- D. The Owner reserves the right to require certified payroll records to be provided to verify the wage rates listed on the wage rate schedule are accurate.

END OF SECTION 00 10 10

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CERTIFICATION REGARDING SUSPENSION, DEBARMENT, INELIGIBILITY AND
VOLUNTARY EXCLUSION

This certificate is required by the regulations implementing Executive Orders 12549 and 12689, Uniform Guidance 2 CFR 200.213 and 2 CFR 180 sections regarding Suspension and Debarment

Is your organization, or its principals, suspended, debarred, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction, by any Federal department or agency? ☐ Yes ☐ No

Are any of your subcontractors, or its principals, suspended, debarred, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction, by any Federal department or agency? ☐ Yes ☐ No

Your Company's Name

Signature

Print Your Name

Date

END OF SECTION 00 10 20

00 10 20

CERTIFICATION REGARDING SUSPENSION, DEBARMENT, INELIGIBILITY AND
VOLUNTARY EXCLUSION

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BIDDER'S CERTIFICATION OF AUTHORIZED EMPLOYMENT

In accordance with Indiana Code 22-5-1. 7 as amended, each Contractor in any tier of a public works project shall not knowingly employ unauthorized aliens. Every contractor shall enroll in and verify the work eligibility status of all employees hired after June 30, 2015 using the U.S. Citizenship and Immigration Services (USCIS) E-Verify program as defined in IC §22-5-1.7-3, unless the E-Verify program no longer exists.

The Prime Contractor shall require their subcontractors who perform work under this Contract to certify to the Prime Contractor that the subcontractor does not knowingly employ or contract with an unauthorized alien and that the subcontractor has enrolled and is participating in the E-Verify program. The Prime Contractor agrees to maintain this certification throughout the duration of the term of a contract with a subcontractor. The successful Prime Contractor and its sub-contractors at all levels shall comply with all provisions of the statute or the Contract is subject to cancellation.

I hereby certify that I have read and understand the "Contractor's Certification of Authorized Employment" provision of the Contract Documents In Section 00 20 11 Amendments to General Conditions Article 13, subparagraph 13.1.7.3 and its subparagraphs and that the undersigned and proposed and actual sub-contractors at all tiers shall comply with the provisions of the Statute

On behalf of and as authorized by the Bidder, I affirm and depose that the Bidder and our Subcontractors shall not knowingly employ unauthorized aliens.

(Bidder - Please print full name of your proprietorship, partnership, or corporation)

(Name - Authorized Signing Officer)

(Title)

(Signature)

(Date)

END OF SECTION 00 10 45

00 10 45
BIDDER'S CERTIFICATION OF AUTHORIZED EMPLOYMENT

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**Indiana State
University**

Office of the Senior Vice President for
Finance and Administration and University Treasurer
Rankin Hall Suite 200
210 North 7th Street
Terre Haute, Indiana 47809

Contract for Construction Between Indiana State University and Contractor

ISU Form CfC101-19
Based on AIA Form A101

AGREEMENT

Agreement for the Contract of Construction made as of the _____ day of _____ in the year
of Two Thousand and _____

BETWEEN the Owner
Indiana State University
210 North Seventh Street
Terre Haute, Indiana 47809-0001

and the Contractor:
(Name and address)

Project is:
(Name and location)

The Architect/Engineer is:
(Name and address)

Indiana State University and the Contractor agree as set forth below:

Part 1 – Contract Documents:

The Contract Documents include this Contract for Construction, Conditions of the Contract (General and Special Conditions), Drawings, Specifications, Addenda issued prior to execution of this Contract, other documents listed in this Contract, and Modifications issued after execution of this Contract; these form the Contract, and are as fully a part of the Contract as if attached to this Contract or repeated herein. This Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representation or agreements, either written or oral. An enumeration of the Contract Documents and other Modifications appears in Part 9 of this document.

Part 2 – Work of This Contract:

The Contractor shall execute the entire work as described in the Contract Documents, except to the extent specifically indicated in the Contract Documents to be the responsibility of others, or as follows:

Part 3 – Start Date and Substantial Completion Date:

- 3.01 The Start Date shall be as indicated in Section 00 10 10 of the Project Specifications, as listed in any subsequent Addenda, the Notice to Proceed Letter or as listed below:
- 3.02 The Contractor shall achieve Substantial Completion as indicated in Section 00 10 10 of the Project Specifications, as listed in any subsequent Addenda, the Notice to Proceed Letter or as listed below:
- 3.03 Substantial Completion maybe adjusted as allowed under Contract Documents or as mutually agreed upon in writing by the Owner and the Contractor.

Part 4 – Contract Sum:

- 4.01 Indiana State University shall pay the Contractor in current funds for the Contractor's performance of the Contract the Contract Sum of _____dollars
(\$_____) subject to additions or deductions as provided in the Contract Documents
- 4.02 The Contract Sum is based upon the following Alternates, if any, which are described in the Contract Documents and are hereby accepted by Indiana State University:
- 4.03 Unit Prices, if any, are as follows:
- 4.04 Allowances

Part 5 – Progress Payments

- 5.01 Based on an Application for Payment Issued to the Architect/Engineer by the Contractor, Indiana State University shall make progress payments on the account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.
- 5.02 The period covered by each Application for Payment shall be on a regular monthly basis of not less than Twenty Eight (28) calendar days.
- 5.03 When the Application for Payment is received by the Architect/Engineer, Indiana State University shall make payment within fifteen (15) days after the approval of the Application for Payment by the Architect/Engineer and receipt by Indiana State University Office of Finance and Administration.
- 5.04 Each Application for Payment shall be based on the schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of Work and shall be prepared in a form and supported by such data as required by the Architect/Engineer and Indiana State University to evaluate and substantiate the accuracy of the Application for Payment. Unless objected to by the Architect/Engineer or Indiana State University this schedule of values shall be the basis for all Contractor Applications for Payment.
- 5.05 Applications for Payment shall indicate the percentage of completion of each portion of Work as of the end of the application period.
- 5.06 A Partial Waiver of Lien shall be included with each progress Application for Payment.
- 5.07 Subject to provisions of the Contract Documents, the amount of the Application for Payment shall be computed as follows:
 - A. Total of all portions of Work indicted on the schedule of values completed during the application period.
 - B. Total of verified stored materials indicated on the schedule of values acquired during the application period, provided proof of insurance on the storage facility is submitted.
 - C. Total of all Change Orders approved or Change Directives issued during the application period.
 - D. Less a Retainage of ten percent (10%)
 - E. Subtract the aggregate of previous Applications of Payments made to Indiana State University and subtract amounts, if any, withheld or nullified by the Architect/Engineer.
- 5.08 The progress payment amount determined by Section 5.06 shall be further modified under the following circumstances
 - A. Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to ninety five percent (95%) of the Contract Sum; less any amounts the Architect/Engineer or Indiana State University shall determine for incomplete work and unsettled claims.
 - B. Add, if final completion of the work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with Subparagraph 9.10.3 of the General Conditions.
- 5.09 Reduction or Limitation of Retainage:
 - A. At the sole written discretion of Indiana State University, if acceptable progress is made, at fifty percent (50%) completion of the Contract Sum the remaining Retainage may be reduced to 0%.

Part 6 – Final Payment

- 6.01 Final payment, constituting the remaining unpaid balance of the Contract Sum, shall be made to the Contractor by Indiana State University when:
 - A. The Contract has been fully performed by the Contractor as detailed in the Contract Documents.
 - B. Approval of the Final Application for Payment is received from the Architect/Engineer.
- 6.02 No Contractor claims for additional compensation shall be permitted or accepted more than sixty (60) days following the Contractor's submission of their Final Application for Payment.
- 6.03 Payment shall be made by Indiana State University 61 days after issuance of the of the Contractor's Final Application for Payment and Final Waiver of Lien and final approval from the Architect/Engineer of the Final Application for Payment.

Part 7 – Miscellaneous Provisions

- 7.01 Where reference is made in this document to a provision of the General Conditions or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

Part 8 – Termination or Suspension

- 8.01 The Contract may be terminated by Indiana State University or the Contractor as provided in Article 14 of the General Conditions.
- 8.02 The Work may be suspended by Indiana State University as provided in Article 14 of the General Conditions.

Part 9 – Enumeration of Contract Documents

- 9.01 The Contract Documents, except for Modifications issued after execution of this Contract, are enumerated as follows:
- A. The agreement is this executed **Contract for Construction Between Indiana State University and Contractor, ISU Form Cfc101-20**.
 - B. The General Conditions are the General Conditions of the Contract for Construction, AIA Document A201.
 - C. The Supplementary and Other Conditions are those contained in the Project Specifications and are as follows:
See attached Exhibit A Sections 00 and 01
 - D. The Specifications:
See attached Exhibit A Sections 02-33 as applicable
 - E. The Drawings:
See attached Exhibit B
 - F. The Addenda:

Number	Date	Pages
 - G. Other Documents, if any, forming the Contract Documents are as follows:
Certification Regarding Suspension, Debarment, Ineligibility and Voluntary Exclusion Form, MBE/WBE/VBE Participation Plan, Contractor's Certification of Authorized Employment Form, Award Letter, Purchase Order

This agreement is entered into as of the day and year first written above and is executed by electronic copy in PDF format of which one is delivered to the Contractor, one is delivered to the Architect/Engineer, and the remainder to Indiana State University for distribution to the ISU Purchasing Department, the Office of the Senior Vice President for Finance and Administration and the ISU Department of Facilities Management.

Indiana State University

Contractor

(Signature)

(Signature)

Seth Hinshaw
(Printed or Typed Name)

(Printed or Typed Name)

Exhibit A – Refer to Addenda for any additions, deletions or revisions to these Specification Sections

Exhibit B – Refer to Addenda for any additions, deletions or revisions to these Drawings

00 20 00
BID FORM

BASED ON BID FORM
FORM NO. 96
REVISED FORMAT 1/14/2013

GENERAL BID FOR PUBLIC BUILDING

PROJECT: **CHHS Occupation Therapy Renovation Bid Number B0028833**

TO: INDIANA STATE UNIVERSITY
BOARD OF TRUSTEES
TERRE HAUTE, INDIANA

FROM:

(Name of Bidder) (Company Name)

(Address)

(City, State, Zip)

PHONE NUMBER _____

DATE: _____

SUBMITTED BY: _____
(Signature) (Title)

The Bidder's signature certifies the Bidder is in compliance with all aspects of the Bid Documents

ADDENDA

The following Addenda have been received. The modifications to the bidding documents noted therein have been considered and all costs thereto are included in the Bid Sum(s).

Addendum # _____	Dated _____
Addendum # _____	Dated _____
Addendum # _____	Dated _____
Addendum # _____	Dated _____
Addendum # _____	Dated _____
Addendum # _____	Dated _____

OWNER'S RIGHTS REGARDING ACCEPTANCE OF BIDS

It is understood that the Owner reserves the right to accept or reject any Bid and to waive any irregularities in Bidding. It is further understood on Bids with multiple Base Bid Packages the Owner reserves the right to selectively Award individual Base Bid Packages to multiple Prime Bidders submitting the lowest and best Bids for the individual Base Bid Packages.

TAX EXEMPT

Indiana State University is a Tax Exempt Institution and Indiana Sales Tax for products permanently incorporated in work shall not be included as part of the Bid. All other applicable Federal, State and Local taxes shall be included in the Bid sum. Tax exempt certificate available upon request.

00 20 00
BID FORM

OFFER:

Pursuant to and in compliance with 'Instructions to Bidders', and other Bidding Documents prepared by the Indiana State University Facilities Management Department for the above mentioned project, the signer, having become thoroughly familiar with the terms and conditions of the proposed Contract Documents and with local conditions affecting the performance and costs of the Work at the place where the Work is to be completed, and having fully inspected the site in all particulars, hereby proposes and agrees to fully perform the Work within the time stated and in strict accordance with the intent of the proposed Contract Documents, including furnishing bonds, insurance, labor, materials, and to do all the Work required to construct and complete in accordance with the proposed Contract Documents as follows:

BASE BID

Renovation of CHHS for Occupational Therapy per Specifications and Drawings.

Base Bid Total \$_____

_____ Dollars
(State Amount in Words)

ALTERNATE BIDS Refer to Section 01 10 00 Summary of Work 1.4 Scope of Work-Alternates for details

1. Alternate No. 1: Slotted Channel Framing & Pediatric Swing Mount

_____ Dollars (\$_____)
(State Amount in Words) Add ☐ Deduct ☐

2. Alternate No. 2: Classroom A-006 Furniture

_____ Dollars (\$_____)
(State Amount in Words) Add ☐ Deduct ☐

3. Alternate No. 3: New Glass Marker Wall & Boards

_____ Dollars (\$_____)
(State Amount in Words) Add ☐ Deduct ☐

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BID FORM

ALLOWANCES

1. A \$30,000.00 Allowance shall be included in the Base Bid for Unforeseen Conditions and General Construction Contingency. It is solely at the discretion of the Architect/Engineer/Owner what costs may be applied to this Allowance.
2. A \$5,000.00 Allowance shall be included in the Base Bid for the A/E to create "Record Drawings" as detailed in Section 01 77 00 Contract Closeout.

ACCEPTANCE

This offer shall be opened to acceptance and is irrevocable for the period as follows:

- Base Bid and All Alternates - One Hundred Twenty (120) calendar days from the Bid opening date.

If the Owner accepts the Bid within the time period stated above, Bidder will:

- Furnish the required bonds and insurance certificates within ten (10) calendar days of receipt of the Award Letter
- Commence work within seven (7) calendar days of receipt of the Award Letter or as Directed by the Owner.
- Execute the Contract for Construction Between Indiana State University and Contractor within seven (7) calendar days of receipt of the Contract.

The Bidder agrees to coordinate and expedite their work and that if the Award is given within fourteen (14) calendar days from the Bid opening date the work shall be substantially completed as listed in Section 00 10 10 Instructions to Bidders 1.01 C. If the Award is not made within the stated fourteen (14) calendar days then the substantial completion date may be adjusted as allowed by the Contract Documents or as mutually agreed upon in writing by the Owner and Contractor.

COMPLIANCE WITH LAWS

The Bidder shall comply with all applicable federal, state, and local laws, rules, regulations, and ordinances including but not limited to Indiana Code 5-16 and all provisions required thereby to be included herein are hereby incorporated by reference. Bidder warrants Contractor and any subcontractors shall obtain and maintain all required permissions, permits, licenses, registrations, accreditations, certifications, and approvals, and shall comply with all employment, labor, EEOC, E-verify, health, safety, and environmental statutes, rules, or regulations related to the products and services offered under this agreement. Bidder and any principals of the Contractor certify compliance with the requirements of Indiana Code § 5-16-1-9 Application of Indiana Code 5-22-16.5 (e.g. Company has not and will not participate in any investments or activities in Iran and refrains from engaging in any new investments or activities in Iran).

NON-COLLUSION AFFIDAVIT

The Bidder, by its officers and agents or representatives present at the time of filing their bid, being duly sworn, say on their oaths that neither they nor any of them have in any way, directly or indirectly, entered into any arrangement or agreement with any other bidder, or with any public office of the State of Indiana, of any county or municipality or other public offices whereby such affiance or either of them, has paid or is to pay to such other bidder or public officer any sum of money, or has given or is to give to such other bidders or public officer anything of value whatever, or such affiance or either of them has not, directly or indirectly entered into any arrangement or agreement with any other bidder or bidders, which tends to or does lessen or destroy free competition in letting of the contract sought for by the attached bids; that no inducement of any form or character other than which appears upon the face of the bid will be suggested, offered, paid, or delivered to any person whomsoever to influence the acceptance of the said bid or awarding of the contract, nor has this bidder any agreement or understanding of any kind whatsoever, with any person whomsoever to pay, deliver to, or share with any other person in any way or manner, any of the proceeds of the contract sought by this bid.

00 20 00
BID FORM

NON-DISCRIMINATION

The Bidder and its Subcontractors, if any, shall not discriminate against any employee or applicant for employment, to be employed in the performance of this Contract, with respect to their hire, tenure, terms, conditions or privileges of employment or any matter directly or indirectly related to employment because of their sex, race, natural origin, ancestry or religion or disability as prohibited under the Americans with Disabilities Act. Breach of this covenant may be regarded as a material breach of the Contract.

CERTIFICATION OF UNITED STATES STEEL PRODUCTS

The Bidder certifies that the Bidder and all Subcontractors will comply with the statutory obligations to use steel products made in the United States.

MBE/WBE/VBE BIDDING:

See Section 00 10 30 for requirements for MBE/WBE/VBE Compliance. Section 00 10 40 MBE/WBE/VBE Participation Plan must be completed by **all Bidders** and submitted with the Bid. Failure to submit with the Bid may be sufficient cause to disqualify a Bid.

EXPERIENCE QUESTIONNAIRE

List similar projects completed by your organization:

1. Contract Amount _____
Description _____
Date Completed _____
Owner _____
(Name and phone #)
2. Contract Amount _____
Description _____
Date Completed _____
Owner _____
(Name and phone #)

List similar projects currently under construction by your organization

1. Contract Amount _____
Description _____
Date Completed _____
Owner _____
(Name and phone #)
2. Contract Amount _____
Description _____
Date Completed _____

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BID FORM

Owner _____
(Name and phone #)

Yes ☐ No ☐ Has your organization ever failed to complete any work awarded it?
If yes, where and why?

Yes ☐ No ☐ Does your Organization have any pending litigation or litigation completed within the past five (5) years initiated by your Organization or the Owner as a result of your work on another Project?

If yes, attach a complete listing, with your Bid, of all such litigation(s) and name(s) of Institutions and/or Parties involved with complete contact information. Failure to submit this information may result in disqualification of your Bid.

Yes ☐ No ☐ Has your Organization been cited for violation of State or Federal regulations within the past twelve months?

If yes, what was the violation and resolution?

List references from firms for which your organization has performed work. Provide firm name, contact person name and phone number.

APPENDICES

The following Appendices are submitted with the Bid:

Appendix A - Subcontractors and Material/Supplier Lists

Appendix B - Comprehensive Subcontractor and Supplier & Manufacturer List

Appendix C - Wage Rate Schedule

OATH AND AFFIRMATION

Attested to this ____ day of _____, 202__

By _____

ACKNOWLEDGMENT

State of _____
SS:

County of _____

_____ being duly sworn, deposes and
(Name of person)

says that he/she is _____ of
(Title)

_____ and that the
(Name of organization)
statements contained in the foregoing bid, certification and affidavit are true and correct.

Subscribed and sworn to before me by _____

this ____ day of _____, 202__

Notary Public

My Commission Expires _____

County of Residence _____

SUPPLEMENTS TO BID FORM

TO: INDIANA STATE UNIVERSITY

PROJECT: **CHHS Occupation Therapy Renovation Bid Number B0028833**

DATE: _____

SUBMITTED BY:
(full name)

(full address)

In accordance with Instructions to Bidders and Bid Form, we include the Supplements to Bid Form for Appendices listed below. The information provided shall be considered an integral part of the Bid Form.

Appendix A - Subcontractor and Manufacturers List (to be submitted at time of Bid)
Failure to submit may be cause to disqualify bid

(Bidder)

(Project)

The following will be performed (or provided) by the Subcontractors and Manufacturers listed herein and coordinated by us.

The Prime Contractor (Bidder) shall list all Subcontractors and Suppliers/Manufacturers called for in Appendix A of this Bid Form at the time of Bid Submission. Failure to provide this information may be sufficient cause to disallow a Bid.

The Prime Contractor (Bidder) shall use the Subcontractors, Suppliers, Materials and Equipment as listed in the Bid Form Appendix "A" submitted at the time of Bid. It is the Prime Contractor's (Bidder's) responsibility to assure they have listed the correct Subcontractors, Suppliers, Materials and Equipment on their Bid Form. THERE SHALL BE NO CHANGES PERMITTED TO THESE LISTS.

Exception: If the Owner determines the Subcontractors, Suppliers, Materials or Equipment are not acceptable, the Owner shall notify the Prime Contractor (Bidder) in writing within two (2) working days after receipt of Bids of the unacceptable Subcontractor(s), Supplier(s), Material(s) and/or Equipment(s).

(Listings begin on next page)

SUBCONTRACTOR LIST

Bidder shall provide the names of all applicable Subcontractors

Description	Subcontractor
Carpeting	_____
Tile Flooring	_____
Casework	_____
Visual Display	_____
Painting	_____
HVAC	_____
Plumbing	_____
Fire Protection	_____
Electrical	_____
A/V - Telecommunications	_____

(Appendix B begins on the next page)

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BID FORM

Appendix B – Comprehensive Subcontractor and Supplier & Manufacturer List to be submitted by 4:30pm on the day Bids are received by the two apparent low Bidders. See Section 00 10 10 Instructions to Bidders Part 3 3.17 for full details.

SUBCONTRACTOR LIST

Bidder shall provide the names of all applicable Subcontractors

Description	Subcontractor
Storefronts & Glazing	_____
Carpet and Resilient Flooring	_____
Painting	_____
Casework	_____
Air Balancing	_____
Temperature Controls	_____
AV / Technology Installation	_____

SUPPLIER & MANUFACTURERS LIST

Bidder shall provide the names of all applicable Suppliers and Manufacturers

Product Description	Supplier	Manufacturer
Door Hardware	_____	_____
Resilient Base	_____	_____
Tile Carpeting	_____	_____
Casework	_____	_____
Electrical Panels	_____	_____
Interior Lighting	_____	_____
Lighting Controls	_____	_____
Wiring Devices	_____	_____
Fire alarm	_____	_____

Appendix C – Wage Rate Schedules

By 2:00pm on the next business day after receipt of Bids the Bidder shall submit, a wage rate schedule for the workers of the Prime Bidder and all major Subcontractors involved in the Work. Failure to supply the wage rate schedule(s) as required by the Bidding Documents may be sufficient cause to disallow a Bid

00 20 00
BID FORM

END OF SECTION 00 20 00

DRAFT AIA[®] Document A201[™] - 2007

General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

< >
< >

THE OWNER:

(Name, legal status and address)

< >< >
< >

THE ARCHITECT:

(Name, legal status and address)

< >< >
< >

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3	CONTRACTOR
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6	CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS
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12	UNCOVERING AND CORRECTION OF WORK
13	MISCELLANEOUS PROVISIONS
14	TERMINATION OR SUSPENSION OF THE CONTRACT
15	CLAIMS AND DISPUTES

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

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

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 BASIC DEFINITIONS

§ 1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding requirements.

§ 1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 THE WORK

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 THE PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by separate contractors.

§ 1.1.5 THE DRAWINGS

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

§ 1.1.6 THE SPECIFICATIONS

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 INSTRUMENTS OF SERVICE

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 INITIAL DECISION MAKER

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2 and certify termination of the Agreement under Section 14.2.2.

§ 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 CAPITALIZATION

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 INTERPRETATION

In the interest of brevity the Contract Documents frequently omit modifying words such as “all” and “any” and articles such as “the” and “an,” but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

§ 1.5.1 The Architect and the Architect’s consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, 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 publication in derogation of the Architect’s or Architect’s consultants’ reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect’s consultants.

§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

ARTICLE 2 OWNER

§ 2.1 GENERAL

§ 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 have express authority to bind the Owner with respect to all matters requiring the Owner’s approval or authorization. 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 authorized representative.

§ 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 evaluate, give notice of or enforce mechanic’s lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner’s interest therein.

§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner’s obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner’s ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or

the portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.2 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 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. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.2.4 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.2.5 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.3 OWNER'S RIGHT TO STOP THE WORK

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

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 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 Order 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. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

ARTICLE 3 CONTRACTOR

§ 3.1 GENERAL

§ 3.1.1 The Contractor 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 Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 LABOR AND MATERIALS

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other

facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work authorized by the Architect in accordance with Sections 3.12.8 or 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 WARRANTY

The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. 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. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.6 TAXES

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume

the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 ALLOWANCES

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1** Allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- .2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- .3** Whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 SUPERINTENDENT

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the name and qualifications of a proposed superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect's approval. The Architect's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE

The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. Their purpose is to demonstrate the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be

required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.13 USE OF SITE

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 CUTTING AND PATCHING

§ 3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting and patching shall be restored to the condition existing prior to the cutting, fitting and patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

§ 3.15 CLEANING UP

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 ACCESS TO WORK

The Contractor shall provide the Owner and Architect access to the Work in preparation and progress wherever located.

§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

§ 3.18 INDEMNIFICATION

§ 3.18.1 To the fullest extent permitted by law the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 GENERAL

§ 4.1.1 The Owner shall retain an architect lawfully licensed to practice architecture or an entity lawfully practicing architecture in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 4.1.2 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect. Consent shall not be unreasonably withheld.

§ 4.1.3 If the employment of the Architect is terminated, the Owner shall employ a successor architect as to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 4.2 ADMINISTRATION OF THE CONTRACT

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general 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. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) known 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. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 DEFINITIONS

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time for review. Failure of the Owner or Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person or entity previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 SUBCONTRACTUAL RELATIONS

By appropriate agreement, written where legally required for validity, 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 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 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.

§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, 11 and 12.

§ 6.2 MUTUAL RESPONSIBILITY

§ 6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that

the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a separate contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a separate contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 OWNER'S RIGHT TO CLEAN UP

If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 GENERAL

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

§ 7.2 CHANGE ORDERS

§ 7.2.1 A Change Order is a written instrument prepared by the Architect 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.

§ 7.3 CONSTRUCTION CHANGE DIRECTIVES

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 As provided in Section 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.6 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine 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 the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, 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;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and
- .5 Additional costs of supervision and field office personnel directly attributable to the change.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. 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.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 MINOR CHANGES IN THE WORK

The Architect has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

ARTICLE 8 TIME

§ 8.1 DEFINITIONS

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term “day” as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 PROGRESS AND COMPLETION

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of 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 insurance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 DELAYS AND EXTENSIONS OF TIME

§ 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 Contractor's control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 CONTRACT SUM

The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.2 SCHEDULE OF VALUES

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Architect, before the first Application for Payment, 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.

§ 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 At least ten days before the date established for each progress payment, 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 if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.4 CERTIFICATES FOR PAYMENT

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;

- .3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a separate contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.3 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Architect will reflect such payment on the next Certificate for Payment.

§ 9.6 PROGRESS PAYMENTS

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor no later than seven days after receipt of payment from the Owner the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and material and equipment suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor, except as may otherwise be required by law.

§ 9.6.5 Contractor payments to material and equipment suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors and suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.7 FAILURE OF PAYMENT

If the Architect does not issue a Certificate for Payment, 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 date established in the Contract Documents the amount certified by the Architect or awarded by binding dispute resolution, 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 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.

§ 9.8 SUBSTANTIAL COMPLETION

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. 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.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 PARTIAL OCCUPANCY OR USE

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 FINAL COMPLETION AND FINAL PAYMENT

§ 9.10.1 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 will promptly make such inspection 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.

§ 9.10.2 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 and (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. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed 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. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- .1 liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents; or
- .3 terms of special warranties required by the Contract Documents.

§ 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 previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 SAFETY PRECAUTIONS AND PROGRAMS

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 SAFETY OF PERSONS AND PROPERTY

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to

- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

§ 10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 INJURY OR DAMAGE TO PERSON OR PROPERTY

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 HAZARDOUS MATERIALS

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), 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.

§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs of shut-down, delay and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall indemnify the Contractor for all cost and expense thereby incurred.

§ 10.4 EMERGENCIES

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 CONTRACTOR'S LIABILITY INSURANCE

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- .1 Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;
- .2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- .3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- .4 Claims for damages insured by usual personal injury liability coverage;
- .5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- .6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
- .7 Claims for bodily injury or property damage arising out of completed operations; and
- .8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, 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.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, 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.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Architect and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.2 OWNER'S LIABILITY INSURANCE

The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

§ 11.3 PROPERTY INSURANCE

§ 11.3.1 Unless otherwise provided, the Owner 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 without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or

otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.2 BOILER AND MACHINERY INSURANCE

The Owner 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 be named insureds.

§ 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. 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.

§ 11.3.4 If the Contractor 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 Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor 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 Contractor.

§ 11.3.7 WAIVERS OF SUBROGATION

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors 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 covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the

Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. 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 after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Owner 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 Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

§ 11.4.2 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.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 UNCOVERING OF WORK

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 AFTER SUBSTANTIAL COMPLETION

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 ACCEPTANCE OF NONCONFORMING WORK

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 SUCCESSORS AND ASSIGNS

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to covenants, agreements and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. 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.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

§ 13.3 WRITTEN NOTICE

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

§ 13.4 RIGHTS AND REMEDIES

§ 13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

§ 13.4.2 No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach there under, except as may be specifically agreed in writing.

§ 13.5 TESTS AND INSPECTIONS

§ 13.5.1 Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses shall be at the Contractor's expense.

§ 13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.5.5 If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.6 INTEREST

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

§ 13.7 TIME LIMITS ON CLAIMS

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 TERMINATION BY THE CONTRACTOR

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 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 all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency that requires 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; or
- .4 The Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

§ 14.1.2 The Contractor may terminate the Contract if, 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, repeated suspensions, delays or interruptions of the entire Work by the Owner as described in Section 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 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;
- .2 fails to make payment to Subcontractors for materials or labor in accordance with 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.

§ 14.2.2 When any of the above reasons exist, the Owner, upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- .1 that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 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; and
- .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.

§ 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 CLAIMS

§ 15.1.1 DEFINITION

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

§ 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 Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party 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.

§ 15.1.3 CONTINUING CONTRACT PERFORMANCE

Pending final resolution of a Claim, 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 prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 CLAIMS FOR ADDITIONAL COST

If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.5.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 INITIAL DECISION

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker 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 Initial Decision Maker when the response or supporting data will be furnished or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 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.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 MEDIATION

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.6 shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 ARBITRATION

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 CONSOLIDATION OR JOINDER

§ 15.4.4.1 Either party, at its sole discretion, may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Either party, at its sole discretion, may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an

additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as the Owner and Contractor under this Agreement.



PART 1 – GENERAL

1.01 AMENDMENTS TO GENERAL CONDITIONS

- A. The General Conditions for this Project shall be the American Institute of Architects' Document A201-2007, "General Conditions of the Contract for Construction, Articles 1 through 15, inclusive, 38 pages, and hereafter referred to as the "General Conditions." Such document is specifically made a part of the Contract Documents.
- B. The following amendments shall modify, delete, and supplement the General Conditions. Where any Article, Paragraph, or Subparagraph in the General Conditions is supplemented by one of the following Paragraphs, the provisions of such Article, Paragraph, or Subparagraph shall remain in full force and effect and the supplemental provisions shall be considered as added thereto. Where any Article, Paragraph not so amended, deleted, voided, or superseded shall remain in full force and the order and numbering of subsequent articles, Paragraphs or Subparagraphs shall be changed to read as if in sequence.
- C. Refer to other Division 00 documents for additional supplemental requirements.

PART 2 – AMENDMENT ARTICLES

2.01 ARTICLE 1

- A. Subparagraph 1.1.1: Amend this Subparagraph by deleting the last sentence beginning with the words "Unless specifically enumerated" and substituting the following sentence: "The Contract Documents shall also include the Notice to Bidders, Instructions to Bidders, Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion, Bid Form, Subcontractors and Materials Listing, Contractor's Non-Collusion Affidavit, and all portions of Addenda relating to Bidding Requirements."
- B. Add the following Subparagraph 1.1.7
"1.1.7 ARCHITECT/ENGINEER"
"Where the word Architect is used in the AIA A201-2007 it shall be inferred to also include the Design Engineer(s), e.g. Architect/Engineer, Engineer (for Engineer only Administered Projects).
- C. Add the following Section 1.7

"1.7 LITIGATION

1.7.1 All litigation under this Contract must be initiated in Vigo County, Indiana and Contractor consents to the jurisdiction of the Vigo County courts.

1.7.2 Contractor hereby waives its right to a jury trial in any matters litigated in Vigo County.

1.7.3 In any litigation initiated by Contractor, Contractor shall reimburse all attorney's fees and expenses incurred by Owner up to a maximum of \$100,000 provided Contractor has presented its claims as required by this Contract and the Owner has made a good faith offer to resolve any dispute prior to litigation. The determination of a 'good faith offer' shall rest solely with the Architect who will render their opinion in writing to Contractor or Owner upon request prior to Contractor initiating litigation or thereafter as requested. The Architect's decision is binding on Owner and Contractor and admissible in court as determinative of this issue.

1.7.4 In any litigation initiated by Owner against Contractor, provided Contractor was given the opportunity to resolve all issues prior to litigation being initiated and failed to do so through a reasonable offer, as determined by the Architect, then Contractor shall be responsible to reimburse all attorney's fees and expenses incurred by Owner for all litigation as well as for all pre-litigation activities engaged in by the Owner for

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investigating, evaluating, or mediating any claims, issues, or matters related to Contractor.”

2.02 ARTICLE 2

- A. Subparagraph 2.1.2: Delete this Subparagraph in its entirety.
- B. Subparagraph 2.2.5: Amend this Subparagraph by adding “electronically” after the word Documents in the second line.

2.03 ARTICLE 3

- A. Paragraph 3.2: Amend this Paragraph by deleting Subparagraph 3.2.1 in its entirety and replacing with the following new subparagraph 3.2.1 and its subparagraphs:

“3.2.1 By executing the Contract, the Contractor represents to the Owner that:”

“3.2.1.1 The Contractor has a high level of experience and expertise in the business administration construction, management, workplace health and safety supervision and superintendence of projects of similar size and complexity and that it will perform the Work with the care, skill and diligence of such a contractor.”

“3.2.1.2 Contractor and, to the best of its knowledge, its subcontractors are financially solvent, able to pay all debts as they mature and have sufficient working capital to complete the Work and all obligations thereunder.”

“3.2.1.3 The Contractor is able to furnish the plant, tools, materials, supplies, equipment and labor required to complete the Work.”

“3.2.1.4 Contractor is authorized to do business in the State of Indiana.”

“3.2.1.5 Contractor’s execution of the Contract and its performance thereof are within its authorized powers.”

“3.2.1.6 Contractor has:”

“3.2.1.6.1 Studied the Contract Documents, understands their provisions and that that they are sufficiently detailed and complete to permit the Contractor to perform the Work in accordance with the Contract Documents, within the Contract Time and for the Contract Sum.”

“3.2.1.6.2. Inspected the Project site.”

“3.2.1.6.3 Investigated and satisfied itself as to:

“3.2.1.6.3.1 The site and locality where the Work is to be performed and the conditions and difficulties to be encountered, including access thereto.”

“3.2.1.6.3.2 The availability of utilities and access thereto.”

“3.2.1.6.3.3 Conditions affecting transportation, disposal, handling and storage of materials, supplies and equipment.”

“3.2.1.6.3.4 Any materials, supplies or equipment which are to be furnished by the Owner for the Contractor’s use.”

“3.2.1.6.3.5 The type and availability of tools, equipment and facilities to perform the Work.”

“3.2.1.6.3.6 The availability and adequacy of labor and trades, and, if applicable, union wage scales, benefits, working conditions, craft jurisdictions, area practices and collective bargaining agreements affecting the Work.”

“3.2.1.6.3.7 Prevailing weather and climatological conditions.”

“3.2.1.6.3.8 All laws applicable to the Work and to the Contractor.”

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“3.2.1.6.3.9 All other factors which may affect the Contractor’s performance of the Work.”

- B. Paragraph 3.4: Amend this Paragraph by adding Subparagraphs 3.4.4 through 3.4.7 as follows:

“3.4.4 The Contractor shall employ competently trained and experienced engineers and supervisors, who shall coordinate general, mechanical, and electrical Work and crafts with the required construction progress. The Contractor shall exercise complete control over their Subcontractor(s) in a manner which will unite their efforts toward completion of the project as contracted.”

“3.4.5 The Contractor shall continuously maintain adequate protection of all their Work and the Work of Subcontractors from damage and shall hold harmless the Owner and Architect/Engineer from injury or loss arising in connection with this contract, including legal defense costs. The Contractor shall make good any such damage, injury, or loss, except such as may be directly due to errors in the Contract Documents or those caused by agents or employees of the Owner.”

“3.4.6 The Contractor shall be responsible for and shall establish and verify exterior lines and the required elevations of all buildings and structures to be erected at the site.”

“3.4.7 The Contractor shall coordinate and expedite the Work of all lower tier Contractors.”

- C. Paragraph 3.5: Amend this Paragraph by adding Subparagraphs 3.5.1, 3.5.2, and 3.5.3 as follows:

“3.5.1 The Contractor shall warranty that all Work executed under the respective sections will be free from defects of materials and workmanship for the period of one (1) year from the Date of Substantial Completion of the Work or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the Contract Documents. The Contractor further agrees that they will, at their own expense, repair and replace all such defective Work, and all other Work damaged that becomes defective during the term of the warranty. Where warranties are required, Contractor shall secure warranties in writing from Subcontractors, manufacturers and/or material suppliers addressed to and in favor of the Owner and deliver same to the Owner upon completion of Work. Delivery of warranties shall not relieve the Contractor from any obligations assumed under any other provisions of Contract.”

“3.5.2 Any damage to the building or its contents and/or Work of other Contractors caused by failure of any piece of equipment and/or faulty installation shall be repaired or replaced by the party or parties furnishing the original equipment/installation and paid for by the Contractor at fault.”

“3.5.3 An inspection of the installed Work and/or equipment will be made just before the end of the stipulated warranty period and any installations and/or equipment which, in the opinion of the Architect/Engineer and/or Owner, show undue wear, failure, incorrect operation, or otherwise do not conform to the letter and intent of the Contract Documents shall be repaired or replaced by the Contractor furnishing same at no additional charge.”

- D. Paragraph 3.6: Amend this Subparagraph by adding the words “Unless otherwise provided in the Contract Documents,” to the beginning of this Paragraph.

- E. Paragraph 3.9: Amend this Paragraph by adding Subparagraph 3.9.4 as follows:

“3.9.4 Subcontractors for any other Work shall have a competent superintendent at the site at all times when Work is being performed under their contracts.

- F. Paragraph 3.13: Amend this Paragraph by adding Subparagraph 3.13.1 as follows:

“3.13.1 The Contractor shall prepare an overlay sketch of the construction areas indicating spaces assigned for field office, storage sheds, containers, trailers and field

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shops, and for stockpiles and staging of materials for all trades. This sketch shall be submitted to the Owner and the Architect/Engineer for their information prior to moving any such equipment and materials onto the Project Site.”

- G. Paragraph 3.16: Amend this Paragraph 3.16 adding the following to the end:

“If Work is being executed at locations other than the Project site, the Contractor shall notify the Architect/Engineer where such Work is being executed, and at what time such Work will be ready for inspection, in order that the Architect/Engineer may inspect such Work Prior to its delivery to the Project Site.”

- H. Paragraph 3.18: Amend this Paragraph by adding Subparagraph 3.18.3 as follows:

“3.18.3 The Contractor shall indemnify the Owner and Architect/Engineer for any claim, demand or expense which may be made by reason of:

“.1 Any injury to person or property sustained by the Owner or by any person, firms, or corporations, if caused by the Contractor.”

“.2 Any injury to person or property sustained by any person, firms, or corporations caused by an act or omission of the Contractor or of any person, firm, or corporation directly or indirectly employed by him in connection with this Work, whether the said injury or damage occurs upon or adjacent to the Work.”

“.3 The Contractor, at his own cost, expense, and risk, shall defend any and all actions, suits, or other legal proceedings that may be rendered against the Owner and Architect/Engineer in any such action, suit, or proceedings.”

“.4 The Contractor shall indemnify the Owner and Architect/Engineer from any and all costs resulting from any claim or suits in connection with liens that may be brought or instituted against the Owner. Neither the final payment or any part of the retained percentage of the Contract shall become due until the Contractor has delivered to the Owner a complete release of all liens arising out of the Contract.”

2.04 ARTICLE 4

- A. Subparagraph 4.1.2: Delete this Subparagraph in its entirety.
- B. Subparagraph 4.2.7: Modify the first sentence of this Subparagraph by deleting the words “approve or take” and substituting the word “indicate.”
- C. Subparagraph 4.2.10: Amend this Subparagraph by adding the words “in writing” after the word “agree” in the first sentence.

2.05 ARTICLE 5

- A. Paragraph 5.3: Amend this Paragraph by adding the following sentence thereto:
- “Unless otherwise excepted, nothing contained in this Contract shall create any contractual relationship between any Subcontractor and the Owner.”

2.06 ARTICLE 6 (NO CHANGE)

2.07 ARTICLE 7

- A. Paragraph 7.1: Amend this Paragraph by adding the following new Subparagraph 7.1.4:

“7.1.4 When a change in the Work is contemplated which may affect the Contract Sum or duration of the Work, the Architect/Engineer will issue a ‘Proposal Request’ detailing the Work involved in such proposed change. Upon receipt of such ‘Proposal Request,’ the Contractor shall promptly, but in no case longer than five (5) working days, issue a reply or ‘Change Quotation,’ stipulating the change in cost of Project and/or duration as a result of the proposed change. This issuance of a Proposal Request does not, in any way, authorize commencement of the Work therein described. Should, after review and consultation with the Owner, the Architect/Engineer find the ‘Change Quotation’ by the

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Contractor to be acceptable, the Architect/Engineer will within thirty (30) calendar days issue a written 'Change Order' to the Contractor."

B. Add the following Subparagraph 7.1.5 as follows

"7.1.5 If Contractor proceeds with change order work before receiving a fully executed change order or change directive, then Contractor waives the right to object to the scope of work change, the amount of the change order, and the adjustment, if any, to the time of performance."

C. Amend Subparagraph 7.3.3 by adding the following Subparagraphs:

".5 Time and material."

".6 Extra Work performed under Item .5 above shall be upon the option of the Owner only in the event that the lump sum required under Item .1 is not acceptable."

".7 Extra Work shall be performed for the cost of the labor payroll plus 15% of the labor payroll and the cost of the material plus 5% of the material cost. Said markup fees are intended to compensate for the cost of payroll taxes, insurance of all kinds, all taxes of the Contractor, including State Taxes, Federal Income Tax, Unemployment, and FICA Taxes, as well as all other overhead costs, expenses, and carrying charges whatsoever, including the profit to be derived from such additional Work. Labor payroll is defined as the actual hourly labor cost plus any fringes payable as listed on the wage rate schedule(s) provided as required by the Bidding Documents.

".8 In case such Work is performed by a Subcontractor or a lower tier Contractor with the Owner's consent, the Work shall be marked up as indicated in 7.3.3.7 by the Contractor actually performing the Work. Each succeeding Contractor may mark up their direct labor and material costs as indicated in 7.3.3.7. Otherwise each succeeding Contractor, including the Prime Contractor, may add 5% for handling/coordination. Additional mark-ups of a Subcontractor's costs shall not be permitted.

".9 Costs for bond premiums are allowable provided documentation from the Bonding Company is included detailing the added bond cost premium, the current bond total and the new bond total."

D. Subparagraph 7.3.7: Amend the following:

.1 Delete the text and replace with:

" .1 The cost of the labor payroll plus 15% of the labor payroll;"

.2 Delete the semicolon at the end of the sentence and add "plus 5% of the total of the costs;"

.3 Delete the semicolon at the end of the sentence and add "plus 5% of the total of the costs;"

.4 Delete all text following the word bonds in the first line and replace with ",with documentation from the Bonding Company including details of the added bond cost premium, the current bond total and the new bond total;"

.5 Delete the text and replace with:

" .5 Additional costs of supervision directly attributable to the change if the change results in supervision of change work at a time outside the normal work hours of the Project."

E. Paragraph 7.3: Add the following new Subparagraphs 7.3.11, 7.3.12, and 7.3.13:

"7.3.11 When extra Work is performed under Item 7.3.3.2 above, said unit prices shall represent the total cost to the Owner and shall not be subject to any additional charges whatsoever."

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“7.3.12 In order to facilitate checking of quotations for extras or credits, all proposals shall be accompanied by a complete breakdown of costs, including labor, material, and subcontracts. Labor and material shall be marked up in the manner prescribed herein. Where cost items consist of major subcontracts, such contracts shall be broken down in a similar fashion.”

“7.3.13 When changes are made that result in a credit to the Owner, the value of the credit will be established by the method indicated in Items 7.3.3.1 or 7.3.3.2”

2.08 ARTICLE 8 (NO CHANGE)

2.09 ARTICLE 9

- A. Subparagraph 9.3.1: Amend this Subparagraph by deleting the words “if required” in the third line.

- B. Paragraph 9.3: Amend this Paragraph by adding Subparagraph 9.3.4 as follows:

“9.3.4 The Owner will retain, until the Work is at least fifty percent (50%) complete, ten percent (10%) of the amount due the Contractor on account of approved progress payments. At the time the Work is at least fifty percent (50%) completed or thereafter, if the manner of completion of the Work and its progress are and remain satisfactory to the Owner and Architect/Engineer, and in the absence of other good and sufficient reasons, the Architect/Engineer will (upon presentation by the Contractor of Consent of Surety) recommend to the Owner that any remaining approved partial payments be paid in full. Regardless of the Owner’s decision relative to further retainage, all prior retainages that were withheld will be held until completion of the contract Work and all remedial Work, listed as conditions of substantial completion, and following final payment. If retainage is limited to ten percent (10%) of the first fifty percent (50%) of the contract amount, as described above, five percent (5%) will be withheld from payments for all subsequent change orders; therefore, the minimum retainage shall be five percent (5%) of the current contract amount.”

- C. Subparagraph 9.6.3: Delete this Subparagraph in its entirety.

- D. Subparagraph 9.6.5: Delete this Subparagraph in its entirety.

- E. Paragraph 9.7: Delete the text of this Paragraph and replace with the following new Subparagraphs 9.7.1 and 9.7.2

“9.7.1 The Architect shall issue to the Owner a Certificate for Payment within seven calendar days after receipt of the Contractor’s Application for Payment. Upon receipt of the Certificate for Payment (Application for Payment) from the Architect, the Owner will endeavor to make payment to the Contractor within fifteen calendar days. If payment is not made within a reasonable time, 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 by the amount of the Contractor’s reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.”

“9.7.2 If an Application for Payment is being held for just cause, the Architect shall notify the Contractor in writing of the cause and what remedial action must be taken for the Application for Payment to be released for payment.

- F. Subparagraph 9.10.2: Amend this Subparagraph by deleting the word “and” in the eighth line and adding the following after the “Owner” in the eleventh line:

“and (6) the Architect/Engineer has received the required Record Drawings, brochures, manuals, operating instructions, warranties, affidavits, final application for payment, any other special data requirements and has performed a final inspection and confirmed that all items of completion are correct and acceptable at which time he will initiate a ‘Final Completion’ letter establishing the date of Final Completion.”

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2.10 ARTICLE 10

- A. Subparagraph 10.2.2: Amend this Subparagraph by adding the following to the end thereof:
"In the event of conflict between these Contract Documents and any Federal, State, or Local Authority laws, rules, regulations, or requirements, the most stringent requirement shall govern the Work."
- B. Subparagraph 10.3.1: Amend this Subparagraph by deleting the phrase "and Architect" in the sixth line.
- C. Subparagraph 10.3.2: Amend this Subparagraph by deleting the phrase "and Architect" in the second sentence; deleting the phrase "and the Architect" from the third sentence; and by deleting the words "either" and "or Architect" from the fourth sentence; by replacing the phrase, "and the Architect have" with the word "has" in the fourth sentence.
- D. Paragraph 10.3 add the following Subparagraph 10.3.7
10.3.7 "The Contractor shall also comply with all the safety paragraphs listed in Section 00 30 00 of the Contract Documents. In the event of conflict between 10.3 and Section 00 30 00, Section 00 30 00 shall prevail."

2.11 ARTICLE 11

- A. Article 11: Insert a new Subparagraph 11.1 and renumber each succeeding Paragraph accordingly:
11.1 See Specification Section 00 20 20 for additional requirements. In the event of conflict between Section 00 20 20 and this Paragraph 11, requirements of Section 00 20 20 shall prevail.
- B. Subparagraph 11.1.1 (renumbered 11.2.1): Amend this Subparagraph by adding the phrase, "and that are acceptable to the Owner," following the word "located," in the second line.
- C. Subparagraph 11.1.1 (renumbered 11.2.1): Amend this Subparagraph by adding the phrase, ", Indiana State University, the Indiana State University Board of Trustees and the Architect/Engineer," following the word "Contractor," in the second line.
- D. Subparagraph 11.1.1 (renumbered 11.2.1): Amend this Subparagraph by adding Sub-Subparagraphs .9 and .10 as follows:
".9 Liability insurance shall include all major divisions of coverage and be on a comprehensive basis including:
Premises Operations (including X, C, and U coverage's as applicable)
Independent Contractor's Protective
Products and Completed Operations
Personal Injury Liability with Employment Exclusion deleted
Contractual, including specified provision for the Contractor's obligations under Paragraph 3.18
Owned, non-owned and hired motor vehicles"
".10 Broad Form Property Damage including Completed Operations: If the General Liability coverage's are provided by a Commercial General Liability Policy on a claims made basis, the policy date or Retroactive Date shall predate the Contract; the termination date of the policy or applicable extended reporting period shall be no earlier than the termination date of coverage's required to be maintained after final payment, certified in accordance with Subparagraph 9.10.2."
- E. Subparagraph 11.1.2 (renumbered 11.2.2): Add the following renumbered Subparagraph 11.2.2.1

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“11.2.2.1 The insurance required by renumbered Subparagraph 11.2.1 shall be written for not less than the following limits, or greater if required by law:

See Section 00 20 20 for Insurance Requirement Levels

- F. Subparagraph 11.1.3 (renumbered 11.2.3): Amend this Subparagraph by changing the word “30” to “60” in the second sentence.

- G. Subparagraph 11.1.3 (renumbered 11.2.3): Amend this Subparagraph by deleting the last sentence beginning with the phrase, “Information concerning reduction....” And substituting the following:

“The form of the certificate shall be AIA Document G715, SUPPLEMENTAL ATTACHMENT for Acord Certificate of Insurance 25-S (7/90). Contractor shall furnish promptly to the Owner copies of any endorsements that are subsequently issued amending coverage or limits. Certificates of Insurance shall name the Owner (Indiana State University Board of Trustees) and Architect/Engineer as ‘Additional Insured’s.’”

- H. Paragraph 11.1 (renumbered 11.2): Amend this Paragraph by adding Subparagraph 11.2.5 as follows:

“11.2.5 The Contractor, in connection with the above mentioned Workmen’s Compensation and Occupational Disease Insurance, shall furnish to the Owner, prior to commencement of the Work, duly executed and validated forms as prescribed by the Indiana Industrial Board showing that such insurance is in full force and effect.”

- I. Sub-subparagraph 11.3.1.1 (renumbered 11.4.1.1): Amend this Subparagraph by adding the following Subparagraph 11.4.1.1.1:

“11.4.1.1.1: Such Insurance shall not insure against loss due to theft of Contractor’s, Subcontractor’s, Sub-Subcontractor’s tools, equipment, and other personal property. The responsibility to guard against such thefts shall lie with the respective Contractor, Subcontractor, or Sub-Subcontractor whose tools, equipment, and other personal property are susceptible to such thefts.”

- J. Subparagraph 11.3.1.3 (renumbered 11.4.1.3): Add the following phrase to the end of the sentence:

The deductible amount shall be \$25,000.00 unless otherwise advised by the Owner.

- K. Subparagraph 11.3.9 (renumbered 11.4.9): Delete this Subparagraph in its entirety.

2.12 ARTICLE 12

- A. Subparagraph 12.2.2.1: Amend this Subparagraph by adding the following sentence to the end:

“Where special warranties of longer duration are required, the Contractor shall secure warranties from Subcontractors, manufacturers and/or material suppliers as applicable, addressed to and in favor of the Owner, and deliver copies of same to the Owner upon completion of the Work. Delivery of said warranties shall not relieve Contractor of any obligation assumed under any other provisions of the Contract.”

2.13 ARTICLE 13

- A. Subparagraph 13.1: Delete the text in its entirety and replace with the following:

“13.1 Contractor and all Subcontractors are responsible to comply with Indiana Code as it pertains to public works projects. The following are notable requirements set forth in IC 5-16-13, in effect as of July 1, 2015, but are not inclusive of all requirements.”

- B. Subparagraph 13.1: Add the following numbered Subparagraph 13.1.1:

“13.1.1 Contractor agrees, and represents to Owner, that at least 15% of the Contract Price (at the time this Agreement is executed) is comprised of any combination of the

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following: 1) Work performed by Contractor's employees; 2) Services supplied directly by Contractor's employees; or 3) Materials supplied directly by Contractor.

- C. Subparagraph 13.1: Add the following numbered Subparagraph 13.1.2:

"13.1.2 Contractor and all Subcontractors, regardless of tier, shall not pay cash to its employees for Work performed on this public works Project."

- D. Subparagraph 13.1: Add the following numbered Subparagraph 13.1.3:

"13.1.3 Contractor and all Subcontractors, regardless of tier, shall comply with federal Fair Labor Standards Act of 1938."

- E. Subparagraph 13.1: Add the following numbered Subparagraph 13.1.4:

"13.1.4 Contractor and all Subcontractors, regardless of tier, shall be in compliance with workers compensation requirements of Indiana Code 22-3-5-1 and Indiana Code 22-3-7-34 and commits worker's compensation fraud if such Contractor or Subcontractor falsely classifies an employee as an independent contractor, sole proprietor, owner, partner, officer, or member of a limited liability company."

- F. Subparagraph 13.1: Add the following numbered Subparagraph 13.1.5:

"13.1.5 Contractor and all Subcontractor, regardless of tier, shall be in compliance with unemployment compensation system requirements of Indiana Code 22-4-1 through 22-4-39-5."

- G. Subparagraph 13.1: Add the following numbered Subparagraph 13.1.6:

"13.1.6 Contractor and all Subcontractors, regardless of tier, shall be in compliance with requirements for drug testing of its employees set forth in Indiana Code 4-13-18-1 through 4-13-18-7 if estimated cost of public works Contract is at least \$150,000. With each application for payment the Contractor shall submit an affidavit, dated and signed by the Contractor, that neither they nor, to their knowledge, any of their subcontractors has violated the "Drug Testing Program provision of the Indiana Code."

- H. Subparagraph 13.1: Add the following numbered Subparagraph 13.1.7:

"13.1.7 Following provisions shall be in effect for Contracts awarded after March 31, 2018."

- I. Subparagraph 13.1.7: Add the following numbered Subparagraph 13.1.7.1:

"13.1.7.1 Contractor and Subcontractors, regardless of tier, shall preserve its payroll and related records for three (3) years after completion of the project work and such records shall be open to inspection by the Indiana Department of Workforce Development."

- J. Subparagraph 13.1.7: Add the following numbered Subparagraphs 13.1.7.2 and 13.1.7.2.1:

"13.1.7.2 Recommended Employment of Apprentices"

"13.1.7.2.1 Owner strongly recommends that Contractor employs apprentices from each building trades craft involved in the Project to the maximum extent feasible. In doing so, the Contractor shall consider whether such apprentices are indentured into a Joint Apprenticeship Training Program or other comparable bona fide apprenticeship training program, registered and certified with the U.S. Department of Labor, Bureau of Apprenticeship and Training and shall use as a guide the Apprenticeship Standards of the Labor-Management Contract for the appropriate jurisdictional area when determining the appropriate ratio of apprentices from each respective craft."

- K. Subparagraph 13.1.7: Add the following numbered Subparagraphs 13.1.7.3, 13.1.7.3.1 and 13.1.7.3.2:

"13.1.7.3 Contractor's Certification of Authorized Employment (E-Verify Requirements.)"

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“13.1.7.3.1 In accordance with Indiana Code 22-5-1. 7 as amended, each Contractor in any tier of a public works project shall not knowingly employ unauthorized aliens. Every contractor shall enroll in and verify the work eligibility status of all employees hired after June 30, 2015 using the U.S. Citizenship and Immigration Services (USCIS) E-Verify program as defined in IC §22-5-1.7-3, unless the E-Verify program no longer exists.

“13.1.7.3.2 The Prime Contractor shall require their subcontractors who perform work under this Contract to certify to the Prime Contractor that the subcontractor does not knowingly employ or contract with an unauthorized alien and that the subcontractor has enrolled and is participating in the E-Verify program. The Prime Contractor agrees to maintain this certification throughout the duration of the term of a contract with a subcontractor. The Prime Contractor and its sub-contractors at all levels must comply with all provisions of the statute or the Contract is subject to cancellation.”

- L. Subparagraph 13.1.7: Add the following numbered Subparagraphs 13.1.7.4 and 13.1.7.4.1

“13.1.7.4 Non-Collusion Affidavit”

“13.1.7.4.1 The Bidder, by its officers and agents or representatives present at the time of filing their bid, being duly sworn, say on their oaths that neither they nor any of them have in any way, directly or indirectly, entered into any arrangement or agreement with any other bidder, or with any public office of the State of Indiana, of any county or municipality or other public offices whereby such affiance or either of them, has paid or is to pay to such other bidder or public officer any sum of money, or has given or is to give to such other bidders or public officer anything of value whatever, or such affiance of affiance or either of them has not, directly or indirectly entered into any arrangement or agreement with any other bidder or bidders, which tends to or does lessen or destroy free competition in letting of the contract sought for by the attached bids; that no inducement of any form or character other than which appears upon the face of the bid will be suggested, offered, paid, or delivered to any person whomsoever to influence the acceptance of the said bid or awarding of the contract, nor has this bidder any agreement or understanding of any kind whatsoever, with any person whomsoever to pay, deliver to, or share with any other person in any way or manner, any of the proceeds of the contract sought by this bid.”

- M. Subparagraph 13.1.7: Add the following numbered Subparagraphs 13.1.7.5 and 13.1.7.5.1

“13.1.7.5 Non-Discrimination”

“13.1.7.5.1 The Bidder and its Subcontractors, if any, shall not discriminate against any employee or applicant for employment, to be employed in the performance of this Contract, with respect to their hire, tenure, terms, conditions or privileges of employment or any matter directly or indirectly related to employment because of their sex, race, natural origin, ancestry or religion or disability as prohibited under the Americans with Disabilities Act. Breach of this covenant may be regarded as a material breach of the Contract.”

- N. Subparagraph 13.1.7: Add the following numbered Subparagraphs 13.1.7.6 and 13.1.7.6.1

“13.1.7.6 Certification of United States Steel”

“13.1.7.6.1 The Bidder certifies that the Bidder and all Subcontractors will comply with the statutory obligations to use steel products made in the United States.

- O. Subparagraph 13.5.1: Add the following Subparagraph 13.5.1.1:

“13.5.1.1: Prior to commencing the Project the Contractor shall submit a list of all proposed testing companies for the Project to the Architect/Engineer and Owner for approval.”

- P. Subparagraph 13.5.2: Add the following Subparagraph 13.5.2.1

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“13.5.2.1: Prior to testing, unless the testing company has been previously approved, the Contractor shall submit to the Architect/Engineer and Owner the proposed testing company for approval.”

2.14 ARTICLE 14

- A. Subparagraph 14.1.1: Amend this Subparagraph by deleting Sub-Subparagraph .4.
- B. Subparagraph 14.2.1: Amend this Subparagraph by adding a new Sub-Subparagraph 14.2.1.5 as follows:

“.5 becomes financially incapable of completing the Work contemplated by the Contract Documents.”

- C. Add subparagraph 14.2.5 as follows

“14.2.5 Contractor shall be responsible to reimburse Owner all attorney’s fees and expenses incurred by Owner if Contractor is terminated for cause.”

2.15 ARTICLE 15

- A. Subparagraph 15.1.2: Delete the text of this Subparagraph and replace by adding the following Subparagraph 15.1.2.1, Subparagraph 15.1.2.2 and Subparagraph 15.1.2.3:

“Subparagraph 15.1.2.1 Claims must be initiated by written notice to the Architect within 21 calendar days after the occurrence of the event.”

“Subparagraph 15.1.2.2 Notice of a claim must include what the claim is for, when the event occurred causing the claim, the amount of additional time (Project extension) being requested and any financial implications of the claim with sufficient specificity to allow the Owner an opportunity to modify the Project scope to remain within the Owner’s approved budget.”

“Subparagraph 15.1.2.3 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.”

- B. Subparagraph 15.1.4 delete this Subparagraph in its entirety.
- C. Subparagraph 15.1.5 delete this and all its subparagraphs in their entirety.
- D. Subparagraph 15.3.2 Delete the text in its entirety and replace with the following:

“15.3.2. If, through acts of neglect on the part of the Contractor, any other Contractor or Subcontractor shall suffer loss or damage on the Work, the Contractor shall agree to settle with such other Contractor or Subcontractor by negotiation or binding dispute resolution, if such other Contractor or Subcontractor will so settle. If such other Contractor or Subcontractor shall assert any claim against the Owner on account of any damage alleged to have been so sustained, the Owner shall notify the Contractor, who shall indemnify and save harmless the Owner against any such claim, including legal defense costs.”

- E. Subparagraph 15.3.3 In the first sentence after the word “fee” add a period and delete the remainder of that sentence.
- F. Paragraph 15.4: Delete this Paragraph in its entirety. Additionally; delete all references and requirements for Arbitration throughout the entire AIA A201-2007 Document and replace with Litigation.

PART 3 – NOT USED

END OF SECTION 00 20 11

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SUPPLEMENTARY GENERAL CONDITIONS

Preface: ***These Supplementary General Conditions supplement and modify AIA Document A201 General Conditions of the Contract for Construction (2007 Edition), General Conditions between the Owner and Contractor.***

PART 1 - SUPPLEMENTARY GENERAL CONDITIONS

1.01 DEFINITIONS

- A. "Contract". The Contract or Agreement, the Notice to Bidders, the Instructions to Bidders, the Bid or Proposal, the General Conditions, The Special Conditions, the Specification and Drawings, also any Addenda or the Modifications incorporated in any of the above documents before the execution of the Contract or Agreement.
- B. "Owner": The Indiana State University Board of Trustees.
- C. "Architect/Engineer": the individual or firm hired by the Owner to prepare the Construction Documents and to Administer the Contract.
- D. "Contractor": The person, firm or corporation who, with the Owner, executes the Contract, or the duly recognized assignee thereof.
- E. "Subcontractor": A person, firm or corporation who, under contract with Contractor, furnished material only, labor and materials, or labor only, at the site of or for the project.
- F. "Director": The Director of Department of Facilities Management at Indiana State University, or his duly authorized representative.
- G. "Surety": Any person, firm or corporation which has executed, as surety, the Contractor's performance bond securing the performance of the within contracts.
- H. "Work": Includes both materials and labor.

1.02 BOND

- A. Before any contract made for this work becomes valid, the Contractor shall furnish the Owner a satisfactory performance and payment bonds, in such form as the Owner may prescribe and with such surety or sureties as it may approve each in an amount equal to 100% of the total contract price. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. These bonds shall guarantee all labor and material to be as required, the faithful payment of any claim or liens from any cause for which the Contractor or any Subcontractor is liable, including those for labor, materials, utility service, transportation costs and for supplies, equipment, machinery (or the rental thereof).
- B. Licensed Sureties and Insurers
 - 1. All bonds required by the Contract Documents (such as the Bid Specifications, Award Letter, Contract for Construction, etc.) to be purchased and maintained by the Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. In addition to appearing on Circular 570 U.S. Dept. of the Treasury, such Surety or insurance company shall maintain an A.M. Best's Rating of not less than "A".

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C. The surety bond shall contain the following paragraph:

1. "The said surety for value received hereby stipulates and agrees that no change, extension of time, alterations, or additions to the terms of the contract, or to the work to be performed hereunder, or the specifications accompanying them, shall in any way affect its obligations on this bond, alteration or addition to the terms of the contract, or to the work or the specifications."

1.03 INSURANCE

**NOTE: The dollar amounts shown in this paragraph are for jobs over \$50,000.
See footnotes and amounts for jobs less than \$50,000.**

- A. The Prime Contractor(s) shall provide all insurances listed here-in in these Specifications and shall require the Subcontractor(s) to provide the same. The Prime Contractor(s) shall not commence work under this Contract until they have obtained all insurance required by these specifications and until such insurance has been approved by the Owner, nor shall the Contractor allow any Subcontractor to commence work on his subcontract until all similar insurance required of the Subcontractor has been obtained. Policies expiring on a fixed date before final acceptance of the project must be renewed and evidence of such renewal submitted to the Owner before such date.
- B. The Prime Contractor(s) shall furnish the Owner with satisfactory evidence of the insurance required, with satisfactory compliance as determined solely by Owner.
- C. It is solely the responsibility of the Prime Contractor(s) to confirm that the Subcontractor(s) are in compliance with the insurance requirements of these Specifications, to maintain copies of the Subcontractors insurance on file and to be prepared to provide evidence of these insurances to the Owner upon demand.
- D. Insurance Required:
 1. Worker's Compensation and Employers Insurance:
 - a. The Prime Contractor(s) shall maintain during the life of this contract Worker's Compensation and Employers Liability Insurance for all Prime Contractor's employees employed at or involved in any manner with the project, and, in case any work is sublet, the Prime Contractor(s) shall require the Subcontractor(s), at their own expense, similarly to provide Worker's Compensation and Employers Liability Insurance for all of the Subcontractor's employees engaged in or involved in any manner with work under this contract. Such Workers' Compensation insurance will be in accordance with the statutory requirements of the State of Indiana, with and including Worker's Compensation for All Other States, if any. The Prime Contractor(s) shall and require Subcontractor(s) to provide insurance coverage equal to that provided under the Worker's Compensation Act, for the protection of the Contractor's employees not otherwise protected. Employer's liability coverage must be maintained in amounts not less than \$500,000/\$500,000/\$500,000. Limits may be provided through a single policy or a primary/excess policy basis.
 2. Commercial General Liability Insurance.¹
 - a. The Contractor shall and require Subcontractors, at their own expense respectively, to maintain during the life of this contract Commercial General Liability Insurance insuring the Prime Contractor and any subcontractor, and owner and any other party required to be insured, from claims for bodily injury, death, personal injury and property damage which may arise from or on account of operations under this Contract, whether such operations be by the Prime Contractor(s) or by any

¹ For Smaller Contracts, the following limits (including umbrella liability) are permitted:

Contracts \$25,000 to \$49,999.....	\$ 2,000,000
" \$10,000 to \$24,999.....	\$ 1,000,000
" \$ 9,999 and under.....	\$ 500,000

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SUPPLEMENTARY GENERAL CONDITIONS

Subcontractor or by anyone directly or indirectly employed by either of them and the amounts of such insurance shall be as follows:

- \$2,000,000 General Aggregate
- \$1,000,000 Combined Single Limit Bodily Injury, Property Damage
- \$1,000,000 Products/Completed Operations
- \$1,000,000 Personal Injury and Advertising Injury
- \$ 100,000 Fire Damage

The General Aggregate limit shall apply separately, in total, to this project only.

3. Business Auto Insurance²:

- a. The Prime Contractor(s) shall and shall require all Subcontractors to maintain at their own expense respectively, at all times during the life of this contract, business auto insurance covering all liability and claims arising from the ownership, use, maintenance, operation, loading or unloading of automobiles anywhere in the United States, in connection with the performance of the Contract, whether such automobiles are owned, hired, or non-owned by the Contractor or Subcontractors.
- b. Such auto insurance shall be written with a limit of not less than \$1,000,000 per occurrence as a combined single limit for Bodily Injury and Property Damage coverage.

4. Umbrella Liability Insurance²:

- a. The Prime Contractor(s) shall and shall require all Subcontractors to maintain at their own expense respectively, at all times during the life of this Contract, Umbrella Liability Insurance providing excess coverage over the above specified primary insurance in an amount not less than:
 - \$1,000,000 for contracts \$50,000 to \$99,999.99
 - \$2,000,000 for contracts \$100,000 to \$999,999.99
 - \$3,000,000 for contracts \$ 1,000,000 to \$2,999,999.99
 - \$5,000,000 for contracts over \$3,000,000

E. Additional Insurance Requirements:

1. The Prime Contractor(s) shall and shall require all Subcontractors to include Indiana State University, Indiana State University Board of Trustees and any Architect/Engineer Firm hired by Indiana State University for the Project, as an additional insured on their Commercial General Liability, Umbrella Liability Insurance and Business Auto Insurance policies with regard to this contract.
2. Certificate(s) of Insurance shall include an endorsement of a Waiver of Subrogation in favor of the Owner for Commercial General Liability Insurance, Umbrella Liability Insurance, Worker's Compensation and Employers Liability Insurance and Business Auto Insurance.
3. On Projects in excess of \$1,000,000.00 a copy of the applicable pages from the Contractor's policy shall be provided showing the endorsements listed in paragraphs 1 and 2 of this Item 1.03 E.
4. With regard to the above mentioned Commercial General Liability, Business Auto, and Umbrella Liability Insurance, if in the event of any major change or cancellation of such policy, the Prime Contractor(s) shall and shall require all Subcontractors to give a 30-day advance notice to the Owner.
5. The Prime Contractor(s) shall and shall require of all Subcontractors that the insurance companies must have an A.M. Best's rating of not less than an "A" for projects over \$150,000 and a rating of B+ or higher for projects under \$150,000 and that the insurance

² For Smaller Contracts, the following limits (including umbrella liability) are permitted

Contracts \$25,000 to \$49,999.....	\$2,000,000
\$10,000 to \$24,999.....	\$1,000,000
\$ 9,999 and under.....	\$ 500,000

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companies are duly licensed or authorized in the jurisdiction in which the Project is located to issue insurance policies for the limits and coverages so required.

F. Builders Risk Insurance:

1. The Owner agrees to provide property insurance including Builders Risk insurance for property under construction, and all materials and labor at or within 1,000 feet of the site intended for use in the "work" or project. Pursuant to this agreement, Owner hereby affirms the policy contains a waiver of subrogation in favor of the contractor or subcontractors should loss or damage of the type insured against result in loss to covered property; and Owner agrees to release from liability the contractor, to the extent such loss or damage is insured by said policy.
2. Coverage does not extend to personal property, tools, equipment, scaffolding, staging, or similar equipment of the contract or subcontractor(s), or any employees thereof.
3. Notwithstanding the foregoing however, Contractor is responsible for the property insurance deductible of \$25,000 applicable to each covered loss to the work or project. Contractor acknowledges and affirms it will, without delay, pay the deductible, or if the loss remains within the deductible, pay that part of the deductible that equals the loss amount.

G. Indemnification:

1. The Prime Contractor shall and shall require Subcontractors to indemnify the Owner and any other party required to be insured from all claims arising from the failure of the Prime Contractor(s) to require the Subcontractors to provide the insurance required by these Specifications.
2. Notwithstanding any other provision to the contrary, the Contractor(s) agree to indemnify the Owner only for losses due to personal injury, or property damage to the extent caused by Contractor's negligent acts or omissions, or the negligent acts or omissions of Contractor's employees, agents and subcontractors during the performance of this Contract, but not to the extent caused by others. The Contractor shall defend Owner on claims that do not present a conflict of legal theory or fact between Owner and Contractor. Each party shall defend itself on any claim that does present a conflict of legal theory or fact between the parties.
3. Under no circumstances shall either party be liable for any loss, damage or delay due to any cause beyond either party's reasonable control, including but not limited to acts of government, fire, explosion, theft, weather damage, flood, earthquake, riot, civil commotion, war, mischief or act of God.
4. In the event of a strike or work stoppage by Contractor's employees, the Contractor agrees to use its best efforts to fulfill its obligations pursuant to their contract utilizing management and supervisory personnel.
5. Under no circumstances shall either party be liable to the other for special, indirect, or consequential damages of any kind including, but not limited to, loss of profits, loss of good will, loss of business opportunity, additional financing costs or loss of use of any equipment or property, whether in contract, tort (including negligence), warranty or otherwise, notwithstanding any indemnity or other provision to the contrary.

1.04 SUBCONTRACTORS

- A. At the time of Bid the Prime Contractor(s) (Bidder(s)) shall provide the names of the proposed Subcontractors listed in Appendix A of the Bid Form. Prior to the Awarding of the Contract, the Contractor shall submit to the Owner, in writing, the names of all the proposed Subcontractors and major material vendors. All Subcontractors shall be licensed and bonded and shall be held to the same level of experience and qualifications as are required of the Prime Contractor (Bidder) in Section 001000 NOTICE TO BIDDERS last paragraph.
- B. The Prime Contractor shall be responsible for the acts and omissions of his Subcontractors and of persons either directly or indirectly employed by them as he is for the acts and omissions of persons directly employed by him.

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SUPPLEMENTARY GENERAL CONDITIONS

- C. Nothing contained in the Contract shall create any contractual relationship between any Sub-contractor and the Owner, and no Subcontractor will be recognized as a party to the Contract.
- D. The Prime Contractor shall use the Subcontractors, Suppliers, Materials and Equipment as listed in the Bid Form Appendix "A" submitted at the time of Bid. There shall be no changes permitted to this list except as listed in Section 00 10 10 Paragraph 3.14 APPENDIX A, Item B.1.

1.05 DRAWINGS

- A. The drawings referred to in these specifications show such plans and details as are regarded necessary by the Architect/Engineer and/or the Owner to properly illustrate the work required, to estimate the cost of the work, and to complete its construction.
- B. The Architect/Engineer and/or the Owner will from time to time furnish such additional detail and working drawings as may be deemed necessary to interpret and explain the Contract drawings and all such additional drawings shall be of equal force with those mentioned above and shall be considered as forming part of this Contract.
- C. The general character of the work shall be subject to minor modifications when detailed or full sized drawings for such work are prepared.
- D. All lettering on drawings is to be considered a part of the drawings.
- E. All drawings, specifications, etc., are the property of the Owner and shall be returned before the final award is issued, if so requested.

1.06 RELATIONSHIP AND PRIORITY OF DOCUMENTS

- A. The documents comprising the Contract are complementary and what is called for by one shall be as binding as if called for by all. The intention of the Contract is to include all labor, materials, and equipment necessary for the proper execution of the work.
- B. In the case of a discrepancy between the requirements of the Drawings and the Specifications or between Sections of the Specifications:
 - 1. The more stringent shall apply.
 - 2. In equal situations the Specifications or as directed by the Owner prevails.

1.07 PERMITS

- A. The Contractor shall give all requisite notices to public officials, secure and pay for all permits, legal fees or charges, have the work inspected by all proper public authorities, pay all charges connected with such inspections and deliver the proper inspection certificates and all receipts for charges to the Owner.
- B. The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations and orders of any public authority bearing on the performance of the work. If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, he shall promptly notify the Owner in writing, and any necessary change shall be accomplished by the appropriate modification. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations and without such notice to the Architect, he shall assume full responsibility therefore and shall bear all cost attributable thereto.

1.08 SAMPLES

- A. The Contractor shall submit in writing to the Owner for approval samples and shop or installation drawings of the materials he proposes to use, or such other related materials as owner otherwise requests.
- B. Each sample shall be labeled, bearing the name and quality of the material, the Contractor's name, the date and a description of the sample. A letter from the Contractor stating that the samples conform to the requirements of the drawings and specifications shall accompany all such samples. Transportation charges on all samples shall be prepaid.

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- C. Samples and drawings shall be submitted in due time so as to permit proper consideration without delaying the Contractor's operation. Material shall not be ordered until approval is received from the Owner, in writing. The use of any material will be permitted only so long as it remains equal to the approved sample.

1.09 CONTRACTOR'S SUPERVISION

- A. The Prime Contractor shall maintain on the Project site a competent Project Superintendent at all times any work is being performed; either by the Prime Contractor's workers or any Subcontractor's workers. **If the Project Superintendent is not on the Project site the Owner shall be notified immediately. If the Project Superintendent is not on the jobsite, without written prior approval or notification to be away from the jobsite, the Owner may be entitled to a \$1,000 credit for each day or part of the day the Project Superintendent is not onsite while actual work is being performed.**
- B. The Contractor's superintendent shall represent the Contractor during their absence and all directions given the superintendent shall be as binding as if given to the Contractor.

1.11 LAYING OUT AND UTILITY LOCATES

- A. The Contractor shall thoroughly examine the drawings and specifications before commencing work and report to the Owner if any discrepancy, errors, or defect appears, but he shall not be held responsible for their existence.
- B. The Contractor shall lay out his own work.
- C. Prior to any cutting, drilling, trenching, excavating or other earthwork the Contractor shall determine the exact location of all utility lines and appurtenances that could be encountered which are not shown on the drawings as follows.
 - 1. A minimum of forty eight (48) hours prior to commencing work the Contractor shall contact Indiana Locates for all public utility locates.
 - 2. A minimum of forty eight (48) hours prior to commencing work the Contractor shall contact the Project Coordinator for all ISU Utility locates.
- D. Failure to contact for the appropriate locates shall make Contractor solely responsible for all costs incurred to repair all damaged utility lines or appurtenances.
- E. The Contractor shall hand excavate within three (3) feet, or as required by the Utility Company, on either side of a marked utility unless exact depth of the marked utility is known and the planned work will in no way be in close proximity with the utility line or appurtenance.

1.12 MATERIAL AND LABOR

- A. Except as otherwise stipulated, the Contractor shall provide and pay for all materials, labor, tools and equipment necessary for the execution of the work.
- B. The Owner reserves the right to require the Contractor to discontinue the service of any workmen employed on the work whom he deems incompetent, negligent, or otherwise objectionable, and to suspend any portion of the work embraced in the Contract whenever, in his opinion, it would be inexpedient to start or continue such work.

1.13 DEFECTIVE WORK AND MATERIALS

- A. Any materials and workmanship found to be defective, improperly placed, not in strict conformity with the drawings and specifications, or defaced or injured through action of fire or elements, through usage by the Contractor or his employees or from any other cause, shall be removed immediately from the premises and satisfactory materials or work substituted therefore without delay. This shall include making good the work of other Contractors destroyed or damaged by such removal or replacement. The cost of the above replacements shall be borne by the Contractor responsible for the defective work or material.
- B. Should the Contractor in the execution of his work discover any imperfections or errors in the work of other Contractors that would interfere with the proper execution of his contract, he

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shall immediately report this fact to the Owner. Errors or imperfections in the work of other Contractors will in no case excuse installation of imperfect work by this Contractor.

- C. No previous inspection shall be held as an acceptance of defective work or materials or relieve the Contractor from the obligation to furnish sound materials or to perform satisfactory work in accordance with the contract requirements. The final payment shall not relieve the Contractor of the responsibility for faulty materials or workmanship and he shall remedy all such defects, settlements, or other work resulting there from, which shall appear within a period of one (1) year from date of final acceptance or within the period stipulated in certain separate guarantees or bonds required elsewhere in the specifications, whichever may be the longer.
- D. The Owner shall be the sole judge of the materials furnished and the character of work performed.

1.14 RESPONSIBILITY FOR DAMAGE

- A. The Contractor shall be responsible for all damages to life and property due to his action or failure to act when action would reasonably be expected. He shall be responsible for all parts of his work, both temporary and permanent, until the work under his contract is declared accepted by the Owner.
- B. The Contractor shall continuously maintain adequate protection of all his work from damage, and shall protect the Owner's property and all adjacent property from injury in connection with the Contract.
- C. The Contractor shall be held responsible for damage to work of other Contractors that is the result of his operation.
- D. Should the Contractor believe that the work shown by the drawings or specifications is not correct when executed to obtain safe and substantial results, or if any discrepancy appears, it is his duty to immediately notify the Owner in writing, stop work on same, and await written instruction.

1.15 INDIANA SALES TAX

- A. Indiana State University is a Tax Exempt Institution and Indiana Sales Tax for products permanently incorporated in work shall not be included as part of the Bid or on any Application for Payment.
- B. Contractor Responsibilities:
 - 1. Pay Indiana Sales Tax on all non-exempt purchases and provide the Owner with detailed documentation of all taxes of non-exempt items invoiced on their Application for Payment. Documentation shall be provided with their Application for Payment at the time of first billing of each taxable item.
 - 2. Upon completion of work, file with Owner notarized statement that all purchases were made under their exemption certificate where entitled to be exempt.
 - 3. Pay legally assessed penalties for improper use of the exemption certificate number.

1.16 CLEANING UP

- A. The Contractor shall at all times keep the premises free from accumulations of waste material or rubbish.
- B. When directed by the Owner, the Contractor shall clear out and remove any rubbish that may constitute an obstruction to the progress of the work.
- C. At completion of the contract, the Contractor shall remove from the premises all rubbish and surplus material, and shall repair any damage to his work no matter by who caused, and shall leave the premises clean and in perfect repair and order.

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1.17 NON-DISCRIMINATION CLAUSE

- A. "Pursuant to the requirements of Indiana Code 22-9-1-10 and 5-16-6-1, Contractor and his Subcontractors may not discriminate against any employee or applicant for employment to be employed in the performance of such contract, with respect to their hire, tenure, terms, conditions or privileges of employment or any matter directly or indirectly related to employment because of their sex, race, natural origin, ancestry or religion or disability as prohibited under the Americans With Disabilities Act. The contractor and subcontractor, if any, agrees to comply with all the provisions contained in the Equal Opportunity Clause quoted in Executive Orders No. 11246 and No. 11375. In addition, the contractor shall cause this Equal Opportunity Clause to be included in the subcontracts or purchase orders hereunder unless exempted by rules, regulations and orders of the Secretary of Labor issued pursuant to Section 204 of the Executive Orders No. 11246 and No. 11375 as amended. Breach of the covenant may be regarded as a material breach of contract."

1.18 PUBLIC RELATIONS

- A. Indiana State University is an Affirmative Action Institution. Any inappropriate actions toward any Indiana State University student, faculty or staff member by any Contractor's Employee shall result in the employee being told to leave the Campus of Indiana State University immediately. This employee shall not be allowed to return to work on the Project for the duration of the Project or longer. Repeated offences by a Contractor's employees may result in disqualification of the Contractor for this and future Indiana State University Projects.

1.19 "OR APPROVED EQUAL" CLAUSE

- A. Unless the Specifications indicates that substitutions are not allowed, whenever a material or article required is specified or shown on the plans by using the name of the proprietary product or of a particular manufacturer or vendor, any material or article which will perform adequately the duties imposed by the general design will be considered equal and satisfactory providing the material or article so proposed is of equal substance and function in the Architect/Engineer and Owner's opinion. It shall not be purchased or installed without written approval. Requests for substitution prior to Bidding shall be as per Section 001010 INSTRUCTIONS TO BIDDERS Item 1.08
- B. Complete descriptive information, specifications and samples or sample material must be submitted at the time the proposal is submitted. In addition, a list of projects with dates and contact persons must be submitted at the time the proposal is submitted showing where the proposed alternate material or article has been installed or used. Failure to submit information as requested will be cause for rejection of the Bid submitted.

1.20 VERIFYING MEASUREMENTS

- A. The Contractor shall verify all measurements on the site and be responsible for any mistakes he may make and their results. If the Contractor discovers any discrepancy, in figures on the drawings, he shall report same to the Architect/Engineer and Owner before proceeding with any work affected by the discrepancy and shall be held responsible for results should he fail to make such reports.

1.21 EXTRAS

- A. Without invalidating the Contract, the Owner may order extra work or make changes by altering, adding to, or deducting from the work, the Contract sum being adjusted accordingly, and the consent of the Surety being first obtained where necessary or desirable. All work of the kind Bid upon shall be paid for at the price stipulated in the proposal, and no claims for any extra work or materials shall be allowed unless the work is ordered in writing by the Owner, and the price is stated in such order.
- B. Requests for compensation, for previously approved Change Orders omitted from an Application for Payment, received sixty (60) calendar days after Owner receipt of the Final Application for Payment (Release of Retainage) shall not be honored.

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1.22 GENERAL GUARANTY

- A. Neither the final certificate of payment nor any provision in the Contract documents nor partial or entire occupancy of the premises by the Owner shall constitute an acceptance of work not done in accordance with the Contract documents or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall remedy any defects in the work and pay for any damage to other work resulting there from, which shall appear within a period of one (1) year from the date of final acceptance of the work, unless a longer period is specified.

PART 2 – NOT USED

PART 3 – NOT USED

END OF SECTION 00 20 20

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SUPPLEMENTARY GENERAL CONDITIONS

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ISU SPECIAL REQUIREMENTS AND INFORMATION

PART 1 - SPECIAL REQUIREMENTS

1.01 BARRICADES

- A. ISU will provide barricades during the initial closure of a construction site. However, once the Contractor mobilizes, ISU will remove the barricades, and Contractor shall replace them with his own. If additional barricades are required during the construction phase, Contractors shall provide them at their expense.

1.02 BURIED UTILITIES

- A. All Direct Buried Utility Lines and Utility Duct Banks will be marked by use of the appropriate marker tape continuously installed a minimum of twelve (12) inches above said utility line or duct bank. Marker tape shall be a minimum of six (6) inches wide.

1.03 REMOVAL AND RE-INSTALLATION OF EQUIPMENT

- A. The Owner is not responsible for the removal or re-installation of any equipment necessitated by this work.
- B. All electrical disconnects and reconnects of equipment necessitated by this work shall be performed by a licensed bonded Electrical Contractor hired by the Contractor to perform this work. The Owner will assist in locating the power source but will not be responsible for the actual performance the electrical work.

1.04 PRIME CONTRACTOR RIGHT OF SALVAGE

- A. The Owner has the first right of salvage of any items not slated for re-use on every Project.
- B. Should the Owner waive their right for salvage for any item not slated for re-use or designated in for recycling; then these items become the property of the Prime Contractor.
- C. The Prime Contractor at their discretion may grant to others the right to salvage items not slated for re-use and this may be used to comply with the recycling requirements as long as records are kept.
- D. However; once an item has been placed in a dumpster or any other trash receptacle no one is allowed to enter a dumpster or search through a trash receptacle for the purpose of removing items for salvage while these trash containers are on the campus of Indiana State University.
- E. The Prime Contractor shall protect these trash containers by use of a six (6) foot high chain link fence enclosure around the trash container(s) to prevent any person from gaining access to the trash containers for actions prohibited by this item.

1.05 CERTIFICATE OF INDUSTRIAL BOARD

- A. The Contractor shall furnish a certificate of insurance from an insurance company acceptable to Indiana State University evidencing that the Contractor has complied with the Indiana Worker's Compensation Law.

1.06 CONTRACTOR PUBLIC STATEMENTS

- A. No person or entity that enters a contract with the University shall be permitted to make any public statement in such contracting party's official capacity as a contractor of the University except where such public statement: a. relates to the business or operation of the University, or to a University sponsored event; or b. has been approved by the Board of Trustees of the University. 620.2.11.1. Certain Public Statements. This Policy 620.2.11 Contractor Public Statements shall not in any way prohibit a contracting party's exercise of any protected expressive activity that is not made in such contracting party's official capacity as a contractor of the University.

1.07 CAMPUS TOBACCO, SMOKING, AND VAPING POLICY FOR CONTRACTORS

ISU SPECIAL REQUIREMENTS AND INFORMATION

- A. Effective in 2025 the following became the ISU policy on Tobacco, Smoking, and Electronic Smoking (Vaping):
 - 1. The sale of electronic smoking devices, hookah, smoking and tobacco products is prohibited on university-owned, operated, or leased property.
 - 2. The use of electronic smoking devices, hookah, smoking, and tobacco products is prohibited on university-owned, operated, or leased property.
 - 3. Any exceptions for the use of smoking tobacco products on university-owned, operated, or leased property must be approved by the President or Provost.
 - 4. Enforcement of this policy will depend on the cooperation of the Contractors and their employees to comply with the policy and encourage others to comply in order to promote a healthy environment in which to work.
 - 5. Observation of violation of this policy should be reported to the Contractor's Project Superintendent and/or the Owner's Project Manager. Contractor's employees repeatedly violating this policy may be asked to leave the Campus of Indiana State University and not be allowed to continue work on the Project.
- B. Additionally on construction sites on university-owned, operated, or leased property the use of all tobacco and vaping products is prohibited.

ISU SPECIAL REQUIREMENTS AND INFORMATION

1.08 PARKING REGULATIONS

- A. Beginning January 2018, construction employees will be required to park with a Construction Permit in Lot N (11th and Chestnut), Lot K (1st and Chestnut) or Lot I (3rd and Tippecanoe) when regular classes are in session. Contractors will be allowed to request an appropriate number of permits depending upon the project size for "core campus" parking. These permits should be used for carpooling or transporting employees to/from the construction and the construction parking lots. Contractors will also be allowed to have 2 foreman construction permits per project which will allow the foreman direct access to the construction project.
- B. When regular classes are not in session (i.e. weekends, Fall Break, Winter Recess, and summer sessions [the Monday after commencement thru one week before move-in]) contractors and their employees will be allowed to park in any regular/open lot on campus with a construction permit unless the lot is reserved for an event.

1.09 ISU ENVIRONMENTAL CODE FOR CONTRACTORS

- A. Prior to starting any work, Contractor shall provide to the Owner a written document containing emergency procedures in case of:
 - 1. Liquid spills or leaks
 - 2. Release of gases or toxic vapors
 - 3. Excessive smoke
- B. This document shall contain but not be limited to:
 - 1. Emergency medical, fire, and police phone numbers including the ISU University Police.
 - 2. EPA phone numbers
 - 3. IDEM phone numbers
 - 4. Location of Material Safety Data Sheets.
- C. Prior to using any chemical or hazardous material the contractor shall provide the Owner with a copy of Material Data Safety Sheets covering the chemical or hazardous material.
- D. Contractor shall not burn or bury waste material on campus, or discharge any hazardous, or undesirable materials to sewers, or release toxic materials to the air.
- E. Contractor shall provide adequate exhaust ventilation for work area when generation of air contaminants is likely, i.e., painting, handling flammable liquids, welding, cutting, applying adhesives, etc.
- F. Contractor shall have at the job site Material Safety Data Sheets (MSDS) covering all chemicals and hazardous materials to be used in the work area. MSDS are to be available to workers and ISU personnel during normal working hours. Contractor shall use proper procedures based on MSDS when handling hazardous chemicals and materials.
- G. Contractor shall provide vacuum breakers or backflow preventers at each location where he utilizes building water supply.
- H. Any Contractor employee who deliberately interferes with environmental monitoring shall be removed from the project immediately.
- I. Contractor shall prevent fumes from welding, cutting, etc. and dust generated by construction from entering areas outside the work area by erecting plastic film barriers, sealing openings and ducts, and installing exhaust fans as required.
- J. Air contaminants in the work area shall not exceed OSHA regulations.

ISU SPECIAL REQUIREMENTS AND INFORMATION

1.10 ISU SAFETY CODE FOR CONTRACTORS

A. General:

1. All work performed by contractors shall be done in accordance with all applicable Federal, State and Local laws, codes, and regulations and recommendations of Factory Mutual Engineering and Research (FM).
2. Any safety hazard or unsafe act recognized by the Owner shall be reported to the Contractor responsible for job coordination. The safety hazard shall be corrected in a timely manner dictated by the severity of the safety hazard or unsafe act.
3. Contractors shall remove all rubbish from the job site daily.
4. All construction materials shall be protected from wind damage. Materials shall be secured to prevent them from becoming airborne with subsequent injury to personnel or damage to property.

B. Communication:

1. Contractor's job supervisors, or designated safety persons, must carry at all times a cellular phone to facilitate communication between the job site and the ISU University Police and Facilities Management Department. The cellular phones must remain on the job site during regular working hours. Contractor(s) shall report to the designated representative of ISU, or to ISU Police, any safety problem, code infraction, personal injury, or damage to ISU property. Report shall be made immediately after such occurrence.

C. Fire Protection:

1. Contractors shall provide a type "ABC" fire extinguisher for each work crew.
2. Extinguishers are to be kept within easy reach of each work crew and never farther than 10 feet from some worker. Inspection tags on extinguishers shall indicate the date of last inspection.
3. Contractor's supervisor shall keep torch cutting operations to a minimum by instructing personnel to use power saws, pipe cutters, etc. It shall be the duty and responsibility of the Contractor performing any cutting or welding to comply with the safety provisions of the National Fire Codes (NFC) pertaining to such work.
4. Contractor shall adhere to Factory Mutual Engineering and Research (FM) "Cutting and Welding" permit system. Permits are available through the Office of Environmental Safety's Fire Specialist Office at 812-237-4020.
5. Prime Contractor shall provide a one hour fire watch at the end of each workday when any cutting or welding occurred to assure that no possibility of fire exists from any work performed that day.

D. Safety Program: Prior to starting any work the Contractor shall submit to ISU a written safety program for the project including but not limited to:

1. Occupational Health & Environmental Controls
 - a. Personal Protective Equipment
 - b. Fire Protection & Prevention
 - c. Hand & Power Tools
 - d. Ladders & Scaffolds
 - e. Motor Vehicles and Mechanized Equipment
 - f. Accident Prevention
 - g. Safety Inspections
 - h. OSHA Inspections

ISU SPECIAL REQUIREMENTS AND INFORMATION

2. Instruct all of his personnel as to location of emergency telephone(s).
 3. Instruct all his personnel as to location of fire alarm (pull) stations.
 4. Instruct all of his personnel to follow FM "Cutting and Welding Permit Systems" and emphasize the need to advise ISU's representative 24 hours prior to doing any welding, cutting, brazing, etc.
 5. Instruct all his personnel to advise ISU representative prior to doing any welding, cutting, or brazing on or near a roof structure.
 6. Instruct all personnel as to location on the job site of a copy of OSHA 29 CFR, Part 1926.
 7. Instruct all of his personnel as to location of first aid supplies.
- E. Flammable Storage:
1. Flammable or combustible liquids (paints, thinners, asphalt, gasoline, and tar or similar materials) shall be stored and handled as per NFPA 30, 4-5.5, and OSHA Construction Standard 1926.152. Quantities of flammable paints, etc., inside building work areas shall not exceed the amount to be used in one day.
 2. Containers of Class I liquids that are stored outside of an inside liquid storage area shall not exceed a capacity of 1 gallon, except safety cans shall be permitted up to 2 gallon capacity. Not more than 10 gallons of class I and class II liquids combined shall be stored in a single fire area outside of an approved storage cabinet or an inside liquid storage area unless in safety cans. Not more than 25 gallons of class I and class II liquids combined shall be stored in a single fire area in safety cans outside of an inside fluid storage area or an approved storage cabinet. Not more than 60 gallons of class IIIA liquids shall be stored outside of an inside liquid storage area or outside an approved storage cabinet.
 3. Rags saturated with flammable liquids shall be placed in approved cans and removed from the work site at the end of the work shift.
- F. Site Control: Contractor shall be responsible for securing the job site at all times and have personnel on call 24 hours per day for emergencies. Contractors shall protect their equipment and materials and ISU property from theft. Contractors shall secure doors, and openings including roof openings.
- G. Prior to a multiple day shutdown the Contractors shall:
1. Remove all debris and leave the premises broom clean.
 2. Shut off all unnecessary electric power and water supplies.
 3. Remove all flammable liquids from the work site.
 4. Secure small tools in gang boxes.
 5. Leave drives open for emergencies.
- H. Temporary Electrical Service:
1. Temporary electrical service shall be provided by a licensed, bonded electrical contractor.
 2. All extension cords shall be protected from abrasion and traffic. Multiple lengths of extension cord shall be connected with waterproof twistlock type connectors. Any electrical service over 115 volts shall be marked accordingly. All electrical power supplied from building service or portable generators shall have ground fault protection as part of the circuit.
 3. Portable generators or welders driven by internal combustion engines shall not be located inside the building. Positioning of this equipment outside the building shall be such that engine exhaust shall not enter the workplace or adjacent buildings.

ISU SPECIAL REQUIREMENTS AND INFORMATION

I. OSHA Reporting:

1. Contractors shall complete an OSHA 106 form on all reportable occupational injuries and illnesses for each of their job locations on the ISU campus. This requires posting the information from the initial accident report on a master log (OSHA 200) form within six working days after the accident occurs. This form must be kept available for OSHA Compliance Safety and Health Office and ISU review.
2. See OSHA Regulations 29 CFR Part 1904, "Recording and Reporting Occupational Injuries and Illnesses"

1.11 FIRE SUPPRESSION SYSTEM REGULATIONS

- A. Prior to closing any fire suppression system valve or in any way making a fire suppression system inoperable the Contractor shall contact the Fire Specialist's Office at 812-237-4020 to obtain a FM Global Red Tag so the impairment to the system may be reported.
- B. When the work is complete the Contractor shall immediately contact the Fire Safety Specialist to report the work is complete so the red tag may be removed and FM Global notified that the system has been returned to normal operation.

1.12 ELECTRICAL SAFETY REGULATIONS

- A. OSHA *Control of Hazardous Energy Lockout/Tagout Regulations* apply to all work performed on the Campus of Indiana State University. These Regulations are available for review on the OSHA Internet Website at <http://www.osha.gov/SLTC/controlhazardousenergy/index.html> . Any individual who removes another's lock or tag shall be ordered to leave Indiana State University and shall be disqualified from any future work at Indiana State University.
- B. High fault currents, in excess of 45kA, exist at certain points on electrical systems at Indiana State University. Employing Contractors shall make their employees working on campus electrical systems aware that this condition exists.
- C. No individual shall be permitted to install or service any energized circuit, equipment or apparatus where voltages greater than 100 volts to ground is present unless another individual is present.
- D. No individual shall be permitted to operate or service any main or feeder main overcurrent protection device, whether group mounted or individually mounted, unless another individual is present.
- E. Deliberately shorting a branch circuit to ground to locate a branch feeder breaker is strictly prohibited.
- F. Any individual observed in violation of Regulations "C", "D" or "E" may be asked to immediately leave the workplace and/or their employer may be fined based on the following scale. Violations may apply to one or multiple employees.

• 1 st violation	Notice of Violation Warning Placed in Employing Firm's Work Record File
• 2 nd violation	\$100.00
• 3 rd violation	\$250.00
• All subsequent violations	\$500.00 per incident
- G. **Repeated violations may be cause to disqualify the individual and/or employing firm from any other future work on the campus of Indiana State University.**

1.13 FIRE ALARM SYSTEM COORDINATION WITH PROJECT WORK

- A. An automatic fire detection system may in operation in areas of work. Prior to start of Work the Contractor shall verify with the Owner if devices are present in the Work area.

ISU SPECIAL REQUIREMENTS AND INFORMATION

- B. Contractor shall coordinate with Owner for the shut down and reactivation of automatic fire detection devices in work areas based on the following procedures.
1. Prior to 2:30pm on the day before work is scheduled the Contractor shall contact either Bryan Duncan 812-237-8195 (Office) or 812-240-9324 (Mobile) to request fire alarm devices be disabled. If no answer, call Brad Welker at 812-237-8109 (alternate contacts). The Contractor shall provide exact work location, the time the devices are required to be disabled by and a means by which to contact the Contractor the next day, i.e. pager or cellular phone number. It is permissible to leave a "voice mail" of the required information.
 2. Prior to starting work the next day the Contractor shall contact Bryan Duncan (preferred contact) or Brad Welker (alternate contact) to verify if the required devices are disabled. Please listen carefully to the voice mail announcement for information in the event of no answer.
 3. Prior to leaving the job-site at the end of workday or by 2:30pm the Contractor shall contact one of the aforementioned individuals to report clearance to reactivate the devices for the evening and what, if any, devices require disabling for the following workday.
- C. Failure to follow these procedures may result in fines being levied on the Contractor based on the following schedule.
- 1st failure to call and schedule in advance – Warning.
 - Any subsequent failure to call and schedule in advance – \$10.00 per occurrence
 - 1st failure to call resulting in activation of fire alarm system – Warning or \$100.00, dependent on situation as determined by the Owner.
 - Any subsequent failure to call resulting in activation of fire alarm system - \$100.00 per occurrence.

1.14 INSPECTION

- A. At the conclusion of the entire work encompassed in this contract, written notice requesting inspection shall be submitted to the Owner at least ten (10) days prior to the anticipated inspection date.

1.15 PAYMENT AND FINAL ACCEPTANCE

A. Anticipated Draw Schedule

1. For any Project in excess of \$500,000.00 the Contractor shall submit an anticipated monthly drawdown schedule.
2. This schedule shall be submitted within fourteen (14) calendar days after Award of Contract to:

The Office of the Senior Vice President for Finance and Administration
Rankin Hall Suite 210
Terre Haute, IN 47809

- B. Applications for Payments shall be submitted on AIA Application for Payment form G702 with Continuation Sheet G703 (or on a form approved by the Owner). While no set date is required for Applications for Payment, the application shall be submitted on a regular monthly basis for labor and materials permanently installed in the work, for material stored on site and for properly insured materials stored off-site under the following conditions:
1. For purposes of making periodic estimates, the Contractor shall furnish an itemized breakdown of his contract amount, distributed according to different classes of work. In making application for payments, the Contractor shall show, each period, the percentages of completion of each class.

ISU SPECIAL REQUIREMENTS AND INFORMATION

2. Contractor shall send three (3) copies for each Application for Payment. In lieu of submitting "hard" copies it is permissible to scan and e-mail the pay applications. See 1.17 B of this Section for list of e-mail recipients.
3. The Owner will make partial payment to the Contractor on the basis of a duly certified, approved estimate of the work performed during the preceding calendar month by the Contractor within 15 days after receipt by the Owner.
4. Payment will be made on balance due on labor and materials installed permanently in the work to within 90% of estimated value, and not to exceed 90% of the value of materials delivered to the site which are not subject to damage by exposure to the elements.
5. Stored materials and equipment offsite: The Owner will make payment for materials and equipment store offsite under the following conditions.
 - a. The Contractor requests in writing to the Architect/Engineer/Owner for payment on offsite stored materials and equipment.
 - b. The Architect/Engineer/Owner is given access to the offsite storage facility for purposes of inspection and verification of the stored materials and equipment. Any material or equipment not properly stored or protected shall not be approved for payment.
 - c. The Contractor shall provide to the Architect/Engineer/Owner a current Certificate of Insurance on the remote storage facility. This insurance shall remain in force for the duration of the storage of the stored materials and equipment at the remote location.
6. The Owner, if conditions in its opinion warrant, has the right to withhold, in addition to retained percentages, such an amount or amounts from the payment to the Contractor as may be necessary to pay just unpaid claims for labor and services rendered and materials furnished in connection with the work.
7. The Owner will not approve for payment on any estimate, the value on any materials which, in his opinion, does not meet the contract requirements.
8. At the conclusion of installation and satisfactory inspection by the Owner, the work shall be acceptable for payment of an amount equal to ninety-five (95%) percent of the total contract amount.
9. Reduction or Limitation of Retainage:
 - a. At the sole written discretion of Indiana State University, if acceptable progress is made, at fifty percent (50%) completion of the Contract Sum the remaining Retainage may be reduced to 0%.
 - b. Any subsequent Change Orders after the reduction of Retainage shall have 5% Retainage withheld.
10. **Requests for compensation, for previously approved Change Orders omitted from an Application for Payment, received sixty (60) calendar days after Owner receipt of the Final Application for Payment (Release of Retainage) shall not be honored.**
11. Final payment will be due and payable the later of sixty-one (61) days from date of receipt of the Final Application for Payment or after the Contractor has completed all punch list items, certified that all Subcontractors and Suppliers have been paid, and all claims, including the Contractor's, have been resolved. Before issuance of the final payment, the Contractor shall furnish an affidavit (Final Waiver of Lien) as evidence that there are no claims on account of the Contract, outstanding liens of claims for materials furnished, or labor performed on the work. The final payment shall constitute the acceptance of the work by the Owner, except as to work thereafter found to be defective. The date of such payment shall be regarded as the date of final acceptance of the work.
12. Warranty: The Warranty Period shall be per AIA A201-2007 Article 3 Paragraph 3.5 as amended by Specification Section 00 20 11 Amendments to General Conditions.

ISU SPECIAL REQUIREMENTS AND INFORMATION

C. ACH Payments

1. In an effort to expedite Contractor payments Indiana State University requests the Contractor set up an ACH account for Project Payments. Contact Catherine Procarione in the ISU Office of the Controller at 812-237-3525 to set up this account.
2. If the Contractor currently has an ACH Account with Indiana State University it is not necessary to set up an account for each Project. It is solely the responsibility of the Contractor to maintain accurate Banking information on file with the ISU Office of the Controller.

D. Special provisions regarding Retainage and Escrow:

1. The laws of the State of Indiana (IC 5-16-5.5-3 as amended) contain certain provisions regarding retainage, bonds and payment of Contractors and Subcontractors. The Contracts and Subcontracts entered into pursuant to these instructions to Bidders shall be governed by those provisions with respect to Contracts in excess of \$200,000 entered into between a Contractor and the Indiana State University Board of Trustees.
2. These provisions require, among other things, that the amounts retained by the Owner from the contractor pursuant to retainage provisions be placed in an escrow agreement to be executed by the Contractor. Pursuant to these provisions, the successful Bidder shall be required to execute an escrow agreement between the Contractor and the Owner.
3. This escrow agreement shall have no application to payment withheld by the Owner pursuant to provisions of the Construction Contract intended to protect the Owner from loss on account of defective work not remedied; claims filed on reasonable evidence; failure of the Contractor to make payments when due to subcontractors or for material or labor; reasonable doubt that the contract can be completed for the balance then unpaid; damage to another contract; failure or refusal of the Contractor to prosecute the work in strict compliance with the above process schedule; or similar provision.
4. In addition, each successful Bidder will be required to comply with all applicable provisions of the statute referred to above with respect to each of his Subcontractors (as the term 'Subcontractor' is defined in the statute referred to above).
5. The Contractor shall contact Kathy Abernathy in the Office of the Senior Vice President for Finance and Administration at (812)-237-3554 to set-up this escrow account.
6. Should a Contractor fail to execute an Escrow Agreement between the Contractor and the Owner (Indiana State University Board of Trustees) the Contractor waives all claims for any interest the Contractor would have accrued had an Escrow Agreement been executed.

1.16 CONTRACTOR'S BID

- A. Contractor shall submit Bid for Base Bid and any Alternate Bids as listed in Section 00 20 00.

1.17 INVOICING

- A. All invoices and/or Certificates of Payment must be addressed to:

Indiana State University
Department of Facilities Management
951 Sycamore Street
Terre Haute, IN 47809
Attention: Bryan Duncan

And sent via the Architect/Engineer
arcDESIGN
201 North Delaware Street Suite B
Indianapolis, Indiana 46204
Attn: Greg Miller

ISU SPECIAL REQUIREMENTS AND INFORMATION

- B. It is permissible to submit applications for payment electronically via e-mail. E-mail copies of the Application for Payment to:

1. Scott Tillman scott.tillman@indstate.edu
2. Greg Miller gmler@arcdesign.us
3. Bryan Duncan bryan.duncan@indstate.edu

Do not sent Applications for Payment to the ISU Accounts Payable Office

- C. A Partial Wavier of Lien shall be submitted with every Application for Payment until the final Application for Payment (Release of Retainage) when a Final Waiver of Lien shall be submitted.

1.18 SITE LOCATION(S)

- A. **Science Building, 600 Chestnut Walk, Terre Haute, Indiana 47809**

1.19 PROJECT CONTACT

- A. All questions regarding this Project shall be addressed to:

Greg Miller
arcDESIGN
201 North Delaware Street Suite B
Indianapolis, Indiana 46204
Phone 317-559-1044 Cell 317-445-4373 E-mail gmler@arcdesign.us

PART 2 – NOT USED

PART 3 – NOT USED

END OF SECTION 00 30 00

SECTION 01 10 00 - SUMMARY OF WORK

PART 1 – GENERAL

1.1 DESCRIPTION

- A. The project is located on the campus of Indiana State University at the College of Health and Human Services (CHHS) Building, 401 N. 4th St, Terre Haute, Indiana 47809.

1.2 RELATED SECTIONS

- A. Division 00 Sections
- B. Division 01 Sections
- C. All Division 02-33 Sections as applicable

1.3 SCOPE OF WORK – BASE BID

- A. The following, but not limited to, is included in the Base Bid Package:
 - 1. Renovation of and Alterations to the CHHS Building Rooms A-004, A-005, and A-006 and adjacent Lounge to create a new Occupational Therapy Lab currently located in SCWAM:
 - a. Interior Finishes including but not limited to flooring replacement, repair and repainting of existing painted surfaces , new casework, new ceiling systems, lighting and controls, and new visual display equipment.
 - b. New casework, counters, visual display equipment, and classroom audio-visual technology.
 - c. New Lighting and alternations to the HVAC systems, automatic fire suppression system, and fire alarm system necessitated by new ceilings and wall layouts.
 - d. New classroom tables, chairs, and other furniture utilized by the Occupational Therapy Lab.
- B. Procedures
 - 1. Phased Work: Conduct the work in phases as indicated on the drawings and outlined in Section 00 10 10 - Instructions To Bidders.
 - 2. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the Base Bid into the Project.
 - 3. Include as part of the Base Bid miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of the Base Bid.
 - 4. Protection: Provide and maintain construction partitions protecting adjacent building occupants, users, and retail food service operations.

1.4 SCOPE OF WORK – ALTERNATES

- A. The following, but not limited to, is included in the Alternate(s)
 - 1. Alternate No. 1: **Slotted Channel Framing and Pediatric Swing Mount** (Add): Base Bid: No Slotted Channel Framing (Delegated Design) work or SouthPaw Pediatric Mounting System for Owner-provided pediatric swing equipment. Alternate Bid: Provide delegated design, installation of slotted channel framing substructure, and SouthPaw Pediatric Swing Mount indicated on the drawings for Owner-provided pediatric swings.
 - 2. Alternate No. 2: **Classroom A-006 Furniture** (Add): Base Bid: Existing to remain - no work. Alternate Bid: Provide new classroom tables and chairs identified on the Drawings and Project Manual,

3. Alternate No. 3: **New Glass Marker Wall and Boards** (Add): Base Bid: Salvage and reinstall existing glass marker wall and boards , as indicated on the Drawings. Alternate Bid: Provide new glass marker wall and boards as indicated in the Drawings and Specification.
- B. The cost or credit for each Alternate is the net addition to or deduction from the Contract Sum to incorporate Alternate into the Work. No other adjustments are made to the Contract Sum.
- C. Procedures:
 1. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the Alternate into the Project.
 2. Include as part of each Alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of Alternate.
 3. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each Alternate. Indicate if Alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to Alternates.
 4. Protection: Provide and maintain construction partitions protecting adjacent building occupants, users, and retail food service operations.
 5. Execute accepted Alternates under the same conditions as other work of the Contract.
- D. Selection and Award of Alternates: The Owner reserves the right to selectively accept or reject Alternates at their discretion and is under no obligation to accept any Alternates.

1.5 BID SUBMISSION REQUIREMENTS

- A. Bids shall be submitted on the included Bid Form (Section 00 20 00) and will be reviewed and accepted or rejected at the Owner's option.
- B. All Bids shall be held for a period of One Hundred Twenty (120) Calendar days after submission of the Bid.

1.6 RELATED WORK SPECIFIED ELSEWHERE

- A. The Prime Contractor shall be aware, and shall make his subcontractors aware that the requirements in the sections of Divisions 00 and 01 pertain to all the work and they are binding on each section of these specifications as if they were repeated in each section in their entirety.
- B. The Prime Contractor shall be responsible for understanding the scope and intent of the work in all sections of these Specifications
- C. The Prime Contractor is responsible for review of all sections of the Specifications and all Drawings to confirm any additional areas of responsibility.
- D. All Contractors are responsible for their area of work which might show up only on a drawing from another series or Specification section.

1.7 CONTRACTS

- A. Work shall be performed under one Prime Contract.

1.8 PRIME CONTRACTOR'S DUTIES

- A. Project Supervision: see Section 00 20 20 - Supplementary General Conditions Rev 11-19-19 item 1.09 for requirements
- B. Except as specifically noted, provide and pay for:
 1. Labor, materials and equipment
 2. Tools, construction equipment and machinery
 3. Other facilities and services necessary for proper execution and completion of work
- C. Pay legally required State and Federal Taxes.

- D. Contractor shall make all his own measurements in the field and shall be responsible for correct fitting. He shall coordinate this work with all other branches in such a manner as to cause a minimum of conflict or delay. Contractor shall coordinate his work in advance with all other trades and report immediately any difficulty which can be anticipated.
- E. The Contract Documents shall be carefully studied by the Contractor during the course of construction. Any errors in layout or errors of omission which are discovered shall be referred immediately to the Architect/Engineer for interpretation or correction.
- F. Secure and pay for, as necessary for proper execution and completion of work, and as applicable at time of receipt of bids:
 - 1. Permits
 - 2. Licenses
- G. Give required notices.
- H. Comply with codes ordinances, rules, regulations, orders and other legal requirements of public authorities which bear on performance of work.
- I. Promptly submit written notice to Architect/Engineer of observed variances of Contract Documents from legal requirements.
- J. Enforce strict discipline and good order among employees.
- K. Coordinate delivery and installation dates with Architect/Engineer and Owner and incorporate into Construction Schedule.
- L. Prepare and update Construction Schedule.
- M. Notify and receive approval from the Owner at least 48 hours in advance for utility connections, or shut-off. Coordinate these operations with the Owner, through the Architect/Engineer, and complete the work in the minimum amount of time.
- N. Notify the Architect/Engineer in writing when work is completed and keep the Architect/Engineer informed of the progress of the work. No work shall be closed or covered until it has been inspected and approved. Should work not inspected be covered, uncover all such work so that it can be properly inspected and after such inspection, properly repair and replace all of the work at no additional cost to the Owner.
- O. Where the Contract Documents require any work to be tested, the Architect/Engineer shall be notified sufficiently in advance so that he may observe such tests.
- P. Contractor shall submit a copy of any permits he has secured before starting work on this project unless otherwise stated by Owner.
- Q. Where the Contract Documents require the use of AIA Documents including, but not limited to, G702 Application and Certificate for Payment and G703 Continuation Sheet.
- R. Coordinate the submission of certified payroll records weekly and deliver to the Owner as required by the Copeland Act and Davis-Bacon and Related Acts.

1.9 OTHER REQUIREMENTS

- A. Nightly the Prime Contractor shall secure the construction area to discourage unauthorized individuals from accessing the project. Special effort to secure the project area shall be made on Friday evenings.
- B. While the site shall be kept orderly at all times, weekly the Prime Contractor shall clean-up the construction site of:
 - 1. Any accumulated trash and rubbish.
 - 2. Dirt, dust, mud, etc., associated with the construction process.
 - 3. Salvaged materials not slated for re-use and excess materials not slated for use.

CHHS OT Renovation
Indiana State University
aD#26140

SUMMARY OF WORK
01 10 00 - 4
arcDESIGN

PART 2 – NOT USED

PART 3 – NOT USED

END OF SECTION 01 10 00

SECTION 01 23 60 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements governing allowances.
 - 1. Certain materials and equipment are specified in the Contract Documents by allowances. In some cases, these allowances include installation. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.
- B. Types of allowances include the following:
 - 1. Lump-sum allowances.
 - 2. Unit-cost allowances.
 - 3. Contingency allowances.
 - 4. Testing and inspecting allowances.
 - 5. Quantity allowances.
- C. Related Sections include the following:
 - 1. Division 01 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
 - 2. Division 01 Section "Quality Requirements" for procedures governing the use of allowances for testing and inspecting.

1.3 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise the Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier.

1.4 SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.
- B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

1.5 CONTINGENCY ALLOWANCES

- A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.
- B. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.

- C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit margins.
- D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.6 TESTING AND INSPECTING ALLOWANCES

- A. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.
- B. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure.
- C. Costs of services not required by the Contract Documents are not included in the allowance.
- D. At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

1.7 UNUSED MATERIALS

- A. Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, prepare unused material for storage by Owner when it is not economically practical to return the material for credit. If directed by Architect, deliver unused material to Owner's storage space. Otherwise, disposal of unused material is Contractor's responsibility.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. Allowance # 1: A \$35,000.00 Allowance shall be included in the Base Bid for Unforeseen Conditions and General Construction Contingency. It is solely at the discretion of the Architect/Engineer/Owner what costs may be applied to this Allowance. Any unused Allowance monies shall be returned to the Owner at Project closeout by Change Order.
- B. Allowance # 2: A \$5,000.00 allowance shall be included in the Base Bid for the A/E to create record drawings. These drawings shall be based on the Contractors field mark-ups of the Construction Documents. The Contractor is solely responsible to provide accurate mark-ups for the creation of these record drawings. Should it be discovered that errors exist in the record drawings the Contractor shall pay for the re-creation of accurate record drawings at no additional cost to the Owner.

END OF SECTION 01 23 60

SECTION 01 25 00 - CONTRACT CONSIDERATIONS

1.1 SECTION INCLUDES

- A. Schedule of Values
- B. Application for Payment
- C. Change procedures
- D. Alternates
- E. Substantial Completion
- F. Final Completion

1.2 SCHEDULE OF VALUES

- A. Submit a printed schedule on AIA Form G703 - Application and Certificate for Payment Continuation Sheet or similar form.
- B. Submit Schedule of Values electronically in PDF format within 15 calendar days after date of the Award Letter.
- C. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the major specification Section. Identify site mobilization, bonds and insurance, and other overhead costs.
- D. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.
- E. Include within each line item, a direct proportional amount of Contractor's overhead and profit.
- F. Revise schedule if additional Alternates are Awarded after the initial Award by adding these Alternates as separate line items broken down in detail as was provided in the initial approved Schedule of Values.
- G. Revise schedule to list approved Change Orders, broken down in detail as was provided in the initial approved Schedule of Values.
- H. Submit "Consent of Surety to Schedule of Values" with Schedule of Values.

1.3 APPLICATIONS FOR PAYMENT

- A. Submit four (4) copies of each application on AIA Form G702- Application and Certificate for Payment and AIA G703 - Continuation Sheet or similar.
- B. Content and Format: Utilize most current approved Schedule of Values for listing items in each Application for Payment.
- C. Payment Period: As indicated in the Contract Documents.
- D. Waiver of Liens.
- E. Include Certified Payroll forms if required by Owner.

1.4 CHANGE PROCEDURES

- A. The Architect/Engineer will advise of minor changes in the Work not involving and adjustment to Contract Sum/Price or Contract Time as authorized by AIA A201-2007 Edition, Paragraph 7.4 by issuing supplemental instructions on AIA Form G710 or ISU Form SI/FCC-12.
 - 1. The Architect/Engineer may issue a Request for Proposal (RFP) which includes A detailed description of a proposed change, with supplementary or revised Drawings and Specifications if required. Contractor shall prepare and submit an estimate within 10 calendar days, listing if:
 - a. A change in Contract Time for executing the change is requested.
 - b. A stipulation of any overtime work required

- c. The period of time during which the requested price will be considered valid, but not less than 21 calendar days.
 - B. The Contractor may propose changes by submitting a request for change, Change Proposal (CP), to the Architect/Engineer, describing the proposed change and its full effect on the Work.
 1. Include a statement describing:
 - a. The reason for the change.
 - b. The effect on the Contract Sum/Price and Contract Time with full documentation.
 - c. A statement describing the effect on Work by separate or other Contractors.
 - d. A stipulation of any overtime work required.
 - e. The period of time during which the requested price will be considered valid, but not less than 21 calendar days.
 - C. RFP and CP Pricing
 1. Project Supervision costs:
 - a. Section 00 20 20 Item 1.09 states in part:
 - 1) "The Prime Contractor shall maintain on the Project site a competent Project Superintendent at all times any work is being performed; either by the Prime Contractor's workers or any Subcontractor's workers."
 - b. There shall be no costs included in the pricing of a RFP or CP for Project Superintendent's Supervision Hours while the work is being performed unless the Work included in the RFP/CP pricing will occur at a time not with-in the normal scheduled Project hours of construction.
 2. Contractor Mark-up and Allowable Charges
 - a. Section 00 20 11 2.07 Subparagraph 3.3.3.7, 3.3.3.8 and 3.3.3.9 states:
 - 1) ".7 Extra Work shall be performed for the cost of the labor payroll plus 15% of the labor payroll and the cost of the material plus 5% of the material cost. Said markup fees are intended to compensate for the cost of payroll taxes, insurance of all kinds, all taxes of the Contractor, including State Taxes, Federal Income Tax, Unemployment, and FICA Taxes, as well as all other overhead costs, expenses, and carrying charges whatsoever, including the profit to be derived from such additional Work. Labor payroll is defined as the actual hourly labor cost plus any fringes payable as listed on the wage rate schedule(s) provided as required by the Bidding Documents.
 - 2) ".8 In case such Work is performed by a Subcontractor or a lower tier Contractor with the Owner's consent, the Work shall be marked up as indicated in 7.3.3.7 by the Contractor actually performing the Work. Each succeeding Contractor may mark up their direct labor and material costs as indicated in 7.3.3.7. Otherwise each succeeding Contractor, including the Prime Contractor, may add 5% for handling/coordination. Additional mark-ups of a Subcontractor's costs shall not be permitted.
 - 3) ".9 Costs for bond premiums are allowable provided documentation from the Bonding Company is included detailing the added bond cost premium, the current bond total and the new bond total."
 - b. Labor charges subject to the 15% mark-up shall be based on the actual labor payroll defined as the actual hourly labor cost plus any fringes payable as listed on the wage rate schedule(s) provided as required by the Bidding Documents.". The Wage Rate Schedule, submitted as required by the Contract Documents, shall be used to determine if the hourly labor rate used for pricing and labor mark-up is correct.
 - c. Insurance, Taxes and similar shall not be included in the RFP or CP pricing since, per 3.3.3.7, "Said markup fees are intended to compensate for the cost of payroll taxes, insurance of all kinds, all taxes of the Contractor, including State Taxes, Federal Income Tax, Unemployment, and FICA Taxes, as well as all other overhead costs, expenses, and carrying charges whatsoever, including the profit to be derived from such additional Work".

3. All RFP and CP pricing shall be submitted in enough detail for the Architect/Engineer and Owner to properly evaluate the proposed pricing. These pricing details extend to the lower tier Subcontractor's pricing as well. The Architect/Engineer and Owner may request additional pricing breakdown if in their opinion insufficient pricing detail was provided for evaluation. The Contractor shall promptly provide the additional pricing detail.
- D. Stipulated Sum/Price Change Order: Based on Proposal Request and Contractor's fixed price quotation or Contractor's request for a Change Order as approved by Architect/Engineer and Owner.
- E. Construction Change Directive: Architect/Engineer may issue a directive, on AIA Form G713 or ISU Form CCD-18 Construction Change Directive signed by the Owner, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute the change.
- F. Maintain detailed records of work done on Time and Material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.
- G. Execution of Change Orders: Architect/Engineer will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

1.5 ALTERNATES

- A. Alternate Bid prices shall be held for one hundred twenty (120) days from date of Bid.
- B. Alternate Bids may be used as the basis for Award of Contract.
- C. The Owner may Award none, some or all Alternates submitted.
- D. The Owner is under no obligation to accept any Alternates submitted.
- E. Accepted Alternates shall be listed as separate line items on the Schedule of Values broken down as directed by the Architect/Engineer/Owner.

1.6 SUBSTANTIAL COMPLETION

- A. The substantial completion date shall be as listed in Section 001010 INSTRUCTIONS TO BIDDERS. The substantial completion date may be adjusted as allowed by the Contract Documents or as mutually agreed upon in writing by the Owner and Contractor.
- B. Should a Contractor list an early substantial completion date on their Project Schedule or any Project Document, this early substantial completion date shall not be permitted to be used as a claim for additional compensation for the Contractor's failure to meet their early substantial completion date.
- C. Warranty: The Warranty Period shall commence at substantial completion per AIA A201-2007 Article 3 Paragraph 3.5 as amended by Specification Section 00 20 11 AMENDMENTS TO GENERAL CONDITIONS.

1.7 FINAL COMPLETION

- A. The Contractor's final Application for Payment (Release of Retainage) shall not be approved for payment until all punch list items are complete, all claims (Contractor and Subcontractor) have been resolved and all conditions of Section 01 77 00 PROJECT CLOSEOUT have been met.
- B. Requests for compensation, for previously approved Change Orders omitted from an Application for Payment, received sixty (60) calendar days after receipt of the Final Application for Payment (Release of Retainage) shall not be honored.
- C. Final payment will be due and payable the late of sixty-one (61) days from date of receipt of the Final Application for Payment or after the Contractor has completed all punch list items, certified that all Subcontractors and Suppliers have been paid, and all claims, including the Contractor's, have been resolved. Before issuance of the final payment, the Contractor shall furnish an affidavit (Final Waiver of Lien) as evidence that there are no claims on account of the Contract, outstanding liens of claims for materials furnished, or labor performed on the work. The final payment shall

constitute the acceptance of the work by the Owner, except as to work thereafter found to be defective. The date of such payment shall be regarded as the date of final acceptance of the work.

PART 2 – NOT USED

2.1 REFERENCE STANDARDS

- A. AIA A201-2007 - General Conditions of the Contract for Construction; 2007.
- B. AIA G703 - Continuation Sheet; 1992.

PART 3 – NOT USED

END OF SECTION 01 25 00

Digital Data License Agreement

The purpose of this Agreement is to grant a license from arcDESIGN to the User, for the User's use of Digital Data and to set forth terms of that license. This Agreement is the entire and integrated agreement between arcDESIGN and the User. Except as specifically described here, this Agreement does not create any other contractual relationship between arcDESIGN, PC and the User.

User: _____ Date: _____

Address: _____ Project Name: _____

User's Role: _____ arcDESIGN Project #: _____

- A. arcDESIGN grants to the User a limited license to use the Digital Data solely and exclusively for use in facilitating the User's instruments of service for the project identified.
- B. The Digital Data is transmitted solely for the User's information. The User acknowledges that any use of the Digital Data shall be at the User's sole risk. The User accepts the Digital Data, developed by arcDESIGN solely for its purposes, "as is" without any warranty or representations from arcDESIGN, as to whether the Digital Data is accurate, complete, or fit for use as intended by the User. The User is solely responsible for verifying whether the Digital Data is accurate, complete, or fit for the User's intended use.
- C. arcDESIGN grants to the User a nonexclusive limited license to use the Digital Data solely and exclusively for the uses, and in accordance with the terms, set forth above.
- D. Only the User is permitted to access and use the Digital Data. Unlicensed and unauthorized access or use by third parties is strictly prohibited.
- E. The transmission of Digital Data to the User constitutes a warranty by arcDESIGN to the User that arcDESIGN is the copyright owner of the Digital Data or otherwise has permission to transmit the Digital Data to the User for its use on the Project in accordance with the terms and conditions of this Agreement.
- F. By transmitting Digital Data, arcDESIGN does not convey any ownership right in the software used to generate or access the Digital Data.
- G. To the fullest extent permitted by law, the User shall indemnify and defend arcDESIGN from and against all claims arising from or related to the User's use of the Digital Data.

- H. Transmission of Digital Data from arcDESIGN to the User does not remove the rights of arcDESIGN, including exclusive ownership interest under all applicable state and federal laws including laws governing the protection of copyrights and intellectual property.
- I. By signing below, the User acknowledges the terms of this agreement listed above:

Printed Name

Position / Title

Company

Date

Signature

Sheets: A###-A###	AutoCAD 2018 Files	Sheets: A###-A###	AutoCAD 2018 Files
	Demolition Plan(s)		Building Section(s)
	Floor Plan(s)		Wall Section(s)
	Reflected Ceiling Plan(s)		Interior Finish Plan(s)
	Roof Plan(s)		Enlarged Plan(s)
	Exterior Elevation(s)		Detail(s)

Note: Transmission of Civil, Landscape, Structural, Mechanical, Fire Protection, Plumbing, Electrical, Telecommunications, or Audio Visual Systems digital data requires an executed agreement with the design professionals responsible for their development, not necessarily arcDESIGN, and the User.

BIM Files	Revit	Copyright
	Architectural Model	arcDESIGN

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SECTION 01 31 00 - COORDINATION AND MEETINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Coordination.
- B. Field engineering.
- C. Preconstruction meeting.
- D. Progress meetings.
- E. Field Record Drawings and Specifications

1.2 COORDINATION

- A. Coordination scheduling, submittals, and Work of the various sections of the Project Manual to assure efficient and orderly sequence of installation of interdependent construction elements, with provision for accommodating items installed later.
- B. Verify utility requirements and characteristics of 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.
- C. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. The Contractor shall provide coordination drawings for above-ceiling areas where at least two different services run in parallel or cross one another. Drawings are to be submitted, reviewed by the consultant team, and returned to the contractor prior to the start of any installation in these areas.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and cleanup of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for Owner's occupancy.
- G. 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.

1.3 FIELD ENGINEERING

- A. Contractor to locate and protect survey control and reference points.
- B. Control datum for survey is that established by Owner provided survey and/or shown on Drawings.
- C. Verify set-backs and easements, confirm drawing dimensions and elevations.
- D. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.
- E. Submit a copy of registered site drawing and certificate signed by the Land Surveyor that the elevations and locations of the Work is in conformance with the Contract Documents.
- F. PRECONSTRUCTION MEETING
 - 1. Architect/Engineer will schedule a meeting after Notice of Award.
 - 2. Attendance Required: Owner, Architect/Engineer, Contractor and major subcontractors.
 - 3. Agenda:
 - a. Introductions.
 - 1) Official Project Name and Number (to appear on all Project correspondence)

- 2) Designation of personnel representing the parties in Contract, Owner and the Architect/Engineer
- b. Status of required paperwork to ISU Purchasing Department.
- c. Distribution of Contract Documents.
- d. Submission of full list of sub-contractors and suppliers, schedule of values, proposed pay application schedule and proposed project schedule.
- e. Procedures and processing of submittals, substitutions, field decisions, proposal request, Change Orders, and Contract closeout procedures.
- f. Scheduling activities of a Testing Agency (if required).
- g. Use of premise by Owner and Contractor.
- h. Owner's requirements and partial occupancy.
- i. Construction facilities and controls provided by Owner.
- j. Temporary utilities.
- k. Survey and building layout.
- l. Security and housekeeping procedures.
- m. Procedures for testing.
- n. Procedures for maintaining record documents.
4. Architect/Engineer to record minutes and distribute copies within seven (7) days after meeting to participants, with copies to Architect/Engineer, Owner, and those affected by decisions made.

1.4 PROGRESS MEETINGS

- A. Schedule and attend meetings throughout progress of the Work at maximum monthly intervals.
- B. Architect/Engineer will make arrangements for meetings, prepare agenda with copies for participant and preside at meetings.
- C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, and Architect/Engineer, as appropriate to agenda topics for each meeting.
- D. Agenda:
 1. Review minutes of previous meetings.
 2. Review of Work progress.
 3. Field observations, problems, and decisions.
 4. Identification of problems which impede planned progress.
 5. Review of submittals schedule and status of submittals.
 6. Review of off-site fabrication and delivery schedules.
 7. Maintenance of progress schedule.
 8. Corrective measures to regain projected schedules.
 9. Planned progress during succeeding work period.
 10. Coordination of projected progress.
 11. Maintenance of quality and work standards.
 12. Effect of proposed changes on progress schedule
 13. Other business relating to Work.
- E. Architect/Engineer to record minutes and distribute copies within seven (7) days after meeting to participants, with copies to the Owner, and those affected by decisions made.

1.5 FIELD PROJECT RECORD DOCUMENTS

- A. Documents and Samples at the Site:
 1. General: The Prime Contractor shall maintain at the site for the Owner and A/E a record copy of the Drawings, Specifications, addenda, bulletins, Architect/Engineer's Supplemental Instructions, and Change Orders, in good order and marked currently to record changes and selections made during construction, and in addition reviewed Shop Drawings, Product Data,

Samples and similar required submittals. These shall be available to the Owner and the Architect/Engineer review.

2. Posting:
 - a. Record Drawings: Keep a complete record of the locations of all items indicating the Work as actually installed. Changes and deviations are to be indicated on the Record Contract Drawings. Give particular attention to concealed work which would be difficult to identify, measure, and record at a later date. The Subcontractor shall record concealed items, changes, and deviations under the direction of the Contractor as the Work progresses. The Contractor shall clearly identify all deviations from the Contract Documents.
 - b. Record Specifications: Indicate the changes made by addendum, bulletin, Architect/Engineer's Supplemental Instructions, and Change Order. Indicate the manufacturer selected for all items whether specified proprietarily or generally.
 - c. No review of record documents by the Architect/Engineer/Owner shall be a waiver of deviations from the Contract Documents or the submittals, or in any way relieve the Contractor from his responsibility to perform the Work in accordance with the Contract Documents.

PART 2 - NOT USED

PART 3 – NOT USED

END OF SECTION 01 31 00

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SECTION 01 32 00 - SUBMITTALS AND SUBSTITUTIONS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Wherever possible throughout the Contract Documents, the minimum acceptable quality of workmanship and materials has been defined either by manufacturer's name and catalog number or by reference to recognized industry standards.
- B. To ensure that the specified products are furnished and installed in accordance with the design intent, procedures have been established for advance submittal of design data and for its review by the Architect/Engineer.
- C. The Architect/Engineer's review of Contractor's material submittal shall not relieve the Contractor of responsibility for errors, omission, quantities, or capacities even though work is executed in accordance with the reviewed/approved submittal material.
- D. The checking of the Contractor's Material Submittal is a gratuitous assistance and the Architect/Engineer does not thereby assume responsibility or liability for errors or omissions. Where such errors or omissions are discovered later, they shall be made good by the Contractor, irrespective of any review/approval by the Architect/Engineer since Contractor's Proposal assumes a complete, operable, and acceptable installation.
- E. Work Included:
 - 1. Submit, to the Architect/Engineer, shop drawings, project data and samples required by Specification sections electronically in PDF format.
 - 2. Simultaneous to submitting to the Architect/Engineer, the Contractor shall submit to the Owner's designated contacts a copy of all submittals provided to the Architect/Engineer in PDF Format.
 - 3. All submittals shall be separated by CSI format and shall list the appropriate CSI 6-digit code on the PDF file name. Submittal packages which include items listed under different Specification sections shall be submitted as separate PDF Files. Multiple submittals at different times under the same Specification Section shall have file name extension added to indicate the number of the submittal, e.g. 26 51 00(1), 26 51 00(2), etc.
 - 4. Designate in construction schedule dates for submission and dates reviewed shop drawings, project data and samples will be needed for each product in order to maintain the progress of construction as scheduled. Also indicate critical delivery dates of all items.
 - 5. Any submittal that requires expedited review shall be noted on the submittal cover page with a "required by" review date listed. A Contractor's failure to submit in a timely manner is not cause to request an expedited review.
 - a.
 - 6. A Contractor's failure to submit in a timely manner is not cause to request an expedited review.

1.2 PRODUCT HANDLING

- A. Make all submittals of shop drawings, samples, requests for substitution, and other similar items, in strict accordance with the provisions of this section of these Specifications.

1.3 DEFINITIONS

- A. Shop Drawings:
 - 1. Original drawings, prepared by Contractor, subcontractor, supplier or distributor, which illustrate some portion of the work, showing fabrication, layout, setting or erection details.
 - a. Prepared by a qualified detailer

- b. Identify details by reference to sheet and detail numbers shown on contract drawings.
- B. Product Data:
 - 1. Manufacturer's standard schematic drawings:
 - a. Scanned copies of schematic drawings from hard copy paper catalog pages are not acceptable. Obtain PDF files of schematic drawings from the Supplier/Manufacturer for submission.
 - b. Modify drawings to delete information which is not applicable to project.
 - c. Supplement standard information to provide additional information applicable to project.
 - 2. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data.
 - a. Scanned copies of catalog sheets from hard copy paper catalog pages are not acceptable. Obtain PDF files of items from the Supplier/Manufacturer for submission.
 - b. Clearly mark each item to identify pertinent materials, products, or models to be provided.
 - c. Show dimensions and clearances required.
 - d. Show performance characteristics and capabilities.
 - e. Show wiring diagrams and controls.
 - 3. Material and Safety Data Sheets shall be furnished for all applicable Project Materials.
 - 4.
- C.
 - 1.
 - a.

1.4 SUBMITTAL REVIEW TIME

- A. Every effort will be made to return submittals within ten (10) calendar days or less.
- B. This ten (10) days may require adjustment based on, but not limited to, the following:
 - 1. Complexity of the submittal
 - 2. Size of the job and number of items included in the submittal
 - 3. Number of submittals received at the same time or on the same day
- C. Submittals received that do not clearly indicate the items being provided on the submittal will be returned marked "Rejected Resubmit" which will further delay the submittal return time.
- D.
- E.

PART 2 - PRODUCTS

2.1 SHOP DRAWINGS

- A. Scale required: Unless otherwise specifically directed by the Architect/Engineer, make all shop drawings accurately to a scale sufficiently large to show all pertinent features of the item and its method of connection to the work.
- B. All shop drawings shall be submitted electronically in PDF Format to the Architect/Engineer with a simultaneous submission to the Owner's designated recipients.
- C. Accompany shop drawings with transmittal letter containing:
 - 1. Date and revision dates
 - 2. Project title and number
 - 3. The names of:
 - a. Architect/Engineer
 - b. Contractor
 - c. Subcontractor
 - d. Supplier

- e. Manufacturer
 - f. Separate detailer when pertinent
- 4. Identification of product or material
- 5. Relation to adjacent structure or materials
- 6. Field dimensions, clearly identified as such
- 7. Specification section number
- 8. Applicable standards, such as ASTM number of Federal Specification
- 9. A blank space 2-1/2" x 3", for the Architect/Engineer's electronic stamp
- D. Identification of deviations from Contract Documents
- E. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of field measurements and compliance with Contract Documents. Any materials submitted without the Contractor's stamp of approval will be returned to the Contractor with no action taken.
- F. Reviewed shop drawings shall be returned to the Contractor and Owner's designated recipients electronically stamped as follows:
 - 1. Reviewed
 - 2. Reviewed as Noted
 - 3. Rejected - Resubmit
- G. The Owner shall submit their review comments to the Architect/Engineer. Official Review of shop drawings shall be by the Architect/Engineer only. The Contractor shall not proceed based on Owner comments only unless the Owner is the Architect/Engineer.

2.2 SUBMITTALS

- A. All submittals for materials and equipment shall be made within sixty (60) days of award of the contract and in no case shall any materials or equipment be delivered to the job site until submittals have been reviewed by the Architect/Engineer and Owner. This requirement will be a condition for approval of subsequent Applications for Payment.
- B. All submittals shall be submitted electronically in PDF Format to the Architect/Engineer with a simultaneous submission to the Owner's designated recipients.
- C. Submittals which reflect color samples shall be submitted in color.
- D. Accompany submittals with transmittal letter containing:
 - a. Date and revision dates
 - b. Project title and number
 - c. The names of:
 - d. Architect/Engineer
 - e. Contractor
 - f. Subcontractor
 - g. Supplier
 - h. Manufacturer
 - i. Separate detailer when pertinent
- 2. Identification of product or material
- 3. Relation to adjacent structure or materials
- 4. Field dimensions, clearly identified as such
- 5. Specification section number
- 6. Applicable standards, such as ASTM number of Federal Specification
- 7. A blank space 2-1/2" x 3", for the Architect/Engineer's electronic stamp
- E. Identification of deviations from Contract Documents
- F. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of field measurements and compliance with Contract Documents. Any materials submitted without the Contractor's stamp of approval will be returned to the Contractor with no action taken.
- G. Reviewed submittals shall be returned to the Contractor electronically stamped as follows:
 - 1. Reviewed

2. Reviewed as Noted
 3. Rejected - Resubmit
- H. The Owner shall submit their review comments to the Architect/Engineer. Official Review of submittals shall be by the Architect/Engineer only. The Contractor shall not proceed based on Owner comments only unless the Owner is the Architect/Engineer.

2.3 SAMPLES

- A. Physical samples as defined by the General Conditions shall be furnished to the Architect/Engineer for approval prior to ordering or fabrication of any product.
- B. Submit samples as specified in each of specification sections.
- C. Submit an electronic transmittal or review sheet stamped by the Contractor with a blank space for the Architect/Engineer's electronic stamp.

2.4 SUBSTITUTIONS DURING CONSTRUCTION

- A. The approved "Suppliers and Manufacturers List" is an essential part of the Contract. Substitutions of materials, equipment, etc. require the written approval of the Architect/Engineer and Owner. Substitutions during construction will only be considered when there is a proven benefit to the Owner. It is at the sole discretion of the Architect/Engineer and Owner to determine if the substitution is warranted.
 1. The Architect/Engineer and Owner will consider proposals for substitution of specified materials, equipment, and methods only when such proposals are accompanied by full and complete technical data and all other information required by the Architect/Engineer and Owner to evaluate the proposed substitution. Also, submit with request accurate cost data on the proposed substitution in comparison with the product specified, whether or not modification of the Contract Sum is to be a consideration.
 2. Do not substitute materials, equipment, or methods unless such substitution has been specifically approved for this work by the Architect/Engineer and Owner.
 3. Requests for substitution, when forwarded by the Contractor to the Architect/Engineer and Owner, are understood to mean that the Contractor:
 - a. Represents that they have personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;
 - b. Will provide the same guarantee for the substitution that they would for that specified;
 - c. Certifies that the cost data presented is complete and includes all related costs under this Contract, but excludes costs under separate contracts and the Architect's redesign cost, and that he waives all claims for additional cost related to the substitution which subsequently become apparent;
 - d. Will coordinate the installation of the accepted substitute, making such changes as may be required for the work to be complete in all respects.
- B. See Section 00 10 10 INSTRUCTIONS TO BIDDERS Item 1.08 for requirements for substitutions prior to Bid.

PART 3 – NOT USED

END OF SECTION 01 32 00

SECTION 01 35 16 - ALTERATION PROJECT PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes special procedures for alteration work.

1.2 RELATED SECTIONS

- A. 01 73 10 - Cutting and Patching for requirements for cutting and patching necessitated by the Work.
- B. 02 41 00 - Selective Demolition for selective demolition of building elements and associated terms and definitions.

1.3 DEFINITIONS

- A. Alteration Work: This term includes remodeling, renovation, repair, and maintenance work performed within existing spaces or on existing surfaces as part of the Project.
- B. Consolidate: To strengthen loose or deteriorated materials in place.
- C. Design Reference Sample: A sample that represents the Architect's prebid selection of work to be matched; it may be existing work or work specially produced for the Project.
- D. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- E. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.
- F. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.
- G. Repair: To correct damage and defects, retaining existing materials, features, and finishes. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.
- H. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.
- I. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.
- J. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.
- K. Retain: To keep an element or detail secure and intact.
- L. Strip: To remove existing finish down to base material unless otherwise indicated.

1.4 REFERENCE STANDARDS

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2027.

1.5 COORDINATION

- A. Alteration Work Subschedule: A construction schedule coordinating the sequencing and scheduling of alteration work for entire Project, including each activity to be performed, and based on Contractor's Construction Schedule. Secure time commitments for performing critical construction activities from separate entities responsible for alteration work.
 - 1. Schedule construction operations in sequence required to obtain best Work results.
 - 2. Coordinate sequence of alteration work activities to accommodate the following:
 - a. Owner's continuing occupancy of portions of existing building.

- b. Owner's partial occupancy of completed Work.
 - c. Other known work in progress.
 - d. Tests and inspections.
- 3. Detail sequence of alteration work, with start and end dates.
- 4. Utility Services: Indicate how long utility services will be interrupted. Coordinate shutoff, capping, and continuation of utility services.
- 5. Use of elevator and stairs.
- 6. Equipment Data: List gross loaded weight, axle-load distribution, and wheel-base dimension data for mobile and heavy equipment proposed for use in existing structure. Do not use such equipment without certification from Contractor's professional engineer that the structure can support the imposed loadings without damage.
- B. Pedestrian Circulation:
 - 1. Coordinate alteration work with circulation patterns within Project building(s) and site. Work is near circulation patterns and adjacent to restricted areas or areas to remain with no direct work.
 - 2. Circulation patterns cannot be closed off entirely and in places can be only temporarily redirected around small areas of work. Access to restricted areas may not be obstructed without coordination with the Owner a minimum of 2 weeks prior to the planned date on which such access or obstruction is required to maintain schedule. Plan and execute the Work accordingly.

1.6 PROJECT MEETINGS FOR ALTERATION WORK

- A. Coordination Meetings: Reference Section 01 31 00 - Coordination and Meetings.
 - 1. Review items of significance that could affect progress of alteration work. Include topics for discussion as appropriate to status of Project including but not limited to:
 - a. Access to alteration work locations.
 - b. Effectiveness of fire-prevention plan.
 - c. Quality and work standards of alteration work.
 - d. Housekeeping and maintenance of Construction Barriers.
 - 2. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.7 MATERIALS OWNERSHIP

- A. Objects including, but not limited to, signage, commemorative plaques and tablets, equipment, items identified on the Drawings, and other items of interest or value to Owner that may be encountered or uncovered during the Work, regardless of whether they were previously documented, remain Owner's property.
 - 1. Carefully dismantle and salvage each item or object in a manner to prevent damage and protect it from damage, then promptly deliver it to Owner where directed on or near Campus.

1.8 QUALITY ASSURANCE

- A. Alteration Work Program: Prepare a written plan for alteration work for whole Project, including each phase or process and protection of surrounding materials during operations. Show compliance with indicated methods and procedures specified in this and other Sections. Coordinate this whole-Project alteration work program with specific requirements of programs required in other alteration work Sections.
 - 1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
 - 2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.

- B. Fire-Prevention Plan:
 - 1. Prepare a written plan for preventing fires during the Work, including placement of fire extinguishers, fire blankets, rag buckets, and other fire-control devices during each phase or process.
 - 2. Coordinate plan with Owner's fire-protection equipment and requirements. Include fire-watch personnel's training, duties, and authority to enforce fire safety.
- C. Safety and Health Standard: Comply with ANSI/ASSP A10.6.

1.9 STORAGE AND HANDLING OF SALVAGED MATERIALS

- A. Salvaged Materials:
 - 1. Clean loose dirt and debris from salvaged items unless more extensive cleaning is indicated.
 - 2. Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area designated by Owner.
 - 5. Protect items from damage during transport and storage.
- B. Salvaged Materials for Reinstallation:
 - 1. Repair and clean items for reuse as indicated.
 - 2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.
 - 3. Protect items from damage during transport and storage.
 - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make items functional for use indicated.
- C. Existing Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by Architect, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after alteration and other construction work in the vicinity is complete.
- D. Storage: Catalog and store items within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.
 - 1. Identify each item for reinstallation with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
 - 2. Secure stored materials to protect from theft.
 - 3. Control humidity so that it does not exceed 85 percent. Maintain temperatures 5 deg F (3 deg C) or more above the dew point.
- E. Storage Space:
 - 1. Arrange for off-site locations for storage and protection of salvaged material that cannot be stored and protected on-site.

1.10 FIELD CONDITIONS

- A. Survey of Existing Conditions: Record existing conditions that affect the Work by use of preconstruction photographs.
- B. Discrepancies: Notify Architect of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.
- C. Owner's Removals: Before beginning alteration work, verify in correspondence with Owner that the following items have been removed:
 - 1. Loose Food Service Equipment.
 - 2. Suspended or hanging signage or University – related promotional materials.
 - 3. Floor supported, portable informational signage standards.

PART 2 PRODUCTS - (NOT USED)

PART 3 EXECUTION

3.1 PROTECTION

- A. Protect persons, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from alteration work.
 - 1. Use only proven protection methods, appropriate to each area and surface being protected.
 - 2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where alteration work is being performed.
 - 3. Erect temporary barriers to form and maintain fire-egress routes.
 - 4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during alteration work.
 - 5. Contain dust and debris generated by alteration work, and prevent it from reaching the public or adjacent surfaces.
 - 6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
 - 7. Protect floors and other surfaces along hauling routes from damage, wear, and staining.
 - 8. Provide supplemental sound-control treatment to isolate demolition work from other areas of the building.
- B. Temporary Protection of Materials to Remain:
 - 1. Protect existing materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
 - 2. Do not attach temporary protection to existing surfaces except as indicated as part of the alteration work program.
- C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.
- D. Utility and Communications Services:
 - 1. Notify Owner, Architect, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by alteration work before commencing operations.
 - 2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for alteration work.
 - 3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.
- E. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.
 - 1. Prevent solids such as adhesive or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from alteration work.
 - 2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.
- F. Existing Roofing: Prior to the start of work at the following areas, install roofing protection surrounding portions of the roof indicated to be replaced.
 - 1. Roof-Mounted Mechanical and HVAC equipment.
 - 2. Restoration of Clerestory Glazed Aluminum Storefront Systems.
 - 3. Replacement of Metal Panel Roofing Systems.

3.2 PROTECTION FROM FIRE

- A. General: Follow fire-prevention plan and the following:
 - 1. Comply with NFPA 241 requirements unless otherwise indicated. Perform duties titled "Owner's Responsibility for Fire Protection." Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary for the immediate work.
 - a. If combustible material cannot be removed, provide fire blankets to cover such materials.
- B. Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work with heat-generating equipment or combustible materials, including welding, torch-cutting, soldering, brazing, removing paint with heat, or other operations where open flames or implements using high heat or combustible solvents and chemicals are anticipated:
 - 1. Obtain Owner's approval for operations involving use of open-flame or welding or other high-heat equipment. Notify Owner at least 24 hours before each occurrence, indicating location of such work.
 - a. Contractor shall adhere to Factory Mutual Engineering and Research (FM) "Cutting and Welding" permit system. Permits are available through the Office of Environmental Safety's Fire Specialist Office at 812-237-4020.
 - b. Prime Contractor shall provide a one hour fire watch at the end of each workday when any cutting or welding occurred to assure that no possibility of fire exists from any work performed that day.
 - 2. As far as practicable, restrict heat-generating equipment to shop areas or outside the building.
 - 3. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.
 - 4. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.
 - 5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
 - 6. Fire Watch: Before working with heat-generating equipment or combustible materials, station personnel to serve as a fire watch at each location where such work is performed. Fire-watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows:
 - a. Train each fire watch in the proper operation of fire-control equipment and alarms.
 - b. Prohibit fire-watch personnel from other work that would be a distraction from fire-watch duties.
 - c. Cease work with heat-generating equipment whenever fire-watch personnel are not present.
 - d. Have fire-watch personnel perform final fire-safety inspection each day beginning no sooner than 30 minutes after conclusion of work in each area to detect hidden or smoldering fires and to ensure that proper fire prevention is maintained.
 - e. Maintain fire-watch personnel at Project site until 60 minutes after conclusion of daily work.
- C. Fire-Control Devices: Provide and maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids. Maintain each as suitable for the type of fire risk in each work area. Ensure that nearby personnel and the fire-watch personnel are trained in fire-extinguisher and blanket use.
- D. Sprinklers: Where sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to sprinklers, shield them temporarily with guards.
 - 1. Remove temporary guards at the end of work shifts, whenever operations are paused, and when nearby work is complete.

3.3 PROTECTION DURING APPLICATION OF CHEMICALS

- A. Protect surrounding surfaces and building elements from harm or spillage resulting from applications of chemicals and adhesives.
- B. Cover adjacent surfaces with protective materials that are proven to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in alteration work program. Use covering materials and masking agents that are waterproof and UV resistant and that will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces. When no longer needed, promptly remove protective materials.
- C. Neutralize alkaline and acid wastes and legally dispose of off Owner's property.
- D. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

3.4 GENERAL ALTERATION WORK

- A. Have specialty work performed only by qualified specialists.
- B. Ensure that supervisory personnel are present when work begins and during its progress.
- C. Record existing work before each procedure (preconstruction), and record progress during the work. Use digital preconstruction documentation photographs or video recordings.
- D. Perform surveys of Project site as the Work progresses to detect hazards resulting from alterations.
- E. Notify Architect of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.
 - 1. Do not proceed with the work in question until directed by Architect.

END OF SECTION 01 35 16

SECTION 01 40 00 - QUALITY CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Quality assurance - control of installation.
- B. Tolerances
- C. References.
- D. Mockups.
- E. Inspecting and testing laboratory services.
- F. Manufacturer's field services and reports.

1.2 QUALITY ASSURANCE - 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 manufacturer's instructions, including each step in sequence.
- C. Should manufacturer's instructions conflict with Contract Documents, request clarification from Architect/Engineer 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. Perform work by qualified people to produce workmanship of quality.
- F. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
- G.

1.3 TOLERANCES

- A. Monitor tolerance control of installed Products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturer's tolerances. Should manufacturer's tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- C. Adjust Products to appropriate dimensions; position before securing Products in place.

1.4 REFERENCES

- A. For Products or workmanship specified by association, trade, or other consensus 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 by date of issue current on date of Contract Documents, except where a specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. The contractual relationship, duties, and responsibilities of the parties in Contract nor those of the Architect/Engineer shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.5 MOCKUPS

- A. Provide mockups of the work as indicated in the Drawings and Specifications.
- B. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following

requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

- C. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.
- D. Notify Architect fifteen (15) working days in advance of dates and times when mock-ups will be constructed.
- E. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.
- F. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- G. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.
 - 1. Architect will issue written comments within seven (7) working days of initial review and each subsequent follow up review of each mock-up.
 - 2. Make corrections as necessary until Architect's approval is issued.
- H. Architect will use accepted mock-ups as a comparison standard for the remaining Work.

1.6 INSPECTING AND TESTING LABORATORY SERVICES

- A. See Section 01 41 00 for requirements for the selection of Inspection and Testing Laboratory Services Testing Agency (Agencies) and responsibility for payment for these services.
- B. An independent firm will perform inspections, tests, and other services specified in individual specification sections and as required by the Architect/Engineer or the Owner.
- C. Inspecting, testing, and source quality control may occur on or off the project site. Perform off-site inspecting or testing as required by the Architect/Engineer or the Owner.
- D. Reports will be submitted by the independent firm to the Architect/Engineer and Contractor, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
- E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
- F. Notify Architect/Engineer and independent firm 24 hours prior to expected time for operations requiring services.
- G. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.
- H. Testing or inspecting does not relieve Contractor to perform Work to contract requirements.
- I. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Architect/Engineer. Payment for retesting will be paid by the Contractor.

1.7 MANUFACTURERS' FIELD SERVICES AND REPORTS

- A. When specified 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. Submit qualifications of observations. Observer subject to approval of Architect/Engineer.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer's written instructions.
- D. Submit report in duplicate within 30 days of observations to Architect/Engineer for information.

CHHS OT Renovation
Indiana State University
aD#26140

QUALITY CONTROL
01 40 00 - 3
arcDESIGN

PART 2 – NOT USED

PART 3 – NOT USED

END OF SECTION 01 40 00

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SECTION 01 41 00 - TESTING AND LAB SERVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section describes testing and inspecting to be provided by the Contractor, plus cooperation required from the Contractor with the Owner's selected testing agency and others responsible for testing and inspecting the Work. This Section supersedes all references within the Contract Documents to Contractor provided testing.
- B. Related Work:
 - 1. Documents affecting Work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 01 of these Specifications.
 - 2. Requirements for testing may be described in various Sections of these Specifications.
 - 3. Where no testing requirements are described, but the Owner decides that testing is required, the Owner may require such testing to be performed under current pertinent standards for testing. Payment for such testing will be made as described in this Section.
- C. Work not included:
 - 1. Selection of testing laboratory: The Owner will select a prequalified independent testing laboratory.
 - 2. Selection of construction soil engineer: The Owner will select a prequalified independent soil engineer to observe performance of Work in connection with excavating, trenching, filling, backfilling, and grading, and to perform compaction tests.

1.2 QUALITY ASSURANCE

- A. The testing laboratory will be qualified to the Owner's approval in accordance with ASTM E329.
- B. Testing, when required, will be in accordance with all pertinent codes and regulations, and with selected standards of the American Society for Testing and Materials.
- C. Promptly process and distribute required copies of test reports and related instructions to assure necessary testing and replacement of materials with the least possible delay in progress of the Work.

PART 2 - PRODUCTS

2.1 REFERENCE STANDARDS

- A. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2023.

2.2 PAYMENT FOR TESTING

- A. Initial services of testing laboratory:
 - 1. The Owner will pay for initial services requested by the Owner.
 - 2. When initial tests indicate non-compliance with the Contract Documents, the costs of all tests associated with that non-compliance will be deducted by the Owner from the Contract Sum.
- B. Initial services of Construction Soil Engineer:
 - 1. The Owner will pay for initial services requested by the Owner, including but not necessarily limited to, observing performance of Work in connection with excavating, trenching, filling, backfilling and grading.

2. The Owner will pay for compaction tests performed by the construction soil engineer, but will deduct from the Contract Sum the costs for compaction tests performed to prove compliance with codes or ordinances.
3. Retesting: When initial tests indicate non-compliance with the Contract Documents, subsequent retesting occasioned by the non-compliance shall be performed by the same testing agency, and costs thereof will be deducted by the Owner from the Contract Sum.

2.3 CODE COMPLIANCE TESTING

- A. Inspections and tests required by codes or ordinances, or by a plan approval authority, and which are made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents.

2.4 CONTRACTOR'S CONVENIENCE TESTING

- A. Inspecting and testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

PART 3 - EXECUTION

3.1 COOPERATION WITH TESTING LABORATORY

- A. Representatives of the testing laboratory shall have access to the Work at all times and at all locations where the Work is in progress. Provide facilities for such access to enable the laboratory to perform its functions properly.

3.2 TAKING SPECIMENS

- A. All specimens and samples for testing, unless otherwise provided in the Contract Documents, shall be taken by the testing personnel. All sampling equipment and personnel will be provided by the testing laboratory. All deliveries of specimens and samples to the testing laboratory will be performed by the testing laboratory.

3.3 SCHEDULES FOR TESTING

- A. Establishing schedule:
 1. By advance discussion with the testing laboratory selected by the Owner, determine the time required for the laboratory to perform its tests and to issue each of its findings.
 2. Provide testing laboratory with a minimum of 24 hours advance notice.
 3. Provide all required time within the construction schedule.
- B. Revising schedule: When changes of construction schedule are necessary during construction, coordinate all such changes with the testing laboratory as required.
- C. Adherence to schedule: When the testing laboratory is ready to test according to the established schedule, but is prevented from testing or taking specimens due to incompleteness of the Work, all extra charges for testing attributable to the delay may be back-charged to the Contractor and shall not be borne by the Owner.

END OF SECTION 01 41 00

SECTION 01 42 00 - DEFINITIONS AND STANDARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 01 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF REQUIREMENTS

- A. General: This section specifies procedural and administrative requirements for compliance with governing regulations and the codes and standards imposed upon the work. The requirements include the obtaining of permits, licenses, inspections, releases and similar documentation, as well as payments, statements and similar requirements associated with regulations, codes and standards.
- B. "Regulations" is defined to include laws, statutes, ordinances and lawful orders issued by governing authorities, as well as those rules, conventions and agreements within the construction industry which effectively control the performance of the work regardless of whether they are lawfully imposed by governing authority or not.
- C. Governing Regulations: Refer to General and Supplementary Conditions for requirement related to compliance with governing regulations.

1.3 DEFINITIONS

- A. General Explanation: A substantial amount of specification language consists of definitions for terms found in other Contract Documents, including drawings. (Drawings must be recognized as diagrammatic in nature and not completely descriptive of the requirements indicated thereon). Certain terms used in Contract Documents are defined in this article. Definitions and explanations contained in this section are not necessarily either complete or exclusive, but are general for the work to the extent that they are not stated more explicitly in another element of the Contract Documents.
- B. General Requirements: The provisions or requirements of Division 00 and Division 01 sections apply to entire work of Contract and, where so indicated, to other elements which are included in project.
- C. Indicated: The term "indicated" is a cross-reference to graphic representations, notes or schedules in the specifications, and to similar means of recording requirements in Contract Documents. Where terms such as "shown", "noted", "scheduled" and "specified" are used in lieu of "indicated", it is for purpose of helping reader locate cross-reference, and no limitation of location is intended except as specifically noted.
- D. Directed, Requested, Etc.: Where not otherwise explained, terms such as "directed", "requested", "authorized", "selected", "approved", "required", "accepted", and "permitted", mean "directed by Architect/Engineer", "requested by Architect/Engineer", and similar phrases. However, no such implied meaning will be interpreted to extend Architect's/Engineer's responsibility into the Contractor's area of construction supervision.
- E. Approve: Where used in conjunction with Architect's/Engineer's response to submittals, requests, applications, inquiries, reports and claims by Contractor, the meaning of term "approved" will be held to limitations of Architect's/Engineer's responsibilities and duties as specified in General and Supplementary Conditions. In no case will "approval" by Architect/Engineer be interpreted as a release of Contractor from responsibilities to fulfill requirements of Contract Documents.
- F. Project Site: The term "project site" is defined as the space available to the Contractor for performance of the work, wither exclusively or in conjunction with others performing other work as

- part of the project. The extent of the project site is shown on the drawings, and may or may not be identical with description of the land upon which project is to be built.
- G. **Furnish:** Except as otherwise defined in greater detail, term "furnish" is used to mean supply and deliver to project site, ready for unloading, unpacking, assembly, installation, and similar operations, as applicable in each instance.
 - H. **Delegated Design**
 - I. **Install:** Except as otherwise defined in greater detail, term "install" is used to describe operations at project site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance.
 - J. **Provide:** Except as otherwise defined in greater detail, term "provide" means to furnish and install, complete and ready for intended use, as applicable in each instance.
 - K. **Installer:** The term "installer" is defined as the entity (person or firm) engaged by the Contractor, its Subcontractor or Sub-subcontractor for performance of a particular unit of work at the project site, including installation, erection, application and similar required operations. It is a requirement that installers be expert in the operations they are engaged to perform.
 - L. **Testing Laboratories:** The term "testing laboratory" is defined as an independent entity engaged to perform specific inspections or tests of the work, either at the project site or elsewhere; and to report and, if required, interpret results of those inspections or tests.
 - M. **Alteration Work:** This term includes remodeling, renovation, repair, and maintenance work performed within existing spaces or on existing surfaces as part of the Project.
 - N. **Dismantle:** To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
 - O. **Existing to Remain:** Existing items that are not to be removed or dismantled, except to the degree indicated for performing required Work.

1.4 PROJECT MANUAL FORMAT AND CONTENT EXPLANATION

- A. **General:** This article is provided to help the user of these specifications more readily understand the format, language, implied requirements and similar conventions of content. None of the following explanations shall be interpreted to modify the substance of the contract requirements.
- B. **Production Methods:** Portions of these specifications have been produced by the Architect's/Engineer's standard method of editing master specifications, and may contain minor deviations from traditional writing formats. Such deviations are a natural result of this production technique, and no other meaning shall be implied.
- C. **Project Manual Format:** These specifications are organized based upon the Construction Specifications Institute's 33 Division format. The organization of these specifications into Divisions, Sections or Trade Headings generally conforms to recognized industry practice.
 - 1. **Divisions** are groupings of related or similar sections. The divisions are recognized as the construction industry consensus method of uniform specification organization.
 - 2. **Sections:** For convenience, "Sections" are considered as the basic units of work. The section title is descriptive only and not intended to limit the meaning or content of a section or to be completely descriptive of requirements specified therein.
 - 3. **Section Numbering** is used to facilitate cross-references in the Contract Documents. Sections are placed in the Project Manual in numeric sequence; however, the numeric sequence is not complete and the listing of the section in the "Index" at the beginning of the Project Manual must be consulted to determine the numbers and names of specifications sections in the Contract Documents.
- D. **Project Identification:** The project number of the Contract Documents is the Bid Number recorded on the Project Manual Cover Sheet, in Section 00 10 00 Notice to Bidders and Section 00 20 00 Bid Form.

- E. Page Numbering: Pages are numbered independently for each section. The section number is shown together with the page number at the bottom of each page to facilitate the location of text in the Project Manual.
- F. Text Subordination: Portions of specification text are subordinated to other portions in the following manner:
 - 1. Certain sections may be subordinate to other sections or parts of other sections. When that occurs, the degree of subordination is described in those sections.
 - 2. Sub-articles, which are printed in upper/lower case lettering, are subordinate to Article titles.
 - 3. Paragraphs and lines of text are subordinate to sub-article titles.
 - 4. Paragraphs and lines of text that are indented from the left margin are subordinate to the preceding text that is either not indented, or is indented by a lesser amount.
- G. Project Manual Content: This project specification has been produced employing certain conventions in the use of language as well as conventions regarding the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:
 - 1. In certain circumstances, the language of the specifications and other Contract Documents is of the abbreviated type. It implies words and meanings that will be appropriately interpreted. Singular words will be interpreted as plural and plural words will be interpreted as singular where applicable and where the full context of the Contract Documents so indicates.
 - 2. Imperative language is generally used in specifications. Except as otherwise indicated, requirements expressed imperatively are to be performed by Contractor. At certain locations in the text, for clarity of reading, contrasting subjective language is used to describe responsibilities which must be fulfilled indirectly by Contractor or, when so noted, by others.
- H. Methods of Specifying: The techniques or methods of specifying requirements varies throughout the text.
 - 1. The method used for specifying one unit or work has no bearing on requirements for another unit of work.
 - 2. Methods of specifying may include the following, or any combination of the following:
 - a. Prescriptive.
 - b. Open-generic-descriptive.
 - c. Performance.
 - d. Proprietary.
 - e. Compliance with reference standards.
- I. Specialists Assignments: In certain instances, specification text requires or implies that specific elements of the work are to be assigned to specialists or expert entities, who must be engaged for the performance of the work. Such assignments are intended to establish which part or entity involved in a specific element of the work is considered as being sufficiently experienced in the indicated construction processes or operations to be recognized as "expert" in those processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of all contract requirements remains with the Contractor.
- J. These requirements should not be interpreted to conflict with the enforcement of building codes and similar regulations governing the work. They are also not intended to interfere with local trade union jurisdictional settlements and similar conventions.
- K. Trades: Except as otherwise indicated, the use of titles such as "Carpentry" in specification text, is not intended to imply that the work must be performed by an accredited or unionized tradesperson of corresponding generic name (such as "carpenter"). It is also not intended to imply that specified requirements apply exclusively to work by tradespersons of that corresponding generic name.

1.5 DRAWING SYMBOL

- A. General: Except as otherwise noted indicated, graphic symbols used on drawings are those symbols recognized in the construction industry for purposes indicated. Where not otherwise

noted, symbols are defined by "Architectural Graphic Standards", published by John Wiley & Sons, Inc., latest edition.

- B. Mechanical/Electrical Drawings: Graphic symbols used on mechanical/electrical drawings are generally aligned with symbols recommend by ASHRAE. Where appropriate, these symbols supplemented by more specific symbols as recommended by other recognized technical associations including ASME, ASPE, IEEE and similar organizations. Refer instances of uncertainty to the Architect/Engineer for clarification before proceeding.

1.6 INDUSTRY STANDARDS

- A. General Applicability of Standards: Except to the extent that more explicit or more stringent requirements are written into the Contract Documents, applicable standards of the construction industry have the same force and effect as if copied directly into the Contract Documents. Such industry standards are hereby made a part of the Contract Documents by reference. Individual specification sections indicate which codes and standards the Contractor must keep available for reference at the project site.
- B. Referenced standards (standard referenced directly in Contract Documents) have precedence over non-referenced standards which are recognized in industry for applicability to work.
- C. Non-referenced standards are hereby defined as not being applicable to the work, except as general requirement of whether the work complies with recognized construction industry standards.
- D. Publication Dates: Except as otherwise indicated, where compliance with an industry standard is required, comply with standard in effect as of date of Contract Documents.
- E. Updated Standards: At the request of the Architect/Engineer, Contractor or governing authority, submit a change order proposal where an applicable industry code or standard has been revised and reissued after the date of the Contract Documents and before the performance of the work affected. The Architect/Engineer will decide whether to issue the change order to proceed with the updated standard.
- F. Conflicting Requirements: Where compliance with 2 or more standards is specified, and where these standards establish different or conflicting requirements for minimum quantities or quality levels, the most stringent requirement will be enforced, unless the Contract Documents specifically indicate a less stringent requirement. Refer requirements that are different, but apparently equal, and uncertainties as to which quality level is more stringent to the Architect/Engineer for a decision before proceeding.
- G. Minimum Quantities or Quality Levels: In every instance, the quantity or quality level shown or specified is intended to be the minimum for the work to be provided or performed. Unless otherwise indicated, the actual work may either comply exactly, within specified, or may exceed that minimum within reasonable limits. In complying with these requirements, the indicated numeric values are either minimum or maximum values, as noted, or as appropriate for the context of the requirements. Refer instances of uncertainty to the Architect/Engineer for decision before proceeding.
- H. Copies of Standards: Contract Documents require that each entity performing work be experienced in that part of the work being performed. Each entity is also required to be familiar with recognized industry standards applicable to that part of the work. Copies of applicable standards are not bound with the Contract Documents.
- I. Where copies of standards are needed for proper performance of the work, the Contractor is required to obtain such copies directly from the publication source.
- J. Although certain copies of standards needed for enforcement of the requirements may be required submittals, the Architect/Engineer reserves the right to require the Contractor to submit additional copies of these standards as necessary for enforcement of the requirements.
- K. Abbreviations and Names: Where acronyms or abbreviations are used in the specifications or other Contract Documents they are defined to mean the industry recognized name of the trade association, standards generating organization, governing authority or other entity applicable to

the context of the text provision. Refer to the "Encyclopedia of Associations", published by Gale Research Co., available in most libraries.

1.7 GOVERNING REGULATIONS/AUTHORITIES

- A. General: The procedure followed by Architect/Engineer has been to contact governing authorities where necessary to obtain information needed for the purpose of preparing Contract Documents; recognized that such information may or may not be of significance in relation to Contractor's responsibilities for performing the work. Contact governing authorities directly for necessary information and decisions having a bearing on performance of work.
- B. Trade Union Jurisdictions: The Contractor shall maintain, and shall require Prime Subcontractor to maintain, complete current information on jurisdictional matters, regulations actions and pending actions, as applicable to the work. Discuss new developments at appropriate project meetings at the earliest feasible dates, and record information of relevance along with the actions agreed upon. The manner in which Contract Documents have been organized and subdivided is not intended to be an indication of jurisdictional or trade union agreements. Assign and subcontract the work, and employ trades-men laborers, in a manner which will not unduly risk jurisdictional disputes of kind which could result in conflicts, delays, claims and losses in the performance of the work.

1.8 SUBMITTALS

- A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence and records established in conjunction with compliance with standards and regulations bearing upon performance of the work.

PART 2 – NOT USED

PART 3 – NOT USED

END OF SECTION 01 42 00 01 42 00

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SECTION 01 50 00 - TEMPORARY FACILITIES RENOVATION PROJECTS

PART 1 - GENERAL

1.1 CONTRACTOR'S USE OF PREMISES AND FACILITIES

- A. Confine operations at site to areas permitted by:
 - 1. Construction Limits
 - 2. Contract Documents
 - 3. Written Owner Approval
- B. Do not load structure with weight that will endanger structure or existing adjacent structures including any subsurface construction.
- C. The Prime Contractor shall assume full responsibility for protection and safekeeping of product stored on premises.
- D. The Prime Contractor shall move any stored products which interfere with operations of Owner or other Contractor.
- E. The activities of the Prime Contractor, including his subcontractors, material suppliers, employees, and others engaged in the work, shall be strictly limited to the Owner's property. Under no circumstances shall parking, material storage, or other uses of adjacent private property be permitted. Locations of storage areas, field office, parking areas, and the like on the project site shall be only within the construction limits as indicated on the drawings or as approved by the Owner.
- F. Use of Installed Work: Construction personnel may use toilet facilities, sink, and other fixtures and equipment installed in work only as expressly permitted by Architect/Engineer or Owner. Any privileges granted may be revoked if abused.
- G. Construction personnel shall exercise care and shall provide whatever protective measures are required to assure that their particular portions of the work do not damage or alter portions of the work that have been previously installed, either partially or completely. All work so damaged or altered shall be repaired or replaced to the satisfaction of the Architect by the party whose work has been affected, and the expense thereof shall be borne by the party who caused the damage or alteration.
- H. Protection of Floors: In interior areas used for construction or field "shops", protect floors from physical damage, oil drippings, and other staining which might impair bonding of new floor coverings, utilizing such methods as heavy polyethylene covering, sawdust or sand boxes, rigid insulation or the like.

1.2 FIELD OFFICE

- A. The Prime Contractor and their Sub-Contractors shall be responsible for their own field office.
- B. The Prime Contractor shall provide telephone service, including cellular phone for the on-site foreman, for the duration of the project.
- C. Provide at all times fire extinguishers as required by applicable codes and regulations.
- D. Post in a conspicuous space near the telephone, pertinent emergency phone numbers and notices as may be required by governing authorities and fire protection department.

1.3 SITE PROTECTION

- A. Contractor shall adhere to Factory Mutual Engineering and Research (FM) "Cutting and Welding" permit system. Permits are available through the Office of Environmental Safety's Fire Specialist Office at 812-237-4020.

- B. Prime Contractor shall provide a one hour fire watch at the end of each workday when any cutting or welding occurred to assure that no possibility of fire exists from any work performed that day.
- C. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect/Engineer immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.

1.4 TEMPORARY ELECTRIC SERVICE

- A. Responsibility: The Prime Contractor shall be allowed to utilize the Owner's electricity for all construction purposes. The Prime Contractor shall arrange for the distribution and continuance throughout the work and the removal at the completion of the work of temporary electrical service. All electrical installations shall be by a Licensed Bonded Electrical Contractor. All elements of such temporary electric service shall conform to the regulations of the National Electric Code, current edition, and OSHA. All temporary wiring shall include a green equipment grounding conductor, and the entire temporary electrical service shall have equipment grounding continuity; all outlets for the connection of portable equipment shall be of the GFCI type. The Contractor shall provide all necessary wiring. The Prime Contractor or their Sub Contractor shall provide extension cords, outlets, etc. required to extend temporary service from nearest outlets of adequate capacity for the power required to points of usage.
- B. Distribution Wiring: The temporary distribution wiring shall be adequate to provide whatever is required for the operation of 120 volts, single-phase portable tools and equipment not exceeding one horsepower; the distribution wiring shall provide a receptacle within 50 feet of all portions of the building area.
- C. Temporary Lighting: The Prime Contractor shall provide all wiring, light bulbs and fixtures necessary to furnish temporary lighting of one watt per sq. ft. of construction area, but provide a minimum of one light in each enclosed space. Keep such temporary lighting in operation during all working periods.
- D. Supervision: The Prime Contractor shall maintain strict supervision over the use of the temporary electrical service and shall be responsible for damages incurred by misuse.

1.5 TEMPORARY WATER SERVICE

- A. The Prime Contractor may use the Owner's existing water service for construction purposes. The Prime Contractor shall provide and maintain leak-free, all hoses, fitting, nozzles, and the like required to distribute water to points of usage. Maintain strict supervision over use and waste of water. Take care not to spill or run water in any part of the building. Repair, replace, or restore (whichever may be deemed necessary by the Architect/Engineer) at no additional cost to the Owner, all work, new or existing, including equipment, furnishings, machines, finished surfaces, and the like which may be damaged by water due to construction operations, and by the misuse of such temporary water service. At completion of the work remove all temporary water distribution items.

1.6 TEMPORARY TOILETS

- A. The Prime Contractor shall provide approved temporary toilet facilities to maintain sanitary conditions. Provide number, type and maintenance of units as required by applicable laws.

1.7 TEMPORARY STORAGE

- A. The Prime Contractor and each of their Sub-Contractors shall be responsible for their own temporary storage.
- B. Provide secure areas as may be required for storage and protection of materials, tools and equipment.

1.8 SIGNS

- A. Identification Signs: No signs or advertisements shall be permitted on the project site or on temporary structures, except those which are required to conform to the safety requirements of the Contract Documents or those which are expressly permitted by the Architect/Engineer or specified herein.

1.9 TEMPORARY BARRIERS

- A. The Prime Contractor shall be responsible for seeing that all shafts and openings through the floors or roofs are adequately barricaded, marked, and lighted.
 - 1. Provide barriers, markers, or other provisions, or all, at all conditions, such as items protruding from the work, which might cause injury to persons.
 - 2. The design, locations, and requirements of protective barricades shall be subject to approval of the Architect/Engineer, but the Contractor shall be responsible for their adequacy. When such conditions no longer exist, barriers and the like shall be removed.
 - a. The Prime Contractor shall be responsible for seeing that all persons, surrounding operations, and surrounding buildings are protected from dust, debris, or harm resulting from alteration work.
 - 3. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where alteration work is being performed.
 - 4. Erect temporary barriers to form and maintain fire-egress routes as required.
 - 5. Contain dust and debris generated by alteration work, and prevent it from reaching the public or adjacent surfaces.
 - 6. Provide supplemental sound-control treatment to isolate demolition work from other areas of the building.

1.10 SITE SECURITY

- A. All temporary construction which may be required to maintain security of buildings or construction areas shall be provided by the Prime Contractor. At the end of each day's work, close all windows opened by construction personnel, and close all access doors to work areas. Work damaged in this regard shall be repaired or replaced to the satisfaction of the Architect/Engineer/Owner. Security guard service shall not be provided as a part of any Contract for this project for field office, storage sheds and storage areas, or for protection of construction tools, equipment, and materials. Such security may, at the Contractor's option, be provided at no additional cost to the Owner.

1.11 TRASH REMOVAL

- A. The Prime Contractor shall remove from the Construction site, and legally dispose of, all rubbish resulting from the work under his contract. Rubbish shall be removed daily and not be allowed to accumulate, other than the trash placed in trash containers outside the building.
- B. The Prime Contractor shall maintain the cleanliness of the pathways utilized to remove construction debris and rubbish by sweeping, mopping, and other methods utilized by the building's janitorial staff.

1.12 RESTORATION OF TEMPORARY FACILITIES

- A. The Prime Contractor shall be responsible for his restoration of his own temporary facilities.
- B. Storage area and project offices: At completion of the work, remove from the project site all evidence of temporary services, field office, temporary sheds, covers, pallets, excess materials, scrap materials, equipment tools, waste, debris, and other foreign materials. Restore to the Architect/Engineer's satisfaction such area to its condition which existed prior to starting construction work, utilizing whatever methods are appropriate. Repair and patch to match all drive

and parking lot surfaces damaged by construction processes; subject to the Architect/Engineer's approval. Fill, grade and reseed all lawn areas and replace all trees, plants or shrubs damaged by the construction process.

1.13 TEMPORARY FENCING

- A. The Prime Contractor shall provide all temporary fencing required to secure the site.
- B. The fencing shall be sectionalized chain link panels at least 6' in height. The use of plastic snow type fencing or caution tape for site protection is not allowed unless approved by the Owner.
- C. Provide feet assemblies to tie the fencing system together and allow for sandbags or other weights to be placed stabilizing the fencing.
- D. Wire ties shall be installed half way up on adjacent panel ends to tie the panels together.
- E. It is acceptable to install chain and padlocks at site entrance locations.

PART 2 – NOT USED

PART 3 – NOT USED

END OF SECTION 01 50 00

SECTION 01 60 00 - MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1 MATERIALS HANDLING

- A. Delivery: Deliver materials and equipment to Project Site in unopened, undamaged dry containers, wrappings, cartons, crates, sacks, or the like, clearly labeled as to product and materials, and with the manufacturer's name or trademark or both. Materials delivered in other than such condition may be rejected by the Architect/Engineer.
- B. Storage: Suitably store materials and equipment in designated areas and in accordance with manufacturer's recommendations or in a manner approved by the Architect or both.
 - 1. Store such materials and equipment off the ground, totally protected from ground splash, mud, weather separation, intrusion of foreign materials, and other damage.
 - 2. Do not store materials, equipment, or tools on roofs, unless such materials are to be immediately installed during the current work day, and unless equipment and tools are being integrally used in the work.
 - 3. Do not store volatile materials such as solvents, gasoline, oil, fuels, and the like within the building.
 - 4. Immediately remove paper, rags, etc., which might become soaked with such materials when they must be taken into the building for use in the work.
 - 5. At the end of each work day, remove such "safety cans" of materials to their storage area outside the building.
 - 6. The Contractor shall, upon delivery of material and equipment to the project site, check to ascertain that all materials, parts, accessories, and other incidentals necessary for the installation of such materials and equipment have been delivered and received at the project site, so that no delays are caused in the work due to insufficient quantities of materials or missing parts.

1.2 INSTALLATIONS

- A. Materials: Materials and equipment shall be new and undamaged and shall be installed as indicated on the drawings. They shall fit accurately into adjacent work and shall be plumb, level, and true-to-line.
 - 1. All materials and equipment shall be anchored securely and rigidly in place, maintaining alignment with adjacent work.
 - 2. Where installation methods and techniques are not specifically covered by the drawings or the specifications, normal first-class trade practices and manufacturer's instructions and recommendations shall govern, providing that they are approved by the Architect/Engineer.
- B. "Not-In-Contract" Items: Materials, equipment, fixtures, devices and other items indicated on the drawings as "Not-In-Contract" or "N.I.C." shall in no way be a part of the Contract.
 - 1. Where such "Not-In-Contract" items are accompanied by an indication to be installed by the Contractor, the Contractor shall receive, store, protect, assemble, install, and connect such items in accordance with the best accepted practices of the trade or trades involved and with the provisions of the Specifications for similar items that are totally part of the Contract.
 - 2. The Contractor shall be responsible for obtaining such specific information for the installation and connection of such items.
- C. Reinstalling Existing Items: Where existing materials, equipment, fixtures, devices, and other items are indicated on the drawings to be removed, or received, and reinstalled under the Contract, treat such existing items as if they were new and install such existing items as shown on the drawings, in accordance with the best accepted practices of the trade or trades involved and with provisions of the specifications for similar new items.

1.3 REMOVAL AND RE-INSTALLATION OF EQUIPMENT

- A. The Owner is not responsible for the removal or re-installation of equipment necessitated by this work.
- B. All electrical disconnects and reconnects of equipment necessitated by this work shall be performed by a licensed bonded Electrical Contractor hired by the Contractor to perform this work. The Owner will assist in locating the power source but will not be responsible for the actual performance the electrical work.

1.4 ACCESSIBILITY

- A. The Contractor shall locate all equipment which must be serviced, operated or maintained in fully accessible positions. Minor deviations from the contract drawings may be made to allow for better accessibility, but changes of magnitude or which involve extra cost shall not be made without approval.
- B. It is the Contractor's responsibility to provide access panels when serviceable parts of his installation are concealed by finished construction, unless access panels are specifically indicated on the Drawings or elsewhere in the Project Manual to be by others. Access panel data shall be submitted with the equipment Shop Drawings.
- C. Ample space shall be allowed for removal of all parts that may require replacement or service in the future. The service area is to be indicated on Shop Drawings.
- D. The Contractor shall extend all grease fittings to an accessible location.

PART 2 – NOT USED

PART 3 – NOT USED

END OF SECTION 01 60 00

SECTION 01 73 10 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Requirements and limitations for cutting and patching of Work

1.2 RELATED SECTIONS

- A. 01 10 00 - Summary of Work: Work by Owner or by separate contractors
- B. 01 32 00 - Submittals and Substitutions
- C. 01 35 16 - Alteration Project Procedures
- D. 01 60 00 - Materials and Equipment
- E. Individual Product Specification Sections:
 - 1. Cutting and patching incidental to work of the section
 - 2. Advance notification to other sections of openings required in work of those sections
 - 3. Limitations on cutting structural members

1.3 SUBMITTALS

- A. Submit written request in advance of cutting or alteration which 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
- B. Include in request:
 - 1. Identification of Project
 - 2. Location and description of affected Work
 - 3. Necessity for cutting or alteration
 - 4. Description of proposed Work and Products to be used
 - 5. Alternatives to cutting and patching
 - 6. Effect on work of Owner
 - 7. Date and time work will be executed

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Primary Products: Those required for original installation.

PART 3 – EXECUTION

3.1 RESPONSIBILITY

- A. Each respective Contractor is responsible for the required cutting and patching to complete his work.
- B. Each respective Contractor shall coordinate with the General Contractor and bear all costs associated with cutting and patching.

- C. Each Contractor will closely examine the requirements of the Work and cutting required to access, perform, and complete the Work and will bear the cost of patching upon completion of the Work.

3.2 EXAMINATION

- A. Examine existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.
- B. After uncovering existing Work, assess conditions affecting performance of work.
- C. Beginning of cutting or patching means acceptance of existing conditions.

3.3 PREPARATION

- A. Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.
- B. Provide protection from elements for areas which may be exposed by uncovering work.
- C. Maintain excavations free of water.

3.4 CUTTING

- A. Execute cutting and fitting including excavation and fill to complete the Work.
- B. Perform whatever cutting and patching is necessary to complete the work.
- C. Uncover work to install improperly sequenced work.
- D. Remove and replace defective or non-conforming work.
- E. Remove samples of installed work for testing when requested.
- F. Provide openings in the Work for access to or penetration of mechanical and electrical work.
- G. Match work that has been cut to adjacent work.
- H. Repair areas adjacent to cuts to required condition.
- I. Remove and replace defective and non-complying work.
- J. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight-exposed surfaces.
- K. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- L. Restore work with new products in accordance with requirements of Contract Documents.
- M. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

3.5 PATCHING

- A. Execute patching to complement adjacent Work, finishing 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.
 - 1. Match color, texture, and appearance.
 - 2. 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.
- B. Fit Products together to integrate with other Work.
- C. Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.
- D. Employ original installer to perform patching for weather exposed and moisture resistant elements, and sight-exposed surfaces.
- E. Restore work with new Products in accordance with requirements of Contract Documents.
- F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- G. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material, to full thickness of the penetrated element.

- H. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

END OF SECTION 01 73 10

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SECTION 01 77 00 - CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 SUBSTANTIAL COMPLETION SUBMISSIONS

- A. Record Drawings and Record Specifications:
 - 1. The Contractor shall provide the final Field Record Drawings and Specifications which have been maintained and updated during the duration of the Project to the Architect/Engineer for review. Submit documents in paper form of each Drawing and Specification Division of the Work.
 - 2. Certifications: The Prime Contractor and Subcontractors shall certify, by endorsement on the Record Drawings and Specifications that each of the revised sheets represents a complete and accurate record of the Work as executed.
- B. Operations and Maintenance Data
 - 1. Assemble a manual in electronic PDF format on USB Flash Drive indexed by Division of work Sub indexed by Specification of work, presenting for the Owner's guidance full details for care and maintenance of visible surfaces and of equipment included in the Work for review by the A/E.
 - a. Include a copy of the reviewed Architect/Engineer submittal and/or shop drawing. The Submittal and/or shop drawing shall be annotated by the Contractor indicating that the comments have been included in the document.
 - b. Include manufacturer's literature relating to motors and other equipment, catalog cut, parts lists, wiring diagrams, instruction sheets, and other pertinent information which will be useful to the Owner in overall operation and maintenance.
 - c. Include a list of installers and service representatives with company names and addresses, names of individuals to contact, and telephone numbers.
 - d. Include manuals called for in other Sections of the Specifications, in this manual.
 - 2. Certifications: The Contractor shall certify, by endorsement of the manual, that the manual is complete and accurate.
 - 3. On Projects where the Owner is the Architect/Engineer, submit to the Owner for review.
- C. Warranties
 - 1. Forms:
 - a. Extended Warranties: Provide a copy of the manufacturer's extended warranty, fill it out completely, sign it, and have it countersigned by the installer and manufacturer if required by the Contract Documents.
 - b. Manufacturers' Warranties: Manufacturer's warranty modified, when required to comply with requirements of the Contract Documents.
 - 2. Starting Date: The starting date for warranties is the Date of Substantial Completion of the Work.
 - 3. Submittal: At the time of Substantial Completion submit all warranties, including special warranties, required by the Contract Documents to the Architect/Engineer review.
- D. Statement of Application
 - 1. Submit Owner prepared fully executed Certificate of Substantial Completion.
- E. Service and Maintenance Contracts
 - 1. At the time of Substantial Completion submit executed contracts for extended service or maintenance required by the Contract Documents to the Architect/Engineer for review by the A/E.
 - 2. Extended maintenance proposals where called for in the specification shall be submitted with the proposals for each trade at the time their portion of the work is bid. Furnish copies of the

maintenance proposal to the Owner and Architect/Engineer for review prior to award of the subcontract for each portion of work.

1.2 FINAL CLEANING

- A. Responsibility: The Prime Contractor is responsible for the final cleaning of the Project and for the coordination and direction of cleaning by all trades.
- B. Materials:
 - 1. Use only cleaning materials recommended by the manufacturers of the surfaces to be cleaned.
 - 2. Use cleaning materials only on surfaces recommended by the cleaning materials manufacturers.
- C. Execution:
 - 1. Employ experienced workers, or professional cleaners, for final cleaning. Schedule final cleaning to be completed prior to Architect Observations required for Substantial Completion.
 - 2. Clean all surfaces whether exposed to view or not.
 - 3. Remove trash, rubbish, waste materials, tools, and equipment from the site.
 - 4. Remove grease, dust, dirt, plaster, mortar, fingerprints, and other foreign materials from interior and exterior surfaces exposed to view, e.g., the surfaces of structural steel, miscellaneous metal, woodwork, plaster, masonry, concrete, mechanical and electrical equipment, piping, duct work, and conduit; polish surfaces so designated to shine finish.
 - 5. Clean the electrical closets, pipe and duct shafts, chases, furred spaces, and similar spaces which are generally unfinished. Leave these spaces free from rubbish, loose plaster, mortar droppings, waste construction materials, dirt, and dust.
 - 6. The Architect/Engineer is to review items which the Prime Contractor proposes removing labels before they are removed.
 - 7. Maintain cleaning until date of Substantial Completion or the date of partial occupancy of the building, whichever is earlier. Re-cleaning will not be required after the Work has been inspected and accepted, unless later operations of the Contractor make re-cleaning of certain portions necessary.

1.3 PREPARATION OF FINAL RECORD DRAWINGS AND RECORD SPECIFICATIONS

- A. The Prime Contractor shall employ the Project A/E to re-draft, in CAD format, the paper copy Record Drawings provided by the Prime Contractor onto the Bid Drawings to create the final Record Drawings.
- B. The Prime Contractor shall employ the Project A/E to retype the paper Record Specifications to indicate all revisions to the Bid Specifications. Items changed shall be marked by a double strike through and revised language inserted in red letters.
- C. An Allowance to cover the costs of the re-drafting of Drawings and revisions to the Specification will be provided and shall be included in the Prime Contractors Bid. Final Allowance cost payments will be based on actual documented A/E costs for their work. The Allowance payment will be adjusted accordingly. This Allowance shall be listed as a separate line item on the Schedule of Values.

1.4 FINAL CLOSEOUT

- A. Final Closeout date shall be as listed in 00 10 10 - Instructions To Bidders
- B. At Final Closeout the Contractor shall submit to the Owner, via the Architect/Engineer if applicable:
 - 1. One (1) copy on a USB Flash Drive of the complete Project Documentation in PDF format, except as noted in item "o" below, including but not limited to:
 - a. Design Meeting Notes (the Contractor shall coordinate with the A/E to obtain)
 - b. Pre-Bid meeting documents
 - c. The Contractor's Project Bidding Documents including Addenda.

- d. Award documentation
 - e. Required submissions as detailed in the Award Letter
 - f. Pre-Construction meeting documents and
 - g. Progress meeting notes and Construction observation notes.
 - h. All Change items, e.g. ASI, RFI, RFQ, CP, CO, etc., with documentation
 - i. Pay Applications
 - j. Reviewed and accepted O&M Manual,
 - k. Warranties,
 - l. Extended Service and Maintenance Contracts
 - m. Record Specifications
 - n. A scanned copy of the marked-up Record Drawings
 - o. Record Drawings in both PDF and CAD format
2. The Prime Contractor shall retain the paper copies of the Record Drawings and Record Specifications for a minimum of seven (7) years in a safe location and produce these documents upon request by the Owner.

PART 2 – NOT USED

PART 3 – NOT USED

END OF SECTION 01 77 00

SECTION 02 41 00 - SELECTIVE DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Selective demolition of building elements for alteration purposes.

1.2 RELATED REQUIREMENTS

- A. Section 00 31 00 - Available Project Information: Existing building survey conducted by Owner; information about known hazardous materials.
- B. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.
- C. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- D. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.
- E. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

1.3 DEFINITIONS

- A. Demolish: Dismantle, raze, destroy, or wreck any building or structure or any part thereof.
- B. Remove: Detach or dismantle items from existing construction and dispose of them off site, unless items are indicated to be salvaged or reinstalled.
- C. Salvage: Detach or dismantle items from existing construction in a manner to prevent damage. Clean, package, label and deliver salvaged items to Owner in ready-for-reuse condition.
- D. Salvage and Reinstall: Detach or dismantle items from existing construction in a manner to prevent damage. Clean and prepare for reuse and reinstall where indicated.
- E. Existing to Remain: Designation for existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.4 REFERENCE STANDARDS

- A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.
- B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2027.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.1 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.

1. Obtain required permits.
 2. Comply with applicable requirements of NFPA 241.
 3. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 4. Provide, erect, and maintain temporary barriers and security devices.
 5. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 6. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
 7. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
- B. Do not begin removal until receipt of notification to proceed from Owner.
- C. Do not begin removal until built elements to be salvaged or relocated have been removed.
- D. Protect existing elements to remain in place which are not removed.
- E. Hazardous Materials:
1. Hazardous materials are not anticipated to be uncovered during removal operations.
- F. Perform demolition in a manner that maximizes salvage and recycling of materials.
1. Dismantle existing construction and separate materials.
 2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

3.2 EXISTING UTILITIES

- A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.3 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
1. Verify construction and utility arrangements are as indicated.
 2. Report discrepancies to Architect before disturbing existing installation.
 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Separate areas in which demolition is being conducted from areas that remain occupied.
1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 50 00 in locations indicated on drawings.
 2. Provide sound retardant partitions of construction and in locations indicated on drawings.
- C. Remove existing work as indicated and required to accomplish new work.

1. Remove items indicated on drawings.
- D. Services including, but not limited to, HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications: Remove existing systems and equipment as indicated.
 1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
 2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 3. Verify that abandoned services serve only abandoned facilities before removal.
 4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.
- E. Protect existing work to remain.
 1. Prevent movement of structure. Provide shoring and bracing as required.
 2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
 3. Repair adjacent construction and finishes damaged during removal work.
 4. Patch to match new work.

3.4 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Protect all surfaces and facility infrastructure from damage and dirt along pathway to transport demolition waste to dumpsters for removal from site.
- C. Provide housekeeping sufficient to maintain cleanliness of all pathways to the project location within the building. The Owner is not responsible for cleaning up after the work.
- D. Remove materials not to be reused on site; comply with requirements of Section 01 74 19 - Waste Management.
- E. Leave site in clean condition, ready for subsequent work.

END OF SECTION 02 41 00

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SECTION 03 01 30 - MAINTENANCE OF 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 other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Patching of concrete.

1.3 REFERENCED STANDARDS AND GUIDELINES

- A. International Concrete Repair Institute (ICRI) Guideline No. 310.2R "Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair" latest edition.
- B. NACE/SSPC (The Society for Protective Coatings) "Surface Preparation Standards, Guides, and Specifications" latest edition.

1.4 ACTION SUBMITTALS

- A. Product Data: For each product.
 - 1. Include construction details, material descriptions, chemical composition, physical properties, test data, and mixing, preparation, and application instructions.

1.5 QUALITY ASSURANCE

- A. Concrete-Repair Installer Qualifications: Engage an experienced concrete-repair firm that employs installers and supervisors who are trained and approved by manufacturer to apply packaged patching-mortar and crack-injection adhesive to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience in only installing or patching new concrete is insufficient experience for concrete-repair work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's written instructions for minimum and maximum temperature requirements and other conditions for storage.
- B. Store cementitious materials off the ground, under cover, and in a dry location.

1.7 FIELD CONDITIONS

- A. Environmental Limitations for Epoxies: Do not apply when air and substrate temperatures are outside limits permitted by manufacturer. During hot weather, cool epoxy components before mixing, store mixed products in shade, and cool unused mixed products to retard setting. Do not apply to wet substrates unless approved by manufacturer.
 - 1. Use only Class A epoxies when substrate temperatures are below or are expected to go below 40 degrees Fahrenheit within eight hours.
 - 2. Use only Class A or B epoxies when substrate temperatures are below or are expected to go below 60 degrees Fahrenheit within eight hours.

3. Use only Class C epoxies when substrate temperatures are above and are expected to stay above 60 degrees Fahrenheit for eight hours.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: For repair products, obtain each color, grade, finish, type, and variety of product from single source and from single manufacturer with resources to provide products of consistent quality in appearance and physical properties.

2.2 BONDING AGENTS

- A. Epoxy-Modified, Cementitious Bonding and Anticorrosion Agent: Manufactured product that consists of water-insensitive epoxy adhesive, portland cement, and water-based solution of corrosion-inhibiting chemicals that forms a protective film on steel reinforcement.
 1. Products: Subject to compliance with requirements, provide the following:
 - a. Sika: Armatec - 110 EpoCem

2.3 PATCHING CONCRETE

- A. Patching Concrete Requirements:
 1. Only use patching concrete that is recommended by manufacturer for each applicable horizontal orientation.
- B. Patching Concrete: Packaged, dry mix for repair of concrete.
- C. Water: Potable.
- D. Reinforcing Mesh: Square welded 2" mesh, 0.188" minimum wire diameter, 84% open, 0.92 lb/sf weight, stainless steel Type 304 as manufactured by McNichols or approved equal.
- E. Wire Ties: 0.188" minimum wire diameter, stainless steel Type 304 for tying reinforcing mesh.

2.4 EQUIPMENT

- A. Concrete square cut edges shall be performed with a power-operated saw equipped with a diamond-impregnated blade.

PART 3 EXECUTION

3.1 GENERAL

- A. The repair procedures specified herein define the suggested general scope and description of the work to be performed. The Contractor is responsible for all means and methods for the safe execution of the work. The manufacturer's printed instructions and best practices shall be strictly followed for all material.
- B. Rapid changes in temperature must be avoided during curing to prevent thermal shock cracks in patching materials.

3.2 CONCRETE PATCHING

- A. Preparation:
 1. Saw cut perimeter of the area to be repaired to a minimum depth of 3/4 inch. Do not nick existing steel reinforcement. Do not overcut the corners of the patch.
 2. Remove concrete within the boundaries of the cut to a minimum depth of 3/4 inch along the edges of the patch. Removed concrete to a minimum depth of 3/4 inch clearance behind the exposed reinforcing steel to allow the patching material to surround the steel.

3. Thoroughly clean the roughened concrete surface and exposed reinforcement of corrosion, dirt, loose particles and dust.
- B. Mixing: Mix repair or patching concrete in strict accordance with the manufacturer's printed instructions paying close attention to the quantity of water used.
- C. Patch application:
 1. Finish with steel trowel, wood, plastic or sponge float for desired surface texture.
- D. Curing: Protect fresh patching mortar from premature evaporation.
 1. Protect newly applied material until compressive strength is 70%.
 2. Protect repair from moisture during curing period.

3.3 PROTECTION

- A. Protect concrete repairs from damage and wear during remainder of construction period. Provide protective covering on installed work when necessary to prevent damage.
- B. Correct deficiencies in or remove concrete repair materials that do not comply with requirements; repair substrates and reapply concrete repair materials.
- C. At completion of Work, remove unused material, equipment and debris from site.

END OF SECTION 03 01 30

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SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Patching of floors and slabs on grade.
- B. Concrete reinforcement.
- C. Concrete curing.

1.2 REFERENCE STANDARDS

- A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).
- B. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.
- C. ACI PRC-302.1 - Guide to Concrete Floor and Slab Construction; 2015.
- D. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- E. ACI PRC-308 - Curing of Concrete—Guide; 2026.
- F. ACI SPEC-301 - Specifications for Concrete Construction; 2020.
- G. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2026.
- H. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2024.
- I. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2024.
- J. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2024a.
- K. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2026.
- L. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens); 2026.
- M. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.
- N. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2020.
- O. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2025a.
- P. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete; 2023.
- Q. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2022.
- R. ASTM C1708/C1708M - Standard Test Methods for Self-Leveling Mortars Containing Hydraulic Cements; 2025.
- S. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2024.
- T. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017 (Reapproved 2023).

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.

- C. Mix Design: Submit proposed concrete mix design.
 - 1. Indicate proposed mix design complies with requirements of ACI CODE-318, Chapter 5 - Concrete Quality, Mixing and Placing.
 - 2. Indicate proposed mix design complies with fiber reinforcing manufacturer's written recommendations.
- D. Samples: Submit samples of underslab vapor retarder to be used.

1.4 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.

1.5 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.1 REINFORCEMENT MATERIALS

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
 - 1. Type: Deformed billet-steel bars.
 - 2. Finish: Galvanized in accordance with ASTM A767/A767M, Class I, unless otherwise indicated.
- B. Steel Welded Wire Reinforcement (WWR): Galvanized, plain type, ASTM A1064/A1064M.
- C. Reinforcement Accessories:
 - 1. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

2.2 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
- B. Fine and Coarse Aggregates: ASTM C33/C33M.
- C. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.
- D. Structural Fiber Reinforcement: ASTM C1116/C1116M.
 - 1. Fiber Length: 0.75 inch, nominal.
 - 2. Fiber Type: Alkali-resistant synthetic.

2.3 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder:
 - 1. Sheet Material: ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single-ply polyethylene is prohibited.
 - 2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
 - 3. Products:
 - a. Stego Industries, LLC: www.stegoindustries.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Self-Leveling Cementitious Concrete Floor Topping:
 - 1. Minimum Compressive Strength at 28 Days, ASTM C1708/C1708M: 7,000 pounds per square inch.
 - 2. Products:
 - a. LATICRETE International, Inc; NXT Level DL: www.laticrete.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.4 CURING MATERIALS

- A. Moisture-Retaining Sheet: ASTM C171.
 - 1. Polyethylene film, white opaque, minimum nominal thickness of 4 mil, 0.004 inch.
- B. Water: Potable, not detrimental to concrete.

2.5 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.
- B. Fiber Reinforcement: Add to mix at rate as recommended by manufacturer for specific project conditions.
- C. Normal Weight Concrete:
 - 1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 3,000 pounds per square inch.
 - 2. Water-Cement Ratio: Maximum 40 percent by weight.
 - 3. Maximum Aggregate Size: 5/8 inch.

2.6 MIXING

- A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.
 - 1. Fiber Reinforcement: Batch and mix as recommended by manufacturer for specific project conditions.
- B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.2 PREPARATION

- A. Where new concrete with integral waterproofing is to be bonded to previously placed concrete, prepare surfaces to be treated in accordance with waterproofing manufacturer's instructions. Saturate cold joint surface with clean water, and remove excess water before application of coat of waterproofing admixture slurry. Apply slurry coat uniformly with semi-stiff bristle brush at rate recommended by waterproofing manufacturer.
- B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
- C. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

3.3 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

- A. Comply with requirements of ACI SPEC-301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.
- B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

3.4 PLACING CONCRETE

- A. Place concrete in accordance with ACI PRC-304.

3.5 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. Maximum Variation of Surface Flatness:
 - 1. Exposed Concrete Floors: 1/4 inch in 10 feet.
 - 2. Under Seamless Resilient Flooring: 1/4 inch in 10 feet.
 - 3. Under Carpeting: 1/4 inch in 10 feet.
- B. Correct the slab surface if tolerances are less than specified.
- C. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.6 CONCRETE FINISHING

- A. Concrete Slabs: Finish to requirements of ACI PRC-302.1 and as follows:
 - 1. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI PRC-302.1; thick floor coverings include quarry tile, ceramic tile, and Portland cement terrazzo with full bed setting system.
 - 2. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI PRC-302.1; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
 - 3. Other Surfaces to Be Left Exposed: Trowel as described in ACI PRC-302.1, minimizing burnish marks and other appearance defects.

3.7 CURING AND PROTECTION

- A. Comply with requirements of ACI PRC-308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Surfaces Not in Contact with Forms:
 - 1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
 - 2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
 - 3. Final Curing: Begin after initial curing but before surface is dry.

3.8 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
- B. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

3.9 PROTECTION

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION 03 30 00

SECTION 03 54 00 - CAST UNDERLAYMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Liquid-applied self-leveling floor underlayment as remediation for existing subfloor conditions at new flooring systems.

1.2 RELATED REQUIREMENTS

- A. Section 09 05 61 - Common Work Results for Flooring Preparation.
- B. Section 09 30 00 - Tiling

1.3 REFERENCE STANDARDS

- A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens); 2026.
- B. ASTM C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars; 2021.
- C. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2022.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.
- E. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's data documenting physical characteristics and product limitations.
- C. Certificate: Certify products of this section meet or exceed specified requirements.
- D. Manufacturer's Instructions: Indicate information on surface preparation, mixing instructions, environmental limitations, and installation instructions.
- E. Applicator's qualification statement.
- F. Testing agency's qualification statement.
- G. Specimen warranty.
- H. Executed warranty.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with minimum 3 years of documented experience.
- B. Applicator Qualifications: Company specializing in performing work of type specified, with minimum 3 years of documented experience.
- C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Store products in manufacturer's unopened packaging until ready for installation.

- C. Keep dry and protect from direct sun exposure, freezing, and ambient temperatures greater than 105 degrees F.

1.7 FIELD CONDITIONS

- A. Do not install underlayment until floor penetrations and peripheral work are complete.
- B. Maintain minimum ambient temperatures of 50 degrees F 24 hours before, during, and 72 hours after installation of underlayment.
- C. During curing process, ventilate spaces to remove excess moisture.

1.8 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 2-year manufacturer warranty for defective materials. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Cementitious Underlayment:
 - 1. LATICRETE International, Inc; NXT Level Plus with Primer Plus: www.laticrete.com/#sle.
 - 2. Mapei Corporation; Mapecem 102: www.mapei.com/#sle.
 - 3. TEC Specialty Products, LLC; TEC Level Set 400 HF Self-Leveling Underlayment: www.tecspecialty.com/#sle.
- B. Primer:
 - 1. LATICRETE International, Inc; Primer Plus: www.laticrete.com/#sle.
 - 2. Mapei Corporation; Primer T: www.mapei.com/#sle.
 - 3. TEC Specialty Products, LLC; Multipurpose Primer: www.tecspecialty.com/#sle.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 MATERIALS

- A. Cementitious Underlayment: Blended cement mix, producing self-leveling underlayment with the following properties when mixed with water in accordance with manufacturer's directions:
 - 1. Compressive Strength: Minimum 4,000 psi after 28 days, tested in accordance with ASTM C109/C109M.
 - 2. Flexural Strength: Minimum 1,000 psi after 28 days, tested in accordance with ASTM C348.
 - 3. Density: 125 pcf, nominal.
 - 4. Final Set Time: 1-1/2 to 2 hours, maximum.
 - 5. Thickness: Capable of thicknesses from feather edge to maximum 3-1/2 inches.
 - 6. Surface Burning Characteristics: Flame spread index of 0 and smoke developed index of 0 when tested in accordance with ASTM E84.
- B. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to underlayment mix materials.
- C. Joint and Crack Filler: Latex-based filler, as recommended by manufacturer.
- D. Concrete Patching: High-performance, fast-setting, cementitious material used for limited area patching of concrete surfaces, capable of receiving primer and covered with cementitious cast underlayment.
 - 1. Available Products: Mapei Corporation, Mapecem Quickpatch, High Performance Concrete Patch.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify substrate surfaces are clean, dry, unfrozen, and do not contain petroleum byproducts or other compounds detrimental to underlayment material bond to substrate.

3.2 PREPARATION

- A. Concrete: Prepare surfaces in accordance with ICRI 310.2R, CSP 5.
- B. Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.
- C. Vacuum clean surfaces.
- D. Prime substrate in accordance with manufacturer's instructions. Allow to dry.

3.3 APPLICATION

- A. Apply underlayment in accordance with manufacturer's instructions.
- B. Mix to self-leveling consistency without over-watering.
- C. If fine, feathered edge is desired, steel trowel edge after initial set, but before edge completely hardens.

3.4 CURING

- A. Once underlayment starts to set, prohibit foot traffic until final set is reached.
- B. Air cure in accordance with manufacturer's instructions.

3.5 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.

3.6 PROTECTION

- A. Protect against direct sunlight, heat, and wind; prevent rapid drying to avoid shrinkage and cracking.
- B. Do not permit traffic over unprotected floor underlayment surfaces.

END OF SECTION 03 54 00

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SECTION 05 43 00 - SLOTTED CHANNEL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Strut channel and accessories, also known as bolted framing systems, continuous slot systems, and metal framing.
 - 1. Trapeze supports for electrical conduit, piping, ducts, cable tray, raceways and other systems.
 - 2. Strut channel and accessories used for various mechanical, electrical, and plumbing system supports.
 - 3. Strut channel and accessories for use as a Strut-Type Channel Raceway in accordance with the National Electrical Code (NEC).
 - 4.

1.2 REFERENCE STANDARDS

- A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).
- B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- G. ASTM A1011 – Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon,
- H. Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
- I. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- J. ASTM A240 – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

1.3 QUALITY ASSURANCE

- A. Manufacturer shall have a minimum of 10 years of experience in the manufacture and supply of strut channel and accessories.
- B. Manufacturer shall comply with the standards of MFMA-4, current revision.
- C. When used as a raceway, products shall comply with NFPA 70 – Article 384 and carry a UL listing on necessary products.

1.4 SUBMITTALS

- A. Manufacturer submittal sheets, including product information, load data, installation instructions, and other specifications shall be submitted.
- B. Delegated Design Submittals:
- C. Shop Drawings:
- D.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Wherever possible, strut channel and accessories should remain in their manufacturer's packaging until ready to be used or at their final distribution location.
- B. Strut channel and accessories shall be handled and transported in a manner that does not damage the product, including surface damage that can compromise the integrity of the coating.
- C. Strut channel and accessories shall be stored in a climate controlled space to prevent exposure to water, high humidity, snow, dirt and other damaging elements.

PART 2 PRODUCTS

2.1 GENERAL

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Fabricate units from slotted channel framing where indicated.

2.2 ACCEPTABLE MANUFACTURERS

- A. Provide products meeting the requirements of this Section from one of the following:
 - 1. Haydon Corporation, H-Strut
 - 2. Unistrut Service Company, Unistrut
 - 3. Flex-Strut, Inc.
 - 4. Gregory Industries, G-Strut

2.3 MATERIALS & FINISHES

- A. PRE-GALVANIZED:
 - 1. Strut channel shall be manufactured using structural grade steel meeting the minimum mechanical properties of ASTM A653 SS Grade 33 with a G90 galvanized coating.
- B. ELECTROGALVANIZED:
 - 1. Strut accessories shall be manufactured using structural grade steel meeting the minimum mechanical properties of ASTM A1011 SS Grade 33.
 - 2. After fabrication, products shall be electrogalvanized in accordance with ASTM B633.
- C. HOT-DIP GALVANIZED:
 - 1. Strut channel and accessories shall be manufactured using structural grade steel meeting the minimum mechanical properties of ASTM A1011 SS Grade 33.
 - 2. After fabrication, products shall be hot-dip galvanized in accordance with ASTM A123.
- D. FIELD PAINTING:
 - 1. Reference Section 09 90 00 - Interior Painting for field finishes applied to slotted-channel framing installed at areas of construction exposed to view. Field paint color generally matches adjacent ceilings unless noted otherwise.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Strut channel and fittings shall be inspected upon receipt and before installation for damage to the products and coatings that could compromise the structural integrity or longevity of the products.

3.2 INSTALLATION – GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications.
- B. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Install strut channel and accessories in accordance with the project's engineering specifications, industry standards, and manufacturer's recommendations.

3.3 MISCELLANEOUS FRAMING SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

END OF SECTION 05 43 00

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SECTION 06 10 53 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- A. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2024).
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.
- C. AWPA M4 - Standard for the Handling, Storage, Field Fabrication and Field Treatment of Preservative-Treated Wood Products; 2023.
- D. AWPA U1 - Use Category System: User Specification for Treated Wood; 2025.
- E. PS 20 - American Softwood Lumber Standard; 2025.

1.2 SUMMARY

- A. Section Includes:
 - 1. Wood blocking and nailers.
 - 2. Fire Resistance Treated (FRT) Plywood subfloor panels.
- B. Related Sections:
 - 1. Section 09 22 16 - Non-Structural Metal Framing
 - 2. Section 07 41 13.16 - Standing-Seam Metal Roof Panels

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product.

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. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece .
 - 3. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal (38-mm actual) thickness or less, 19 percent for more than 2-inch nominal (38-mm actual) thickness unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2.
 - 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 miscellaneous carpentry in contact with concrete slabs on grade unless otherwise indicated.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
 - 2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.
 - 3. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D5664, and design value adjustment factors shall be calculated according to ASTM D6841. For enclosed roof framing, framing in attic spaces, and where high-temperature fire-retardant treatment is indicated, provide material with adjustment factors of not less than 0.85 modulus of elasticity and 0.75 for extreme fiber in bending for Project's climatological zone.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
- C. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- D. Application: Treat all miscellaneous carpentry.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

- F. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 2. ICC-ES evaluation report for fastener.

3.2 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 53

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SECTION 06 20 00 - FINISH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wood base.

1.2 RELATED REQUIREMENTS

- A. Section 09 90 00 - Interior Painting: Painting of finish carpentry items.

1.3 REFERENCE STANDARDS

- A. AWI (QCP) - Quality Certification Program; Current Edition.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
 - 2. Include certification program label.
- C. Samples: Submit two samples of wood trim 6 inch long.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five 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:
 - 1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
 - 2. Provide labels or certificates indicating that work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
 - 3. Provide designated labels on shop drawings as required by certification program.
 - 4. Provide designated labels on installed products as required by certification program.
 - 5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.
- B. Protect from moisture damage.
- C. Handle materials and products to prevent damage to edges, ends, or surfaces.

PART 2 PRODUCTS

2.1 FINISH CARPENTRY ITEMS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.
- C. Interior Woodwork Items:
 - 1. Moldings, Bases, Casings, and Miscellaneous Trim: Poplar; prepare for paint finish.

2.2 LUMBER MATERIALS

- A. Softwood Lumber: Poplar species, plain sawn, maximum moisture content of 6 percent; with vertical grain.

2.3 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Primer: 09 90 00 Interior Painting.
- C. Wood Filler: Solvent base, tinted to match surface finish color.

2.4 SITE FINISHING MATERIALS

- A. Field Finishing: See Section 09 90 00 Interior Painting.

2.5 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

3.1 EXAMINATION

- A. Verify adequacy of backing and support framing.

3.2 INSTALLATION

- A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) 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.

3.3 PREPARATION FOR SITE FINISHING

- A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
- B. Site Finishing: See Section 09 90 00 Interior Painting
- C. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.4 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 06 20 00

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SECTION 07 92 00 - JOINT SEALANTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Spray-applied joint sealants.
- B. Nonsag gunnable joint sealants.
- C. Joint backings and accessories.

1.2 REFERENCE STANDARDS

- A. ASTM C834 - Standard Specification for Latex Sealants; 2017 (Reapproved 2023).
- B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2024.
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- D. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2023).
- E. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.
- F. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.
- G. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2023.
- H. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2019 (Reapproved 2020).
- I. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

1.3 SUMMARY

- A. Section Includes:
 - 1. Silicone joint sealants.
 - 2. Urethane joint sealants.
 - 3. Latex joint sealants.
 - 4. Acoustical joint sealants.

1.4 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Product test reports.
- C. Warranties.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C1021 to conduct the testing indicated.

1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates. Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.

1.7 WARRANTY

- A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MATERIALS, GENERAL

- A. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):
 - 1. Architectural Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- B. Liquid-Applied Joint Sealants: Comply with ASTM C920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C1248 and have not stained porous joint substrates indicated for Project.
- D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

2.2 SILICONE JOINT SEALANTS

- A. Mildew-Resistant, Neutral-Curing, or Acid-Curing Silicone Joint Sealant: ASTM C920.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Building Systems.
 - b. Dow Corning Corporation.
 - c. GE Advanced Materials - Silicones.
 - d. Pecora Corporation.
 - e. Sika Corporation; Construction Products Division
 - f. Tremco Incorporated.
 - 2. Type: Single component (S).
 - 3. Grade: nonsag (NS).
 - 4. Class: 25.
 - 5. Uses Related to Exposure: Nontraffic (NT).

2.3 URETHANE JOINT SEALANTS

- A. Urethane Joint Sealant: ASTM C920.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Building Systems.
 - b. Bostik, Inc.
 - c. Pacific Polymers International, Inc.
 - d. Pecora Corporation.
 - e. Polymeric Systems, Inc.
 - f. Sika Corporation; Construction Products Division.

- g. Tremco Incorporated.
- 2. For use Nontraffic: Single component (S), nonsag (NS), Class 25.
- 3. For use Traffic: Multicomponent (M), nonsag (NS), Class 25.

2.4 LATEX JOINT SEALANTS

- A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Building Systems.
 - b. Bostik, Inc.
 - c. Pecora Corporation.
 - d. SIKA Corporation; Construction Products Division
 - e. Tremco Incorporated.

2.5 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Pecora Corporation.
 - b. USG Corporation.

2.6 JOINT SEALANT BACKING

- A. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated], and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.7 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 EXECUTION

3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
 - 1. Remove laitance and form-release agents from concrete.

2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION

- A. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 1. Place sealants so they directly contact and fully wet joint substrates.
 2. Completely fill recesses in each joint configuration.
 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 1. Remove excess sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide concave joint profile per Figure 8A in ASTM C1193, unless otherwise indicated.
- F. Acoustical Sealant Installation: Comply with ASTM C919 and with manufacturer's written recommendations.
- G. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.3 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
 1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform 5 tests for the first 300 m 1000 feet of joint length for each kind of sealant and joint substrate.
 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.

- B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.4 JOINT-SEALANT SCHEDULE

Sealant Matrix Schedule				(SIKA product unless otherwise noted)	
Application substrate conditions	Preparation	Primer Type (if applicable)	Sealant Type	Product	Product
EXTERIOR (VERTICAL)				multi component	single component
MASONRY					
Brick To Brick	1,2	429 Primer if applicable	Urethane	2C-NS-EZ	
Brick To Limestone	1,2	429 Primer if applicable	Urethane	2C-NS-EZ	
Brick to Steel	1,2	Sikaflex 260 Primer	Urethane	2C-NS-EZ	
Brick to Concrete	1,2		Urethane	2C-NS-EZ	
Brick to Anodized Aluminum	1,2,3	Sikaflex 260 Primer	Urethane	2C-NS-EZ	
Brick to Stainless Steel Flashing	1,2,3	Sikaflex 260 Primer	Urethane	2C-NS-EZ	
CMU to CMU	1,2		Urethane	2C-NS-EZ	
CMU to dissimilar material	1,2		Urethane	2C-NS-EZ	
PAINTED STEEL					
Painted steel to Painted steel	1,2,3	Sikaflex 260 Primer	Urethane	2C NS EZ	Sikaflex 1A
METAL COPING		Sikaflex 260 Primer			
Metal Coping to Metal Coping	1,2,3	Sikaflex 260 Primer	Urethane	2C NS EZ	
ANODIZED ALUMINUM					
Anodized Aluminum to Anodized	1,2,3	Sikaflex 260 Primer	Urethane	2C NS EZ	Sikaflex 1A

Aluminum					
Anodized Aluminum to Painted Tube Steel	1,2,3	Sikaflex 260 Primer	Urethane	2C NS EZ	Sikaflex 1A
INTERIOR					
Control joints interior masonry	1,2		Urethane	2C NS EZ	Sikaflex 1A
Control joints in Gypsum Board	1		Urethane	2C NS EZ	Sikaflex 1A
Isolation joints in cast-in-place concrete slabs, floors and walks	1,2		Urethane	2C SL	Sikaflex 1A
Door frames and windows	1,3		Urethane or Latex	2C NS EZ	Sikaflex 1A
Plumbing fixtures to adjoining walls, floors, counters, and adjacent surfaces	1		Silicone	SIKASIL WS295 FPS	Sikasil GP
Toilet Accessories to adjacent surfaces	1		Silicone	SIKASIL WS295 FPS	Sikasil GP
Casework to adjacent surfaces	1		Silicone	SIKASIL WS295 FPS	Sikasil N Plus
Tile control and expansion joints	1		Silicone	SIKASIL WS295 FPS	Sikasil GP
ACOUSTICAL JOINTS					
Acoustical joints	1		Acoustical		USG Corporation
SPECIALITY SEALANTS					
Security Sealant/Pick Proof	1,2,3		Epoxy	Sikadur 51 NS	
Expanding Foam Seal	1,2,3,		Acrylic Impregnated Polyurethane		Emseal Colorseal

1) Joint surfaces must be sound, clean, dry, and free of all paint, grease, oil, dirt, and foreign matter. Surfaces must be fully cured and free of laitance and moisture.					
2) Clean joint surfaces by grinding, or mechanical abrading to remove existing sealant, dirt, and dust.					
3) Metal edged joint surfaces must be clean, and free of all rust, oil, and dirt.					
4) Apply primer only to joint faces.					
5) Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.					

END OF SECTION 07 92 00

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SECTION 08 12 13 - HOLLOW METAL FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Non-fire-rated hollow metal frames for non-hollow metal doors.

1.2 RELATED REQUIREMENTS

- A. Section 08 14 16 - Flush Wood Doors: Non-hollow metal door for hollow metal frames.
- B. Section 08 14 33 - Stile and Rail Wood Doors: Non-hollow metal door for hollow metal frames.
- C. Section 08 71 00 - Door Hardware: Hardware and silencers.

1.3 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2026.
- C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.
- D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.
- F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2026.
- G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2025.
- H. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.
- I. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- J. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
- K. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.
- C. Manufacturer's qualification statement.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Manufacturer Qualifications: Provide hollow metal frames from SDI Certified manufacturer: <https://steeldoors.org/sdi-certified/#sle>.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
- B. Provide additional protection to prevent damage to factory-finished units.
- C. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- D. Store hollow-metal frames vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Hollow Metal Frames with Integral Casings:
 - 1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 3. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
 - 4. Steelcraft, an Allegion brand: www.allegion.com/#sle.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS

- A. Door Frame Type: Provide hollow metal door frames with integral casings.
 - 1. Interior Doors: Use frames with integral casings.
- B. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
- C. Accessibility: Comply with ICC A117.1 and ADA Standards.
- D. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior frame that is also indicated as being sound-rated must comply with the requirements specified for exterior frames and for sound-rated frames; where two requirements conflict, comply with the most stringent.
- E. Hardware Preparations, Selections and Locations: Comply with BHMA A156.115, NAAMM HMMA 830, NAAMM HMMA 831 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

2.3 HOLLOW METAL DOOR FRAMES WITH INTEGRAL CASINGS

- A. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance ; in accordance with ANSI/SDI A250.4.
 - c. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.

- d. Zinc Coating: Manufacturer's standard coating thickness; ASTM A653/A653M.
2. Terminated Stops: Provide at interior doors; closed end stop terminated 6 inches above floor at 45 degree angle.
3. Frame Finish: Factory primed and field finished.

2.4 FRAME ANCHORS

- A. Jamb Anchors:
 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
 3. Postinstalled Expansion Anchor: Minimum 3/8-inch- diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
 1. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at top of underlayment.
- C. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
 1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized according to ASTM A153/A153M, Class B.

2.5 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.
- E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- F. Glazing: Comply with requirements in Section 08 80 00 "Glazing."

2.6 FINISHES

- A. Primer: Rust-inhibiting, fast-curing, lead- and chromate-free, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.7 ACCESSORIES

- A. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. Install frames in accordance with manufacturer's instructions and related requirements of specified frame standards or custom guidelines indicated. Comply with SDI A250.11 NAAMM-HMMA 840.
- B. Coordinate frame anchor placement with wall construction.
- C. Install door hardware as specified in Section 08 71 00.

3.4 TOLERANCES

- A. Maximum Diagonal Distortion: 1/16 inch measured with straight edges, crossed corner to corner.
- B. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - 4. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

3.5 CLEANING AND TOUCHUP

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- C. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.
- D. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08 12 13

SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Flush wood doors; flush configuration; non-rated.

1.2 RELATED REQUIREMENTS

- A. Section 08 12 13 - Hollow Metal Frames .
- B. Section 08 41 26 - All-Glass Entrances and Storefronts
- C. Section 08 71 00 - Door Hardware.
- D. Section 08 80 00 - Glazing.

1.3 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.
- B. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.
- C. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.
- D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- E. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- F. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- G. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2021, with Errata (2022).

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C. Shop Drawings: Door schedule showing doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing, fire ratings and other details below
 - 1. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.
 - 2. Details of frame for each frame type, including dimensions and profile.
 - 3. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
- D. Samples: Submit two samples of door veneer, manufacturers standard size illustrating wood grain, stain color, and sheen.
- E. Specimen warranty.
- F. Warranty, executed in Owner's name.

1.5 QUALITY ASSURANCE

- A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.

- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Package, deliver and store doors in accordance with specified quality standard and manufacturer's written instructions.
- B. Accept doors on site in manufacturer's packaging, and inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.
- D. Mark each door on top or bottom rail with opening number used on Shop Drawings.

1.7 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide manufacturer's warranty on interior doors for the life of the installation. Complete forms in Owner's name and register with manufacturer.
 - 1. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction
 - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Wood Veneer Faced Doors:
 - 1. Forte Opening Solutions; Aspiro Select Wood Veneer Doors: www.forteopenings.com/#sle.
 - 2. VT Industries, Inc; Heritage Collection: www.vtindustries.com/#sle.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 DOORS AND PANELS

- A. Doors: See drawings for locations and additional requirements.
 - 1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
 - 2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
 - 1. Provide solid core doors at each location.
 - 2. Wood veneer facing for field transparent finish as indicated on drawings.

2.3 DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.
- B. ANSI A208.1, Grade LD-1 particleboard.
 - 1. Blocking: Provide wood blocking in particleboard-core doors as follows:
 - a. 5-inch top-rail blocking, in doors indicated to have closers.
 - b. 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
 - 2. 5-inch midrail blocking, in doors indicated to have exit devices.

- C. Provide doors with glued-wood-stave or WDMA I.S. 10 structural-composite-lumber cores instead of particleboard cores for doors scheduled to receive exit devices in Section 08 71 00 "Door Hardware."
 - 1. Glued wood stave.
 - 2. WDMA I.S. 10 structural composite lumber.
 - a. Screw Withdrawal, Face: 550 lbf .
 - b. Screw Withdrawal, Edge: 550 lbf .

2.4 DOOR FACINGS

- A. Veneer Facing for Transparent Finish: White Maple, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
 - 1. Vertical Edges: Any option allowed by quality standard for grade.
 - 2. "Running Match" each pair of doors and doors in close proximity to each other.

2.5 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Cores Constructed with stiles and rails:
 - 1. Provide solid blocks at lock edge for hardware reinforcement.
 - 2. Provide solid blocking for other throughbolted hardware.
- C. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
- D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- E. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- F. Provide edge clearances in accordance with the quality standard specified.

2.6 FINISHES - WOOD VENEER DOORS

- A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
- B. Finish work in accordance with WDMA I.S. 1A for grade specified and as follows:
 - 1. Transparent:
 - a. System - TR-8, UV Cured Acrylated Polyester/Urethane.
 - b. Stain: Match Existing Adjacent Doors: Eggers Gardall 07 Dark Oak (indicated on ISU Record Drawings).
 - c. Sheen: Satin.

2.7 ACCESSORIES

- A. Glazed Openings:
 - 1. Heat-Strengthened and Fully Tempered Glass: ASTM C1048.
 - 2. Tint: Clear.
- B. Glazing: See Section 08 80 00.
- C. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.

PART 3 EXECUTION

3.1 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.
- D. Reject doors with defects.
- E. Proceed with installation only after unsatisfactory conditions have been corrected

3.2 FIELD CONDITIONS

- A. Do not deliver or install doors until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of construction period.

3.3 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C. Use machine tools to cut or drill for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.
- E. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
 - 1. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- F. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.
- G. Coordinate installation of glazing.
- H. Install frames level, plumb, true, and straight.
 - 1. Anchor frames to anchors or blocking built in or directly attached to substrates.
 - a. Secure with countersunk, concealed fasteners and blind nailing.
 - b. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork.
 - c. For factory-finished items, use filler matching finish of items being installed.
 - 2. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

3.4 TOLERANCES

- A. Align and fit doors in frames with uniform clearances and bevels as indicated below.
 - 1. Do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors.
- B. Clearances:
 - 1. Provide 1/8 inch at heads, jambs, and between pairs of doors.
 - 2. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated on Drawings.
 - 3. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 - 4. Comply with NFPA 80 for fire-rated doors.
 - 5. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.

- 6. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- C. Factory Fitted Doors:
 - 1. Align in frames for uniform clearance at each edge.
- D. Comply with specified quality standard for fit and clearance tolerances.
- E. Comply with specified quality standard for telegraphing, warp, and squareness.

3.5 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.
- C. Operation: Rehang or replace doors that do not swing or operate freely.
- D. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

3.6 SCHEDULE

- A. Refer to drawings for schedule

END OF SECTION 08 14 16

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SECTION 08 43 13 - ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Aluminum-framed storefront, with vision glass and openings for solid flush wood doors.

1.2 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.
- B. Section 08 71 00 - Door Hardware: For door hardware associated with solid-core flush wood doors integrated into storefront framing.
- C. Section 08 80 00 - Glazing: Glass and glazing accessories.

1.3 REFERENCE STANDARDS

- A. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum; 2025.
- B. AAMA 611 - Specification for Anodized Architectural Aluminum; 2026.
- C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
 - 1. Include preparation for door hardware specified in Section 08 71 00 - Door Hardware.
- D. Samples: Submit two samples six inches in size illustrating finished aluminum surface, and glazing materials.
- E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
 - 1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.
 - a. Safety Glazing Certification Council (SGCC).
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
 - 1. Provide company, field supervisors, and installers that hold active ANSI accredited certifications in appropriate categories for work specified.
 - a. North American Contractor Certification (NACC) for glazing contractors.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.7 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Aluminum-Framed Storefronts:
 - 1. Kawneer North America; 450 1 3/4" Sightline: www.kawneer.com/#sle.

2.2 BASIS OF DESIGN -- FRAMING FOR MONOLITHIC GLAZING

- A. Center-Set Style:
 - 1. Basis of Design: Kawneer Trifab VersaGlaze 450 Framing System.
 - 2. Vertical Mullion Dimensions: 1 3/4" x 4 1/2 inches.
- B. Substitutions: See Section 01 60 00 - Product Requirements.
 - 1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.3 BASIS OF DESIGN -- SWINGING DOORS

- A. Reference Section 08 11 13 Flush Wood Doors for doors in interior frame systems.

2.4 ALUMINUM-FRAMED STOREFRONT

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Finish: Class I natural anodized.
 - a. Factory finish all surfaces that will be exposed in completed assemblies.
 - 2. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
 - 3. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
 - 4. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
 - 5. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
 - 6. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

2.5 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, drainage holes and internal weep drainage system.
 - 1. Glazing Stops: Flush.
 - 2. Wall Thickness: Not less than 0.070 inches (1.8 mm).

3. Anchors, clips, and accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating.
- 4.

2.6 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Fasteners: Stainless steel.
- C. Glazing Gaskets: Type to suit application and requirements.

2.7 FINISHES

- A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.8 HARDWARE

- A. Other Door Hardware: See Section 08 71 00.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.2 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Install hardware using templates provided.
 1. See Section 08 71 00 for hardware installation requirements.
- F. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.3 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.4 ADJUSTING

- A. Adjust operating hardware and sash for smooth operation.

3.5 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

- C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.6 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION 08 43 13

SECTION 08 71 00 - DOOR HARDWARE

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Mechanical and electrified door hardware
 - 2. Electronic access control system components
- B. Section excludes:
 - 1. Windows
 - 2. Cabinets (casework), including locks in cabinets
 - 3. Signage
 - 4. Toilet accessories
 - 5. Overhead doors
- C. Related Sections:
 - 1. Division 01 "General Requirements" sections for Allowances, Alternates, Owner Furnished Contractor Installed, Project Management and Coordination.
 - 2. Division 06 Section "Rough Carpentry"
 - 3. Division 06 Section "Finish Carpentry"
 - 4. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
 - 5. Division 08 Sections:
 - a. "Metal Doors and Frames"
 - b. "Flush Wood Doors"
 - c. "Stile and Rail Wood Doors"
 - d. "Interior Aluminum Doors and Frames"
 - e. "Aluminum-Framed Entrances and Storefronts"
 - f. "Stainless Steel Doors and Frames"
 - g. "Special Function Doors"
 - h. "Entrances"
 - 6. Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
 - 7. Division 28 "Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

1.2 REFERENCES

- A. UL LLC
 - 1. UL 10B - Fire Test of Door Assemblies
 - 2. UL 10C - Positive Pressure Test of Fire Door Assemblies
 - 3. UL 1784 - Air Leakage Tests of Door Assemblies
 - 4. UL 305 - Panic Hardware
- B. DHI - Door and Hardware Institute
 - 1. Sequence and Format for the Hardware Schedule
 - 2. Recommended Locations for Builders Hardware
 - 3. Keying Systems and Nomenclature
 - 4. Installation Guide for Doors and Hardware
- C. NFPA – National Fire Protection Association
 - 1. NFPA 70 – National Electric Code

2. NFPA 80 – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code
4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies
- D. ANSI - American National Standards Institute
 1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
 2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
 3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
 4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
 5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.3 SUBMITTALS

- A. General:
 1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
 2. Prior to forwarding submittal:
 - a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
 - b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.
- B. Action Submittals:
 1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
 2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
 - a. Wiring Diagrams: For power, signal, and control wiring and including:
 - 1) Details of interface of electrified door hardware and building safety and security systems.
 - 2) Schematic diagram of systems that interface with electrified door hardware.
 - 3) Point-to-point wiring.
 - 4) Risers.
 3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
 - a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
 4. Door Hardware Schedule:
 - a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
 - b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
 - c. Indicate complete designations of each item required for each opening, include:
 - 1) Door Index: door number, heading number, and Architect's hardware set number.
 - 2) Quantity, type, style, function, size, and finish of each hardware item.
 - 3) Name and manufacturer of each item.

- 4) Fastenings and other pertinent information.
 - 5) Location of each hardware set cross-referenced to indications on Drawings.
 - 6) Explanation of all abbreviations, symbols, and codes contained in schedule.
 - 7) Mounting locations for hardware.
 - 8) Door and frame sizes and materials.
 - 9) Degree of door swing and handing.
 - 10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.
5. Key Schedule:
- a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
 - b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
 - c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
 - d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
 - e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
 - f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.
- C. Informational Submittals:
1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
 2. Provide Product Data:
 - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
 - b. Include warranties for specified door hardware.
- D. Closeout Submittals:
1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
 - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
 - b. Catalog pages for each product.
 - c. Final approved hardware schedule edited to reflect conditions as installed.
 - d. Final keying schedule
 - e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
 - f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
- E. Inspection and Testing:
1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
 - a. Fire door assemblies, in compliance with NFPA 80.
 - b. Required egress door assemblies, in compliance with NFPA 101.

1.4 QUALITY ASSURANCE

- A. Qualifications and Responsibilities:
1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing

- facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
 3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
 - a. For door hardware: DHI certified AHC or DHC.
 - b. Can provide installation and technical data to Architect and other related subcontractors.
 - c. Can inspect and verify components are in working order upon completion of installation.
 - d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.
 4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.
- B. Certifications:
1. Fire-Rated Door Openings:
 - a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
 - b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
 2. Smoke and Draft Control Door Assemblies:
 - a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
 - b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.
 3. Electrified Door Hardware
 - a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
 4. Accessibility Requirements:
 - a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.
- C. Pre-Installation Meetings
1. Keying Conference
 - a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
 - 1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 - 2) Preliminary key system schematic diagram.
 - 3) Requirements for key control system.
 - 4) Requirements for access control.
 - 5) Address for delivery of keys.
 2. Pre-installation Conference
 - a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Inspect and discuss preparatory work performed by other trades.
 - c. Inspect and discuss electrical roughing-in for electrified door hardware.

- d. Review sequence of operation for each type of electrified door hardware.
- e. Review required testing, inspecting, and certifying procedures.
- f. Review questions or concerns related to proper installation and adjustment of door hardware.
- 3. Electrified Hardware Coordination Conference:
 - a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping
- B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.
- C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
- D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
- F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.6 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

1.7 WARRANTY

- A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.
 - 1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
 - 2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
 - a. Mechanical Warranty
 - 1) Locks
 - (a) Schlage ND Series: 10 years

1.8 MAINTENANCE

- A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
- B. Turn over unused materials to Owner for maintenance purposes.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. The Owner requires use of certain products for their unique characteristics and project suitability to ensure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute."
 - 1. Where "No Substitute" is noted, submittals and substitution requests for other products will not be considered.
- B. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category are only to be considered by official substitution request in accordance with section 01 25 00.
- C. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.
- D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.2 MATERIALS

- A. Fabrication
 - 1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer's recognized installation standards for application intended.
 - 2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
 - 3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with "Metal Doors and Frames", "Flush Wood Doors", "Stile and Rail Wood Doors" to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.
- B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
 - 1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.
- C. Cable and Connectors:
 - 1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
 - 2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.
 - 3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.3 HINGES

- A. Manufacturers and Products:
 - 1. Scheduled Manufacturer and Product:
 - a. Ives 5BB series
 - 2. Acceptable Manufacturers and Products:
 - a. Hager BB1191/1279 series
 - b. McKinney TB series

- c. Best FBB series
- B. Requirements:
 - 1. Provide hinges conforming to ANSI/BHMA A156.1.
 - 2. Provide five knuckle, ball bearing hinges.
 - 3. 1-3/4 inch thick doors, up to and including 36 inches wide:
 - a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches high
 - b. Interior: Standard weight, steel, 4-1/2 inches high
 - 4. 1-3/4 inch thick doors over 36 inches wide:
 - a. Exterior: Heavy weight, bronze/stainless steel, 5 inches high
 - b. Interior: Heavy weight, steel, 5 inches high
 - 5. 2 inches or thicker doors:
 - a. Exterior: Heavy weight, bronze or stainless steel, 5 inches high
 - b. Interior: Heavy weight, steel, 5 inches high
 - 6. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
 - 7. Provide three hinges per door leaf for doors 90 inches or less in height, and one additional hinge for each 30 inches of additional door height.
 - 8. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
 - a. Steel Hinges: Steel pins
 - b. Non-Ferrous Hinges: Stainless steel pins
 - c. Out-Swinging Exterior Doors: Non-removable pins
 - d. Out-Swinging Interior Lockable Doors: Non-removable pins
 - e. Interior Non-lockable Doors: Non-rising pins
 - 9. Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

2.4 FLUSH BOLTS

- A. Manufacturers:
 - 1. Scheduled Manufacturer:
 - a. Trimco
 - 2. Acceptable Manufacturers:
 - a. Ives
 - b. Rockwood
- B. Requirements:
 - 1. Provide automatic, semi-automatic, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide flush bolts with key components constructed of stainless steel for durability. Provide 12 inch steel or brass rods at doors up to 90 inches in height. For doors over 90 inches in height increase top rods by 6 inches for each additional 6 inches of door height. Provide dust-proof strikes at each bottom flush bolt.

2.5 CYLINDRICAL LOCKS – GRADE 1

- A. Manufacturers and Products:
 - 1. Scheduled Manufacturer and Product:
 - a. Schlage ND series
 - 2. Acceptable Manufacturers and Products:
 - a. Oak 1CL series
- B. Requirements:
 - 1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors.

2. Indicators: Where specified, provide escutcheon with lock status indicator window on top of lockset rose:
 - a. Escutcheon height (including rose) 6.05 inches high by 3.68 inches wide.
 - b. Indicator window measuring a minimum 3.52-inch by .60 inch with 1.92 square-inches of front facing viewing area and 180-degree visibility with a total of .236 square-inches of total viewable area.
 - c. Provide snap-in serviceable window to prevent tampering. Lock must function if indicator is compromised.
 - d. Provide messages color-coded with full text and symbol, as scheduled, for easy visibility.
 - e. Unlocked and Unoccupied message will display on white background, and Locked and Occupied message will display on red background.
3. Cylinders: Refer to "KEYING" article, herein.
4. Provide locks with standard 2-3/4 inches backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
5. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
6. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
7. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
8. Provide electrified options as scheduled in the hardware sets.
9. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
 - a. Lever Design: RHO

2.6 CYLINDERS

- A. Manufacturers:
 1. Scheduled Manufacturer and Product:
 - a. BEST System
 2. Acceptable Manufacturers and Products:
 - a. No Substitute
- B. Requirements:
 1. Provide cylinders/cores to match Owner's existing key system, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.

2.7 KEYING

- A. Scheduled System:
 1. Existing factory registered system:
 - a. Provide cylinders/cores keyed into Owner's existing factory registered keying system. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
- B. Requirements:
 1. Construction Keying:
 - a. Replaceable Construction Cores.
 - 1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
 - (a) 3 construction control keys
 - (b) 12 construction change (day) keys.
 - 2) Owner or Owner's Representative will replace temporary construction cores with permanent cores.
 2. Permanent Keying:
 - a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.

- 1) Master Keying system as directed by the Owner.
- b. Forward biting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
- c. Provide keys with the following features:
 - 1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
 - 2) Patent Protection: Keys and blanks protected by one or more utility patent(s).
- d. Identification:
 - 1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
 - 2) Identification stamping provisions must be approved by the Architect and Owner.
 - 3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE"
 - 4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
 - 5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
- e. Quantity: Furnish in the following quantities.
 - 1) Permanent Control Keys: 3.
 - 2) Master Keys: 6.
 - 3) Change (Day) Keys: 3 per cylinder/core that is keyed differently
 - 4) Key Blanks: Quantity as determined in the keying meeting.

2.8 KEY CONTROL SYSTEM

- A. Manufacturers:
 1. Scheduled Manufacturer:
 - a. Match Owners existing system
 2. Acceptable Manufacturers:
 - a. No Substitute
- B. Requirements:
 1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
 - a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
 - b. Provide hinged-panel type cabinet for wall mounting.

2.9 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

- A. Manufacturers:
 1. Scheduled Manufacturers:
 - a. Glynn-Johnson
 2. Acceptable Manufacturers:
 - a. No Substitute
- B. Requirements:
 1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.

2.10 DOOR STOPS AND HOLDERS

- A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Trimco
2. Acceptable Manufacturers:
 - a. Ives
 - b. Rockwood
- B. Provide door stops at each door leaf:
 1. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.
 2. Where a wall stop cannot be used, provide universal floor stops.
 3. Where wall or floor stop cannot be used, provide overhead stop.
 4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

2.11 SILENCERS

- A. Manufacturers:
 1. Scheduled Manufacturer:
 - a. Trimco
 2. Acceptable Manufacturers:
 - a. Ives
 - b. Rockwood
- B. Requirements:
 1. Provide "push-in" type silencers for hollow metal or wood frames.
 2. Provide one silencer per 30 inches of height on each single frame, and two for each pair frame.
 3. Omit where gasketing is specified.

2.12 FINISHES

- A. FINISH: BHMA 626/652 (US26D); EXCEPT:
 1. Hinges at Exterior Doors: BHMA 630 (US32D)
 2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
 3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
 4. Protection Plates: BHMA 630 (US32D)
 5. Overhead Stops and Holders: BHMA 630 (US32D)
 6. Door Closers: Powder Coat to Match
 7. Wall Stops: BHMA 630 (US32D)
 8. Latch Protectors: BHMA 630 (US32D)
 9. Weatherstripping: Clear Anodized Aluminum
 10. Thresholds: Mill Finish Aluminum

PART 3 EXECUTION

3.1 EXAMINATION

- A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Custom Steel Doors and Frames: HMMA 831.
 - 3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
 - 4. Installation Guide for Doors and Hardware: DHI TDH-007-20
- B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.
- C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
- D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
- E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
- F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
- H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.
- I. Lock Cylinders:
 - 1. Install construction cores to secure building and areas during construction period.
 - 2. Replace construction cores with permanent cores as indicated in keying section.
 - 3. Furnish permanent cores to Owner for installation.
- J. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:
 - 1. Conduit, junction boxes and wire pulls.
 - 2. Connections to and from power supplies to electrified hardware.
 - 3. Connections to fire/smoke alarm system and smoke evacuation system.
 - 4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
 - 5. Connections to panel interface modules, controllers, and gateways.
 - 6. Testing and labeling wires with Architect's opening number.
- K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- L. Continuous Hinges: Re-locate the door and frame fire rating labels where they will remain visible so that the hinge does not cover the label once installed.
- M. Door Closers & Auto Operators: Mount closers/operators on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers/operators so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.
- N. Overhead Stops/Holders: Mount overhead stops/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
- O. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
- P. Thresholds:
 - 1. Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

2. Aluminum thresholds to be cut-in, and scribed around mullions, frame members, and stops. Do not butt to thresholds. Provide a continuous surface across full width of opening from jamb to jamb.
 3. Where aluminum panic-type (rabbeted) thresholds with neoprene inserts are specified, undercut doors as required to properly mate with seal in threshold.
- Q. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
- R. Perimeter Gasketing:
1. Apply to head and jamb, forming seal between door and frame.
 2. Install gasketing in a manner eliminating need to cut any seal to install surface mounted hardware. Install compatible mounting bracket for surface mounted hardware unless minimum 1/4 inch thick solid aluminum seals are provided for mounting of surface applied hardware.
- S. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- T. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.3 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
1. Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
 2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.4 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items per manufacturer's instructions to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.5 DOOR HARDWARE SCHEDULE

- A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.
- B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.
- C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.
- D. Hardware Sets:

156847 OPT0497504 VERSION 1

HARDWARE GROUP NO. 01

002					

PROVIDE EACH DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	STOREROOM LOCK	ND80BDC RHO	626	SCH
1	EA	PERM. CORE	BEST AS REQUIRED	626	BES
1	EA	WALL BMPR CAST CONCAVE SC	1270-CV	626	TRM
3	EA	SILENCERS-MTL	1229-A		TRM

HARDWARE GROUP NO. 02

001					

PROVIDE EACH DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 (NRP AS REQ'D)	652	IVE
1	EA	SEMI-AUTO F/B,SGL,WD DR,U	3825 LH	625	TRM
1	EA	ENTRANCE LOCK	ND53BDC RHO	626	SCH
1	EA	PERM. CORE	BEST AS REQUIRED	626	BES
1	EA	OH STOP & HOLDER	100F ADJ RH	630	GLY
1	EA	WALL BMPR CAST CONCAVE SC	1270-CV LH	626	TRM
2	EA	SILENCERS-MTL	1229-A		TRM

END OF SECTION 08 71 00

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SECTION 08 80 00 - GLAZING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Glazing units.

1.2 REFERENCE STANDARDS

- A. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2026).
- B. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.4 FIELD CONDITIONS

- A. Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1.5 WARRANTY

- A. See Section 01 77 00 for additional warranty requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Float Glass Manufacturers:
 - 1. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
 - 2. Guardian Glass, LLC: www.guardianglass.com/#sle.
 - 3. Pilkington North America Inc: www.pilkington.com/na/#sle.
 - 4. Saint Gobain North America: www.saint-gobain.com/#sle.
 - 5. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
 - 6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
- C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.

1. Kind FT - Fully Tempered Type: Complies with ASTM C1048.

2.3 GLAZING UNITS

- A. Type G-1 - Monolithic Interior Vision Glazing for aluminum storefronts and all-glass storefronts :
 1. Applications: Interior glazing unless otherwise indicated.
 2. Glass Type: Fully tempered float glass.
 3. Tint: Ultra-Clear.
 4. Thickness: 5/8" inch, nominal.
 5. Glazing Method: Dry glazing method, gasket glazing.

2.4 ACCESSORIES

- A. Concealed nonprogressive structural glass mounting system.
- B. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area. Confirm type recommended in writing by sealant or glass manufacturer.
- C. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

3.1 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

3.2 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.
- D. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
- B. Grind smooth and polish exposed glass edges and corners.

3.4 INSTALLATION, GENERAL

- A. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge

damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

- B. Provide spacers for glass lites where length plus width is larger than 50 inches.
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch- minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- C. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.

3.5 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

- A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.
- E. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- F. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- G. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.

END OF SECTION 08 80 00

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SECTION 08 87 33 - DECORATIVE WINDOW FILM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Patterned film: Single Patterned

1.2 REFERENCE STANDARDS

- A. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2026.
- B. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).
- C. ASTM D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers; 2000 (Reapproved 2020).
- D. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting; 2026.
- E. ASTM D1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting; 2021.
- F. ASTM D1044 - Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion by the Taber Abraser; 2024.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.
- H. ASTM E903 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres; 2020.

1.3 RELATED SECTIONS

- A. Section 08800 - Glazing; general glazing applications to receive architectural window film.

1.4 REFERENCES

- A. ASHRAE - American Society for Heating, Refrigeration, and Air Conditioning Engineers; Handbook of Fundamentals.
- B. ASTM International (ASTM):
 - 1. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
 - 2. ASTM D1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
 - 3. ASTM D1044 - Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test).
 - 4. ASTM D 2582 - Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.
 - 5. ASTM D 5895 - Standard Test Methods for Evaluating Drying or Curing During Film Formation of Organic Coatings Using Mechanical Recorders.
 - 6. ASTM E84 - Standard Method of Test for Surface Burning Characteristics of Building Materials.
 - 7. ASTM E903 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.
- C. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- D. IES LM-83-12: IES Spatial Daylight Autonomy (sDA) and Annual Sunlight Exposure.

- E. Consumer Products Safety Commission 16 CFR, Part 1201 - Safety Standard for Architectural Glazing Materials.

1.5 PERFORMANCE REQUIREMENTS

- A. Fire Performance: Surface burning characteristics when tested in accordance ASTM E84:
 - 1. Flame Spread: 25, maximum.
 - 2. Smoke Developed: 450, maximum.

1.6 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Samples for verification: For each film specified, two samples representing actual film color and pattern.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten years experience.
 - 1. Provide documentation that the adhesive used on the specified films is a Pressure Sensitive Adhesive (PSA).
- B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five years demonstrated experience in installing products of the same type and scope as specified.
 - 1. Provide documentation that the installer is authorized by the Manufacturer to perform Work specified in this section.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.9 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: 3M Window Film , which is located at: 3M Center Bldg. 0235-02-S-27 ; St. Paul, MN 55144-1000; Toll Free Tel: 866-499-8857; Tel: 651-733-2222; Fax: 651-737-3446; Email:3Mrenewableenergy@mmm.com; Web:www.3m.com/windowfilm

2.2 SINGLE PATTERNED FILM

- A. Fasara - Milky White (Milano) Decorative / Privacy Glazing Film, field verify film to match existing:
1. Ultraviolet Rejected (ASTM E 903): Not less than 99 percent.
 2. Visible Light Transmission (ASTM E 903, ASTM E 308): 59 percent.
 3. Visible Light Reflected (ASTM E 903): 21 percent.
 4. Solar Heat Reflection: 31 percent.
 5. Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): 0.4.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Film Examination:
1. If preparation of glass surfaces is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
 - a. Glass surfaces receiving new film should first be examined to verify that they are free from defects and imperfections, which will affect the final appearance.
 2. Do not proceed with installation until glass surfaces have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions.
 3. Commencement of installation constitutes acceptance of conditions.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Refer to Manufacturer's installation instructions for methods of preparation for Impact Protection Adhesive or Impact Protection Profile film attachment systems.

3.3 INSTALLATION

- A. Film Installation, General:
1. Install in accordance with manufacturer's instructions.
 2. Cut film edges neatly and square at a uniform distance of 1/8 inch to 1/16 inch of window sealant. Use new blade tips after 3 to 4 cuts.
 3. Spray the slip solution, composed of one capful of baby shampoo or dishwashing liquid to 1 gallon of water, on window glass and adhesive to facilitate proper positioning of film.
 4. Apply film to glass and lightly spray film with slip solution.
 5. Squeegee from top to bottom of window. Spray slip solution to film and squeegee a second time.
 6. Bump film edge with lint-free towel wrapped around edge of a 5-way tool.
 7. Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly, and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.

8. If completing an exterior application, check with the manufacturer as to whether edge sealing is required.

3.4 CLEANING AND PROTECTION

- A. Remove left over material and debris from Work area. Use necessary means to protect film before, during, and after installation.
- B. Touch-up, repair or replace damaged products before Substantial Completion.
- C. After application of film, wash film using common window cleaning solutions, including ammonia solutions, 30 days after application. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film. Use synthetic sponges or soft cloths.

END OF SECTION 08 87 33

SECTION 09 01 90 - PREPARATION FOR REPAINTING

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- A. ASTM C842 - Standard Specification for Application of Interior Gypsum Plaster; 2005 (Reapproved 2025).

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 SUMMARY

- A. Section includes preparation for repainting as follows:
 - 1. Removing deteriorated paint finishes.
 - 2. Cleaning substrates to receive new paint finishes.
 - 3. Patching substrates to receive new paint finishes.
- B. Related Requirements:
 - 1. Section 01 35 16 "Alteration Project Procedures" for general remodeling, renovation, repair, and maintenance requirements.
 - 2. Section 09 90 00 "Interior Painting," Section 099611 "High-Performance Coatings" for Paint materials and systems for existing and new construction.

1.4 SEQUENCING AND SCHEDULING

- A. Perform preparation for repainting in the following sequence, which includes work specified in this and other Sections:
 - 1. Dismantle existing surface-mounted objects and hardware except items indicated to remain in place. Tag items with location identification and protect.
 - 2. Verify that temporary protections have been installed.
 - 3. Examine condition of surfaces to be painted.
 - 4. Remove existing paint to the degree required for each substrate and surface condition of existing paint.
 - 5. Apply paint system. Reference painting sections for systems specified.
 - 6. Reinstall dismantled surface-mounted objects and hardware unless otherwise indicated.

1.5 ACTION SUBMITTALS

- A. Cleaning and Preparation Schedule: Submit a schedule of cleaning and preparation for each type of existing painted surface indicated to receive new finishes.

1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing of cleaning materials, paint removers and compatibility of paint coatings and systems for each indicated type of painted surface.
 - 1. Use test areas as indicated and representative of proposed materials and existing construction.
 - 2. Propose changes to materials and methods to suit Project.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste daily.

PART 2 PRODUCTS

2.1 PREPARATORY CLEANING MATERIALS

- A. Water: Potable.
- B. Detergent Solution: Solution prepared by mixing 2 cups (0.5 L) of tetrasodium pyrophosphate (TSPP), 1/2 cup (125 mL) of laundry detergent that contains no ammonia, 5 quarts (5 L) of 5 percent sodium hypochlorite bleach, and 15 quarts (15 L) of warm water for every 5 gal. (20 L) of solution required.
- C. Mildewcide: Commercial proprietary mildewcide or a job-mixed solution prepared by mixing 1/3 cup (80 mL) of household detergent that contains no ammonia, 1 quart (1 L) of 5 percent sodium hypochlorite bleach, and 3 quarts (3 L) of warm water.
- D. Abrasives for Ferrous Metal Cleaning: Aluminum oxide paper, emery paper, fine steel wool, steel scrapers, and steel-wire brushes of various sizes.

2.2 PAINT REMOVERS

- A. Low-Odor, Solvent-Type Paste Paint Remover: Manufacturer's standard low-odor, water-rinsable, solvent-type paste, gel, or foamed emulsion formulation for removing paint from masonry, stone, wood, plaster, or metal as required to suit Project; and containing no methanol or methylene chloride.
- B. Covered, Solvent-Type Paste Paint Remover: Manufacturer's standard, low-odor, covered, water-rinsable, solvent-type paste or gel formulation for removing paint from masonry, stone, wood, plaster, or metal as required to suit Project; and containing no methanol or methylene chloride.

2.3 PATCHING MATERIALS

- A. Metal-Patching Compound: Two-part, polyester-resin, metal-patching compound; knife-grade formulation as recommended in writing by manufacturer for type of metal repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be produced for filling metal that has deteriorated from corrosion. Filler shall be capable of filling deep holes and spreading to feather edge.
- B. Gypsum-Plaster Patching Compound: Finish coat plaster and bonding compound according to ASTM C842 and manufacturer's written instructions.

PART 3 EXECUTION

3.1 PROTECTION

- A. Comply with each manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.
 - 1. Cover adjacent surfaces with materials that are proven to resist chemical solutions being used unless the solutions will not damage adjacent surfaces. Use protective materials that are UV resistant and waterproof. Apply masking agents to comply with manufacturer's written

instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.

2. Do not apply chemical solutions during winds of sufficient force to spread them to unprotected surfaces.
3. Neutralize and collect alkaline and acid wastes before disposal.
4. Dispose of runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

3.2 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of painting work. Comply with paint manufacturer's written instructions for inspection.
- B. Maximum Moisture Content of Substrates: Do not begin application of coatings unless moisture content of exposed surface is below the maximum value recommended in writing by paint manufacturer and not greater than the following maximum values when measured with an electronic moisture meter appropriate to the substrate material:
 1. Gypsum Board: 12 percent.
- C. Alkalinity: Do not begin application of coatings unless surface alkalinity is within range recommended in writing by paint manufacturer. Conduct alkali testing with litmus paper on exposed plaster, cementitious, and masonry surfaces.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
 1. If existing surfaces cannot be prepared to an acceptable condition for proper finishing by using specified surface-preparation methods, notify Architect in writing.
- E. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.3 PREPARATORY CLEANING

- A. General: Use the gentlest, appropriate method necessary to clean surfaces in preparation for painting. Clean all surfaces, corners, contours, and interstices.
- B. Vacuum Cleaning: Vacuum ledges, troughs, bulkheads, and other construction holding dust and debris prior to detergent cleaning surface restoration, or application of new finishes.
- C. Dry-Brush Cleaning: Dry brush irregular surfaces with visible dust, cobwebs, or other contamination. Combine dry-brush cleaning with forced or compressed air.
- D. Detergent Cleaning: Wash surfaces by hand using clean rags, sponges, and bristle brushes. Scrub surface with detergent solution and bristle brush until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that surface remains wet. Rinse with water applied by clean rags or sponges.

3.4 SUBSTRATE REPAIR

- A. General: Repair substrate surface defects that are inconsistent with the surface appearance of adjacent materials and finishes.
- B. Gypsum-Board Substrates:
 1. Repair defects including dents, gouges, and scrapes more than 1/8 inch in size and all holes and cracks by filling with gypsum-plaster patching compound and sanding smooth.
 2. Remove all fasteners, adhesives, and or anchors and repair by filling with gypsum-plaster patching compound and sanding smooth.

3. Rout out surface cracks to remove loose, unsound material; fill with patching compound and sand smooth.
- C. Galvanized Steel Substrates:
 1. Remove surface rust or other oxidation by abrasive materials or hand tools. Promptly prime areas to prevent further oxidation.
 2. Remove loose, flaking, or peeling paint with hand tools. Sand transitions from bare metal to remaining sound paint and prime area to prevent further deterioration.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

3.6 SURFACE-PREPARATION SCHEDULE

- A. General: Before painting, prepare surfaces where indicated on Drawings for painting according to applicable requirements specified in this schedule.
 1. Examine surfaces to evaluate each surface condition according to paragraphs below.
 2. Where existing degree of soiling prevents examination, preclean surface and allow it to dry before making an evaluation.
 3. Repair substrate defects according to "Substrate Repair" Article.
- B. Surface Preparation for Repainting of Painted Gypsum Board with minimal painted Surface Degradation:
 1. Surface Condition: Existing paint film in good condition and tightly adhered.
 2. Paint Removal: Not required.
 3. Preparation for Painting: Wash surface by detergent cleaning; use solvent cleaning where needed. Roughen or degloss cleaned surfaces to ensure paint adhesion according to paint manufacturer's written instructions.
- C. Surface Preparation for Steel Roof Decking with cracking and peeling of existing paint finish:
 1. Surface Condition: Paint film loose, flaking, or peeling.
 2. Paint Removal: Remove loose, flaking, or peeling paint film by hand-tool paint-removal methods.
 3. Preparation for Painting:
 - a. Dry-brush with forced air or vacuum to remove dust, cobwebs and other organics.
 - b. If needed at stained areas, wash surface by detergent cleaning. Use other cleaning methods for small areas of bare substrate if required.
 - c. Sand surfaces to smooth remaining paint film edges.
 - d. Prepare bare cleaned surface to be painted according to paint manufacturer's written instructions for substrate construction materials.

END OF SECTION 09 01 90

SECTION 09 05 61 - COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
 - 1. Tile Carpeting.
 - 2. Thin-set ceramic tile.
 - 3. Resilient Flooring.
- B. Removal of existing floor coverings.
- C. Preparation of existing concrete floor slabs for installation of floor coverings.
- D. Testing of concrete floor slabs for moisture and alkalinity (pH).
- E. Testing of existing concrete floor slabs for moisture and alkalinity (pH) has already been conducted; test report is attached.
- F. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
 - 1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.
- G. Patching compound.

1.2 RELATED REQUIREMENTS

- A. Section 01 40 00 - Quality Requirements: Additional requirements relating to testing agencies and testing.
- B. Section 03 54 00 - Cast Underlayment: Self-leveling underlayment applied as remediation to existing slab on grade construction not meeting the tolerances of flooring indicated.

1.3 REFERENCE STANDARDS

- A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens); 2026.
- B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters, and Gypsum Concrete; 2020.
- C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
- D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.
- E. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2018.

1.4 SUBMITTALS

- A. Visual Observation Report: For existing floor coverings to be removed.
- B. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
 - 1. Moisture and alkalinity (pH) limits and test methods.
 - 2. Manufacturer's required bond/compatibility test procedure.
- C. Testing Agency's Report:

1. Description of areas tested; include floor plans and photographs if helpful.
 2. Summary of conditions encountered.
 3. Moisture and alkalinity (pH) test reports.
 4. Copies of specified test methods.
 5. Recommendations for remediation of unsatisfactory surfaces.
 6. Submit report to Architect.
 7. Submit report not more than two business days after conclusion of testing.
- D. Adhesive Bond and Compatibility Test Report.
- E. Floor Moisture Testing Technician Certificate: International Concrete Repair Institute (ICRI) Concrete Slab Moisture Testing Technician- Grade I certificate.
- F. Copy of RFCI (RWP).

1.5 QUALITY ASSURANCE

- A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by the flooring Contractor according to the requirements of the respective new flooring to be provided.
- B. Contractor may perform adhesive and bond test with Contractor's own personnel or hire a testing agency.
- C. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
- D. Contractor's Responsibility Relating to Independent Agency Testing:
1. Provide access for and cooperate with testing agency.
 2. Confirm date of start of testing at least 10 days prior to actual start.
 3. Allow at least 4 business days on site for testing agency activities.
 4. Achieve and maintain specified ambient conditions.
 5. Notify Architect when specified ambient conditions have been achieved and when testing will start.
- E. Floor Moisture Testing Technician Qualifications: International Concrete Repair Institute (ICRI) Concrete Slab Moisture Testing Technician Certification- Grade I.
- F. Remedial Coating Installer Qualifications: Company specializing in performing work of the type specified in this section, trained by or employed by coating manufacturer, and able to provide at least 3 project references showing at least 3 years' experience installing moisture emission coatings.

1.6 FIELD CONDITIONS

- A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.
- B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with cementitious underlayments, primers, isolation membranes, setting materials, and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:

1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.
3. Products:
 - a. TEC Specialty Products LLC; TEC VersaPatch Latex Modified Floor Patch: www.tecspecialty.com/#sle.
 - b. Mapei Corporation, Mapecem Quickpatch High Performance Concrete Patch.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.1 CONCRETE SLAB PREPARATION

- A. Perform following operations in the order indicated:
 1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:
 - a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.
 - b. Removal of existing floor covering.
 2. Preliminary cleaning.
 3. Profiling
 4. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
 5. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
 6. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
 7. Specified remediation, if required.
 8. Patching, smoothing, and leveling, as required.
 9. Other preparation specified.
 10. Adhesive bond and compatibility test.
 11. Protection.
- B. Remediations:
 1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
 2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating recommended in writing by the flooring manufacturer over entire suspect floor area.
 3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply remediation recommended in writing by the flooring manufacturer over entire suspect floor area.

3.2 REMOVAL OF EXISTING FLOOR COVERINGS

- A. Comply with local, State, and federal regulations and recommendations of RFCI (RWP), as applicable to floor covering being removed.
- B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.3 PROFILING CAST-IN-PLACE CONCRETE

- A. Provide a substrate that is clean, durable, flat, pitched to specifications, SSD, and free of surface contaminants for new flooring type indicated.
 - 1. Determine the general condition, soundness, presence of contaminants, and the best method to prepare the surface.
 - 2. Remove non-durable concrete prior to the installation of the flooring system. Weak or deteriorated concrete must be removed to a level of sound concrete.
 - 3. Remove surface contaminants prior to creating a surface profile.
 - a. Contamination of concrete surfaces includes all materials that may affect the adhesion and performance of the coating to be applied. Examples include, but are not limited to, dirt, oil, grease, chemicals, curing compounds, etc.
 - b. Remove contaminants by use of detergent scrubbing with a heavy-duty cleaner/degreaser, low-pressure water cleaning (less than 5,000 psi), or steam cleaning.
- B. Create surface profiles by shotblasting, grinding and similar techniques.
 - 1. Profile floor by shot blasting to between CSP-3 and CSP-5 according to the International Concrete Repair Institute (ICRI) Guideline No. 310.2.
- C. Correct conditions that are found to be out of compliance with the requirements of each new flooring specification, including substrate repair, pre-leveling, joint and crack treatment as required to achieve the specified finish.

3.4 MOISTURE VAPOR EMISSION TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F1869 and as follows.
- D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.
- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.
- F. Report: Report the information required by the test method.

3.5 ALKALINITY TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.
 - 1. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.
 - 2. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.
 - 3. Use of a digital pH meter with probe is acceptable; follow meter manufacturer's instructions.
- C. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.6 PREPARATION

- A. See individual floor covering section(s) for additional requirements.
- B. Comply with requirements and recommendations of floor covering manufacturer.
- C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.
- D. Do not fill expansion joints, isolation joints, or other moving joints.

3.7 ADHESIVE BOND AND COMPATIBILITY TESTING

- A. Comply with requirements and recommendations of floor covering manufacturer.

END OF SECTION 09 05 61

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SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Framing systems.
 - 2. Grid suspension systems.
- B. Related Requirements:
 - 1. Section 054000 "Cold-Formed Metal Framing" for exterior and interior load-bearing, interior non-load-bearing wall framing exceeding height limitations, and exterior non-load-bearing wall studs; floor joists; and roof rafters and ceiling joists.

1.2 REFERENCE STANDARDS

- A. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- C. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019 (Reapproved 2025).
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.
- E. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2024.
- F. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.
- G. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2023.
- H. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017 (Reapproved 2023).
- I. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.
- J. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2026.
- K. ASTM E413 - Classification for Rating Sound Insulation; 2022.

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. Framing systems.
 - a. Demonstrate system compliance with performance criteria indicated in Part II.
 - 2. Grid suspension systems.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of code-compliance certification for studs and tracks.
- B. Evaluation Reports: Submit evaluation reports certified under an independent third-party inspection program administered by an agency accredited by IAS to ICC-ES AC98 accreditation criteria for inspection agencies.
- C. Manufacturer's Certification: Submit manufacturer's certification of product compliance with codes and standards along with product literature and data sheets for specified products.

1.5 QUALITY ASSURANCE

- A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified in accordance with the product-certification program of the Steel Framing Industry Association (SFIA) or similar organization providing a verifiable code-compliance program.
- B. Contractor to provide effective, full-time quality control over fabrication and erection complying with pertinent codes and regulations of government agencies having jurisdiction. Conduct preinstallation meeting to verify Project requirements, substrate conditions, and manufacturer's written installation instructions.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Notify manufacturer of damaged materials received prior to installation.
- B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI S202.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, in accordance with ASTM E119 and displaying a classification label from an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Construct fire-resistance-rated partitions in compliance with tested assembly requirements indicated on Drawings.
 - 2. Rated assemblies to be substantiated from applicable testing using proposed products, by Contractor.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, in accordance with ASTM E90 and classified in accordance with ASTM E413 by an independent testing agency.
- C. Horizontal Deflection:
 - 1. For composite wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft. (239 Pa).
 - 2. For non-composite wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft. (239 Pa).
 - 3. For composite or non-composite wall assemblies indicated to receive ceramic tile, limited to 1/360 of the wall height based on horizontal loading of 5 lbf/sq. ft. (239 Pa).
 - 4. For non-composite vertical bulkhead assemblies, limited to 1/120 of the wall height based on horizontal loading of 5 lbf/sq. ft. (239 Pa).
- D. Design framing systems in accordance with AISI S220 and ASTM C645, Section 10, unless otherwise indicated.
- E. Design Loads: As indicated on architectural Drawings or 5 lbf/sq. ft. (239 Pa) minimum as required by the IBC.
- F. Design framing systems to accommodate deflection of primary building structure and construction tolerances and to withstand design loads with a maximum deflection of 1" (25.4mm).
 - 1. Design framing systems in the long-span areas of the Worship Center and Stage area to accommodate a 2" maximum deflection of primary building structural members.

2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with AISI S220 and ASTM C645, Section 10 for conditions indicated.
 - 1. Steel Sheet Components: Comply with AISI S220 and ASTM C645, Section 10 requirements for metal unless otherwise indicated
 - 2. Protective Coating: Comply with AISI S220; ASTM A653/A653M, G40 (Z120); or coating with equivalent corrosion resistance. Galvannealed products are unacceptable.
 - a. Coating to demonstrate equivalent corrosion resistance with an evaluation report acceptable to authorities having jurisdiction.
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; DiamondPlus Coating on ProSTUD and ProTRAK 20.
- B. Studs and Track: AISI S220 and ASTM C645, Section 10.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; [ProSTUD Drywall Framing System](#) with Smart Edge technology or comparable product by one of the following current members of the SFIA:
 - a. CEMCO; California Expanded Metal Products Co.
 - b. Telling Industries.
 - c. Substitutions: See Section 00 16 00 – Product Requirements.
 - 2. Minimum Base-Steel Thickness: As required by performance requirements for horizontal deflection.
 - 3. Flange Size: 1-1/4 inches.
 - 4. Depth: As indicated on Drawings.
- C. Slip-Type Head Joints: Where indicated, provide one of the following:
 - 1. Single Long-Leg Track System: Top track with 3-inch deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging and spacer bar located within 12 inches of the top of studs to provide lateral bracing.
 - a. Locations: Worship Center, Connection Corridor, Multi-Purpose, Kids area.
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; [Deep Leg Deflection Track](#) and [Spazzer 9200 Bridging and Spacer Bar](#) or comparable product by a current member of the SFIA.
 - 2. Slotted Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Locations: Where Head of Wall Deflection joints are not visible or are concealed by other construction.
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; [MaxTrak Slotted Deflection Track](#) or comparable product by one of the following current members of the SFIA:
 - 1) CEMCO; California Expanded Metal Products Co.
 - 2) Telling Industries.
 - 3) Substitutions: See Section 00 16 00 – Product Requirements.
- D. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; [BlazeFrame DL](#) or comparable product by one of the following current members of the SFIA:
 - a. CEMCO; California Expanded Metal Products Co.
 - b. Steel Network, Inc. (The).
 - c. Substitutions: See Section 00 16 00 – Product Requirements.
- E. L-Angle / Corner Angle: For Head of Wall Deflection Joints where deflection exceeds 1".
 - 1. Locations: Worship Center Demising Wall @ Storage.

2. Basis of Design: Clark Dietrich 500x500 (5-inch by 5-inch) L-Angle, 12ga (0.017") with G90 coating.
- F. Backing Plate: Proprietary fire-retardant-treated wood blocking and bracing in width indicated.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; [Danback Fire-Retardant Treated Wood Backing Plate](#) D16F or comparable product by a current member of the SFIA.
- G. Flat Strap: Steel sheet for blocking and bracing in length and width indicated.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; [Flat Strap](#) or comparable product by a current member of the SFIA.
 2. Minimum Base-Steel Thickness: 0.0296 inch.
- H. Channel Bridging and Bracing: Pre-notched steel, 7/8 by 7/8 by 50 inches (22.2 by 22.2 by 1270 mm), 0.0329-inch- (0.84-mm-) minimum base-steel thickness.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; [Spazzer 9200 \(SPZD\)](#) or comparable product by a current member of the SFIA.
- I. U-Channel Bridging: Steel, 0.0538-inch- (1.37-mm-) minimum base-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; Cold-Formed [U-Channel](#) and Fastbridge Bridging Clip or comparable product by a current member of the SFIA.
 2. U-Channel Depth: 1-1/2 inches.
- J. Rigid Furring Channels: Hat-shaped channels for furring out walls.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; [Furring Channel](#) or comparable product by a current member of the SFIA.
 2. Minimum Base-Steel Thickness: 0.0179 inch.
 3. Depth: 1-1/2 inches.
- K. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; [RC Deluxe](#) or comparable product by a current member of the SFIA.
 2. Configuration: Asymmetrical.
- L. Sound Isolation Clips: Use with 7/8-inch- (22-mm-), 18-mil (0.457-mm), 25-gauge, drywall furring channels for acoustical separation.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; [Sound Clip \(CDSC\)](#) or comparable product by a current member of the SFIA.
- M. Carrying Channels: 0.053-inch (1.34-mm) base-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
 1. Depth: 3/4 inch.
 2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum base-steel thickness of 0.0296 inch.
 3. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.57-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.
- N. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 3/4 inch, minimum base-steel thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; [Z-Furring Channel](#) or comparable product a current member of the SFIA.
- O. Partial Wall Framing Connection: 3/8-inch (9.5-mm) ASTM A36/A36M steel-plate ST50H stud connector designed to support out-of-plane loading of cantilevered partial wall systems that are unsupported at the top track.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich; [Pony Wall PW36](#) or comparable product by a current member of the SFIA.
 2. Minimum Base-Steel Thickness: 0.0966 inch.

3. Size (Height; Width by Length): 35-3/4 inches long plate.

2.3 GRID SUSPENSION SYSTEMS

- A. Grid Suspension Systems for Gypsum Board Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong Ceiling & Wall Solutions.
 - b. CertainTeed; SAINT-GOBAIN.
 - c. Rockfon; ROCKWOOL International.
 - d. USG Corporation.
 - e. Substitutions: See Section 00 16 00 – Product Requirements.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
 1. Asphalt-Saturated Organic Felt: ASTM D226/D226M, Type I (No. 15 asphalt felt), nonperforated.
 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C754.
 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.

- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLATION OF FRAMING SYSTEMS

- A. Install framing system components in accordance with spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Single-Layer Application: As required by horizontal deflection performance requirements; 16 inches o.c. unless otherwise indicated or required to achieve performance indicated.
 - 2. Multilayer Application: As required by horizontal deflection performance requirements; 16 inches o.c. unless otherwise indicated.
 - 3. Tile Backing Panels: As required by horizontal deflection performance requirements; 16 inches o.c.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Install fire-resistant partitions using manufacturer's proprietary equivalent-gauge studs in compliance with requirements of UL U419.
 - b. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 - 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
 - 6. Curved Partitions:
 - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
 - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches (152.4 mm) o.c.
- E. Direct Furring:
 - 1. Attach to concrete or masonry with screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
 - 2. Provide structural connection of furring framing to exterior concrete walls at one-third points.
- F. Z-Shaped Furring Members:
 - 1. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

2. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.
- G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLATION OF GRID SUSPENSION SYSTEMS

- A. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

3.6 FIELD QUALITY CONTROL

- A. Installation Tolerances: Install suspension systems that are level to within 1/16 inch in 12 feet] measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 09 22 16

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SECTION 09 29 00 - GYPSUM BOARD

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Paper faced gypsum board.
 - 2. Abuse Resistant gypsum board
 - 3. Mold, mildew, moisture resistant paper faced gypsum board.
 - 4. Fiberglass mat faced gypsum board.
 - 5. Cement board.
 - 6. Accessories.
 - 7. Sound Attenuation Batts (Acoustic Insulation)
 - 8. Trim.
 - 9. Joint tape.
 - 10. Joint compounds.

1.2 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI A108 Interior Installation of Cementitious Backer Units.
- B. ASTM International (ASTM):
 - 1. ASTM C475/C475M Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - 2. ASTM C840 Standard Specification for Application and Finishing of Gypsum Board.
 - 3. ASTM C919 Standard Practice for Use of Sealants in Acoustical Applications.
 - 4. ASTM C1002 Standard Specifications for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - 5. ASTM C1178/C1178M Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.
 - 6. ASTM C1325 Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units.
 - 7. ASTM C1396/C1396M Standard Specification for Gypsum Board.
 - 8. ASTM C1629/C1629M Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.
 - 9. ASTM C1658/C1658M Standard Specification for Glass Mat Gypsum Panels.
 - 10. ASTM C1766 Standard Specification for Factory-Laminated Gypsum Panel.
 - 11. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
 - 12. ASTM E814 Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
 - 13. ASTM G21 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- C. Gypsum Association (GA):
 - 1. GA-214 Recommended Levels of Gypsum Board Finish.
 - 2. GA-216 Application and Finishing of Gypsum Panel Products.

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. Each type of gypsum product.

2. Cementitious board.
 3. Trim accessories.
- B. Samples
1. Trim Accessories: 12-inch 12 inch length of trim.

PART 2 PRODUCTS

2.1 PAPER FACED GYPSUM BOARD

- A. Gypsum Board, Regular Core, ASTM C1396/C1396M.
1. Basis of Design: Gold Bond Building Products, LLC provided by National Gypsum Company:
 - a. Gold Bond® Gypsum Board.
 - b. Thickness: As Indicated on the drawings.
- B. Gypsum Board, Fire-Resistant Core: ASTM C1396/C1396M.
1. Basis of Design: Gold Bond Building Products, LLC provided by National Gypsum Company:
 - a. Gold Bond® Fire-Shield® Gypsum Board.
 - b. Thickness: 5/8".

2.2 MOLD, MILDEW AND MOISTURE RESISTANT PAPER FACED GYPSUM BOARD

- A. Gypsum Board, Regular Core, Mold, Mildew, Moisture Resistant: ASTM C1396/C1396M.
- B. Gypsum Board, Fire Resistant Core, Mold, Mildew Moisture Resistant: ASTM C1396/C1396M.
1. Basis of Design: Gold Bond Building Products, LLC provided by National Gypsum Company:
 - a. Gold Bond® XP® Fire-Shield® Gypsum Board.

2.3 ABUSE REISTANT

- A. Gypsum Board, Abuse Resistant: ASTM C1396/C1396M.
1. Basis of Design: Gold Bond Building Products, LLC provided by National Gypsum Company:
 - a. Gold Bond® XP® Hi-Abuse® Gypsum Board.
 2. Thickness: 5/8 inch.
 3. Core: Type X.
 4. Edges: Tapered.
 5. Mold/Mildew Resistance: ASTM D3273; Score of 10.
 6. Surface Abrasion: ASTM C1629/C1629M; Level 3.
 7. Indentation: ASTM C1629/C1629M; Level 1.
 8. Soft-Body Impact: ASTM C1629/C1629M; Level 2.
 9. Hard-Body Impact: ASTM C1629/C1629M; Level 1.

2.4 FIBERGLASS MAT FACED GYPSUM BOARD - TILE BACKER

- A. Gypsum Board: ASTM C1658/C1658M.
1. Basis of Design: Gold Bond Building Products, LLC provided by National Gypsum Company:
- B. Gypsum Board, Tile Backer: ASTM C1178/C1178M.
1. Basis of Design: Gold Bond Building Products, LLC provided by National Gypsum Company:
 - a. Gold Bond® eXP® Fire-Shield® Tile Backer.
 2. Thickness: 5/8 inch.
 3. Core: Type X.
 4. Edges: Square.
 5. Sustainability: GREENGUARD Gold Certified.
 6. Mold/Mildew Resistance: ASTM D3273; Score of 10.

2.5 CEMENT BOARD

- A. Cement Board, Backer, Interior/Exterior: ASTM C1325.
 - 1. Basis of Design: PermaBASE Building Products, LLC provided by National Gypsum Company:
 - a. PermaBASE® Cement Board.
 - b. PermaBASE PLUS® Cement Board.
 - 2. Thickness: 5/8 inch.
 - 3. Weight: 3.65 lbs./sq.ft. (17.8 kg/m²).
 - 4. Edges: Round.
 - 5. Sustainability: GREENGUARD Gold Certified.
 - 6. Mold/Mildew Resistance: ASTM D3273; Score of 10.
 - 7. Shear Bond Strength: 241 psi.

2.6 ACCESSORIES

- A. Acoustical Sealant: ASTM C919.
 - 1. Manufacturers and Products:
 - a. Grabber Construction Products; Acoustical Sound and Smoke Sealant GSCSF.
 - b. Specified Technologies Inc.; SpecSeal SNS Smoke N Sound Acoustical Sealant.
 - c. BOSS Products; BOSS 826 Acoustical Acrylic Sound Sealant.
- B. Firestopping: ASTM E814.
 - 1. Manufacturers and Products:
 - a. Specified Technologies Inc.; SpecSeal SSP Putty & Putty Pads.
 - b. BOSS Products; BOSS 818 Fire Rated Putty Pads.
- C. Fasteners for Cement Board: ASTM C1002.
- D. Fasteners for Tile Backer: ASTM C1002.

2.7 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.
 - 1. Material: Paper-faced galvanized-steel sheet.
 - 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.
 - h. Vinyl L-Bead with Comnpressible Foam
- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
 - 1. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B221 (((ASTM B221M))), Alloy 6063-T5.
 - 2. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.
- C. Vinyl Trim:
 - 1. Reveal Bead:
 - a. Basis of Design Product: Architectural Reveal Bead, by Trim-Tex Inc.
 - b. Tab Size: 1.125 inch.
 - c. Length: 10 feet.
 - d. Reveal Size: 0.625 inch by 0.625 inch (191 mm by 191 mm).
 - 2. Shadow Z Bead:

- a. Basis of Design Product: Architectural Z Shadow Bead, by Trim-Tex Inc.
 - b. Tab Size: 1.125 inch.
 - c. Length: 10 feet.
 - d. Reveal Size: 0.625 inch by 0.625 inch (15.9 mm by 15.9 mm).
3. F Reveal Bead:
 - a. Basis of Design Product: Architectural F Reveal Bead, by Trim-Tex Inc.
 - b. Tab Size: 1.125 inch.
 - c. Length: 10 feet.
 - d. Reveal Size: 0.625 inch by 0.625 inch (15.9 mm by 15.9 mm).
4. Shadow Bead:
 - a. Reveal Size: 0.625 inch by 0.625 inch (15.9 mm by 15.9 mm).
5. Vinyl L-Bead with Compressible Foam:
 - a. 1/2" Leg x 1 1/8" Flange (Optional Rip Bead) with Compressible Foam seal for sound attenuation.
 - b. Basis of Design: Clark Dietrich Ultra Bead.

2.8 SOUND ATTENUATION BATTS - ACOUSTIC INSULATION

- A. Glass or Mineral wool Medium-Density, Type 1, Class A (ASTM C6625) formaldehyde-free batts, friction fit, in widths required for stud cavities indicated.
 1. Basis of Design: Knauf Eco-Batt.
 - a. Thickness: 3 1/2"
 - b. Combustibility: ASTM E136, Non-Combustible.
 - c. Mold Growth: ASTM C1338, Pass.
 2. Substitutions: Acceptable, meeting the requirements of this section.

2.9 JOINT TAPE

- A. Paper Tape: 2-1/16 inch wide (2.06 inch), cross-fibered paper, ASTM C475/C475M.
 1. Basis of Design: ProForm Finishing Products, LLC provided by National Gypsum Company:
 - a. ProForm™ Paper Joint Tape.
- B. Fiberglass Mesh Tape: Polymer-coated (alkali-resistant) fiberglass mesh.
 1. Basis of Design: PermaBASE Building Products provided by National Gypsum Company:
 - a. PermaBASE™ Cement Board Tape, 2 inch.

2.10 JOINT COMPOUNDS

- A. Setting Type Compound
 1. Field mixed quick setting and hardening: ASTM C475/C475M.
 - a. Basis of Design: ProForm Finishing Products, LLC provided by National Gypsum Company:
 - 1) ProForm® Quick Set™ Setting Compound.
 - 2) .
 2. Field mixed quick setting and hardening; fire resistant: ASTM E814.
 - a. Basis of Design: ProForm Finishing Products, LLC provided by National Gypsum Company:
 - 1) ProForm® Quick Set™ Fire and Smoke Stop 90 Setting Compound.
- B. Drying Type Compound:
 1. Ready mix, vinyl base: ASTM C475/C475M.
 - a. Basis of Design: ProForm Finishing Products, LLC provided by National Gypsum Company:
 - 1) ProForm® All Purpose Joint Compound.
 - 2) ProForm® All Purpose Machine Grade Joint Compound.

2. Ready mix, vinyl base, topping compound: ASTM C475/C475M.
 - a. Basis of Design: ProForm Finishing Products, LLC provided by National Gypsum Company:
 - 1) ProForm® Topping Joint Compound.
3. Ready mix, vinyl base, embedding tape and trim: ASTM C475/C475M.
 - a. Basis of Design: ProForm Finishing Products, LLC provided by National Gypsum Company:
 - 1) ProForm® Taping Joint Compound.
 - 2) ProForm® Taping Lite Joint Compound.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION AND FINISHING OF PANELS, GENERAL

- A. Install in accordance with:
 1. Manufacturer recommendations.
 2. ANSI A108.
 3. ASTM C840.
 4. GA-216.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 2. Fit gypsum panels around ducts, pipes, and conduits.
 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.
- K. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 - 3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- L. Multilayer Application:
 - 1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
 - 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 - 3. Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.
- M. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.3 INSTALLATION OF EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

- A. Apply panels perpendicular to supports, with end joints staggered and located over supports.
 - 1. Install with 1/4-inch (6.4-mm) open space where panels abut other construction or structural penetrations.
 - 2. Fasten with corrosion-resistant screws.

3.4 INSTALLATION OF TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
- B. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.
- C. Water-Resistant Backing Board: Install where indicated with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
- D. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLATION OF TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints at locations indicated on Drawings and if not specifically indicated, provide according to ASTM C840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners unless noted otherwise.
 - 2. Bullnose Bead: Use where indicated on Drawings.
 - 3. LC-Bead: Use at exposed panel edges.
 - 4. L-Bead and L-Tear Away Bead: Use where gypsum board abuts precast concrete wall panels or materials other than finished gypsum board.
 - 5. Architectural Reveal Bead: For aesthetic affect, where Indicated on the Drawings.
 - 6. U-Bead: Use at exposed panel edges.

3.6 FINISHING

- A. Finish in accordance with:
 - 1. Manufacturers recommendations.
 - 2. ASTM C840:
 - a. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - b. Level 2: Panels that are substrate for tile.
 - c. Level 3: Where wall coverings or other materials conceal the entire wall surface.
 - d. Level 4: At all panel surfaces that will be exposed to view unless otherwise indicated.
 - 1) Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
 - e. Level 5: Where indicated on Drawings.
 - 1) Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
 - 3. GA-214

3.7 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

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SECTION 09 30 00 - TILING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Tile for wall applications.
- B. Non-ceramic trim.

1.2 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary of Work for Alternates affecting the Work of this Section.
- B. Section 07 92 00 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.
- C. Section 09 21 16 - Gypsum Board Assemblies: Tile backer board.

1.3 REFERENCE STANDARDS

- A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2024.
- B. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2023.
- C. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation; 2019.
- D. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014 (Reaffirmed 2024).
- E. ANSI A118.15 - American National Standard Specifications for Improved Modified Dry-Set Cement Mortar; 2023.
- F. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.
- G. ANSI A137.3/A108.19/A108.20 - American National Standard Specifications for Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs (Material and Installation Standards); 2025.
- H. ANSI A326.3 - American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials; 2021.
- I. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2018 (Reapproved 2023).
- J. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
- K. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.
- L. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.
- M. TCNA (HB-GP) - Handbook for Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs Installation; 2025-2026.
- N. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2025.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by affected installers.

1.5 SUBMITTALS

- A. See Section 01 30 00 - 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. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
- D. Samples for verification: 2 full size samples representing color, size and finish of each tile product specified. 2 physical grout samples for each grout color specified.
- E. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

1.6 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. System Bond Warranty: Written warranty, signed by mortar and grout manufacturer agreeing to replace ceramic tile that has bond failure within specified warranty period. Warranty does not include deterioration or failure of ceramic tile due to unusual traffic, vandalism, or abuse. Failures include, but are not limited to, cracks in ceramic tile floors and joints.
 - 1. Warranty Period: Fifteen (15) years from date of Substantial Completion.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.
- B. Installer Qualifications:
 - 1. Company specializing in performing tile installation, with minimum of five years of documented experience.
 - 2. Installer Certification:
 - a. Ceramic Tile Education Foundation (CTEF): Certified Tile Installer (CTI).
- C. Documents on Site: Maintain one copy of ANSI A108/A118/A136, TCNA (HB), ANSI A137.3/A108.19/A108.20, and TCNA (HB-GP) on site.

1.8 MOCK-UPS

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Construct tile mock-up incorporating components specified for location.
 - 1. Mock-up may remain as part of work.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.
- C. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- D. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- E. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

1.10 FIELD CONDITIONS

- A. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials and as required by manufacturer's written instructions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Tile:
 - 1. Provide basis of design product listed on the drawings.
 - 2. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.
- B. Setting Materials:
 - 1. Provide products by one of the following:
 - 2. TEC Specialty Products LLC: www.tecspecialty.com/#sle.
 - 3. LATICRETE International, Inc: www.laticrete.com/#sle.
 - 4. Mapei Corporation: www.mapei.com/#sle.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
 - 6. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.
- C. Grout:
 - 1. Provide products by one of the following:
 - 2. TEC Specialty Products LLC: www.tecspecialty.com/#sle.
 - 3. LATICRETE International, Inc: www.laticrete.com/#sle.
 - 4. Mapei Corporation: www.mapei.com/#sle.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
 - 6. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

2.2 PERFORMANCE REQUIREMENTS

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

2.3 TILE

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
 - 1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
 - 2. Obtain waterproof membrane and crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:

1. Metal Edge Strips
- D. General
 1. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 2. Provide tile complying with Standard grade requirements unless otherwise indicated.
 3. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
 4. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- E. Glazed Wall Tile, Type CT1, CT2: ANSI A137.1 standard grade.
 1. Moisture Absorption: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
 2. Size: As indicated on drawings.
 3. Color: As indicated on drawings.
 4. Pattern: As indicated on drawings..
 5. Products:
 - a. Provide basis of design products listed on drawings..
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.4 TRIM AND ACCESSORIES

- A. Non-Ceramic Trim: TS1 Satin natural anodized extruded aluminum styles and dimensions to suit application, set with tile mortar or adhesive.
 1. Applications:
 - a. Open edges of wall tile.
 2. Products:
 - a. Provide basis of design products listed on Drawings
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.5 SETTING MATERIALS

- A. Provide setting and grout materials from same manufacturer.
- B. Improved Latex-Portland Cement Mortar Bond Coat: ANSI A118.15.
 1. Applications: Use where large and heavy tile mortar is indicated on drawings.
 2. Products:
 - a. TEC Specialty Products LLC; TEC Ultimate 6 Plus Mortar: www.tecspecialty.com/#sle.
 - b. LATICRETE International, Inc; 4-XLT: www.laticrete.com/#sle.
 - c. Mapei Corporation; Keraflex Super: www.mapei.com/#sle.

2.6 GROUTS

- A. Provide setting and grout materials from same manufacturer.
- B. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
 1. Applications: Use where indicated on drawings and where no other type of grout is indicated.
 2. Color: As indicated on drawings.
 3. Products:
 - a. Provide basis of design product listed on the drawings or an approved comparable by one of the following:
 - b. TEC Specialty Products LLC; TEC Power Grout: www.tecspecialty.com/#sle.
 - c. LATICRETE International, Inc; LATICRETE PERMACOLOR Select Grout: www.laticrete.com/#sle.

- d. Mapei Corporation; Ultracolor Plus FA: www.mapei.com/#sle.

2.7 ACCESSORY MATERIALS

- A. Grout Release: Temporary, water-soluble pre-grout coating.
 - 1. Products:
 - a. As recommended by tile and grout manufacturer.
- B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify wall surfaces are smooth and flat within tolerances specified for that type of work, are dust-free, and are ready to receive tile.

3.2 PREPARATION

- A. Vacuum clean surfaces and damp clean.
- B. Seal substrate surface cracks with filler.
- C. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.
- D. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION - GENERAL

- A. Install tile and grout in accordance with applicable requirements of ANSI A108/A118/A136, manufacturer's instructions, and TCNA (HB) or TCNA (HB-GP) recommendations, as applicable.
- B. Lay tile to pattern indicated on drawings. Do not interrupt tile pattern through openings.
 - 1. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - a. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - b. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align wall joints.
 - 1. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
- E. Form internal angles square and external angles square.
- F. Install non-ceramic trim in accordance with manufacturer's instructions.
- G. Sound tile after setting. Replace hollow sounding units.
- H. Keep control and expansion joints free of mortar, grout, and adhesive.

- I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- J. Grout tile joints unless otherwise indicated on drawings. Use standard grout unless otherwise indicated on drawings.
- K. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.
- L. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- M. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Glazed Wall Tile: 1/16 inch .
- N. Install tile in accordance with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of ANSI A108 series that are referenced in TCNA installation methods and specified in tile installation schedules, and apply to types of setting and grouting materials used.
- O. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- P. Movement Joints: Provide movement joints and other sealant-filled joints, including control, contraction, and isolation joints. Form joints during installation of setting materials, mortar beds, and tile. Keep joints free of dirt, debris, and setting materials prior to filling with sealants. Do not saw-cut joints after installing tiles.

3.4 INSTALLATION - WALL TILE

- A. Over coated glass mat backer board on studs, install in accordance with TCNA (HB) Method W245.
- B. Over gypsum wallboard on wood or metal studs, install in accordance with TCNA (HB) Method W243, thin-set with dry-set or latex-Portland cement bond coat.
- C. Install wall tile only after permanent overhead lighting has been installed.

3.5 CLEANING

- A. Clean tile and grout surfaces.
 - 1. Remove grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.6 PROTECTION

- A. Do not permit traffic over finished floor surface for 7 days after installation.
- B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

END OF SECTION 09 30 00

SECTION 09 51 00 - ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.
- C. Perimeter trim.

1.2 REFERENCE STANDARDS

- A. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.
- B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019 (Reapproved 2025).
- C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2022.
- D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

1.3 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.
 - 1. Describe attachment methods including at minimum the information below:
 - a. Ceiling suspension-system members.
 - b. Structural members to which suspension systems will be attached.
 - c. Method of attaching hangers to building structure.
 - 1) Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
 - d. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
- C. Product Data: Provide data on suspension system components and acoustical units.
- D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Acoustical Units: 1 full carton of each type and size installed.
 - 3. Maintenance Data: For finishes to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.5 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

- B. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
 - 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.
- C. Do not install acoustical units until after interior wet work is dry.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acoustic Tiles/Panels:
 - 1. Armstrong World Industries, Inc; ____: www.armstrongceilings.com/#sle.
 - 2. Basis of Design Product: As indicated in the Finish Legend on the Drawings.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Suspension Systems:
 - 1. Armstrong World Industries, Inc; ____: www.armstrongceilings.com/#sle.
 - 2. Basis of Design Product: As indicated in the Finish Legend on the Drawings.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84.

2.3 ACOUSTICAL UNITS

- A. Acoustical Units - General: ASTM E1264, Class A.
- B. Acoustical Panels, Type ____: Glass fiber with membrane-faced overlay, with the following characteristics:
 - 1. Classification: ASTM E1264 Type XII.
 - 2. Size: 24 by 48 inches.
 - 3. Thickness: 1 inch.
 - 4. Light Reflectance: 88 percent, determined in accordance with ASTM E1264.
 - 5. NRC Range: 0.95, determined in accordance with ASTM E1264.
 - 6. Articulation Class (AC): 190, determined in accordance with ASTM E1264.
 - 7. Ceiling Attenuation Class (CAC): N/A, determined in accordance with ASTM E1264.
 - 8. Panel Edge: Square tegular.
 - 9. Color: White.
 - 10. Suspension System: Exposed.

2.4 SUSPENSION SYSTEM(S)

- A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
- B. Exposed Suspension System: Hot-dip galvanized steel grid with aluminum cap.
 - 1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
 - 2. Profile: Tee; 9/16 inch face width.
 - 3. Finish: Baked enamel.
 - 4. Color: White.

2.5 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.
- C. Perimeter Moldings: Same metal and finish as grid.
 - 1. Size: As required for installation conditions.
 - 2. Angle Molding: L-shaped, for mounting at same elevation as face of grid.
- D. Metal Edge Trim for Suspension Systems: Steel or extruded aluminum; provide attachment clips, splice plates, and preformed corner pieces for complete trim system.
 - 1. Trim Height: 6 inches.
 - 2. Finish: Baked enamel.
 - 3. Color: White.
 - 4. Products:
 - a. Armstrong World Industries, Axiom Classic Straight Perimeter Trim, www.armstrongceilings.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
 - 1. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Verify that layout of hangers will not interfere with other work.
- C. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Install after major above-ceiling work is complete.
- B. Coordinate the location of hangers with other work.
- C. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
 - 1. Arrange directionally patterned acoustical panels as indicated on reflected ceiling plans.
- D. Layout openings for penetrations centered on the penetrating items.
- E. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- F. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- G. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

3.3 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Locate system on room axis according to reflected plan.
- D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
 - 2. Miter corners.
 - a. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends. Miter corners accurately and connect securely.
 - b. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- G. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- I. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- J. Do not eccentrically load system or induce rotation of runners.

3.4 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with ASTM C636/C636M with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Lay directional patterned units with pattern parallel to longest room axis unless noted otherwise on reflected ceiling plans.
- D. Fit border trim neatly against abutting surfaces.
- E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- F. Cutting Acoustical Units:
 - 1. Make field cut edges of same profile as factory edges.
 - 2. Double cut and field paint exposed reveal edges.
 - a. Match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

3.5 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.6 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Clean surfaces.

1. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
 2. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.
- C. Replace damaged or abraded components.
- D. Provide small marking tags for panels whose removal provides access to valves or mechanical equipment above the ceiling. Coordinate tag with Owner's representative and requirements.

END OF SECTION 09 51 00

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SECTION 09 65 00 - RESILIENT FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Resilient tile flooring.
- B. Resilient base.
- C. Installation accessories.

1.2 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 09 05 61 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

1.3 REFERENCE STANDARDS

- A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2025a.
- B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
- C. ASTM F1344 - Standard Specification for Rubber Floor Tile; 2021a.
- D. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021 (Reapproved 2025).
- E. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.
- F. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.
- G. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.
- H. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2018.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Shop Drawings: Indicate seaming plans and floor patterns.
- D. Verification Samples: Submit two samples, 4 by 4 inch in size illustrating color and pattern for each resilient flooring product specified, labeled to match tags on drawings.
- E. Sustainable Design Submittal: Submit VOC content documentation for flooring and adhesives.
- F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum ten years documented experience.
- B. Installer Qualifications: Company specializing in installing specified flooring with minimum five years documented experience.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

- C. Testing Agency Qualifications: Independent firm specializing in performing concrete slab moisture testing and inspections of the type specified in this section.

1.6 MOCK-UPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- B. Store all materials off of the floor in an acclimatized, weather-tight space.
- C. Maintain temperature in storage area between 55 degrees F and 85 degrees F.
- D. Do not double stack pallets.

1.8 FIELD CONDITIONS

- A. Store materials for not less than 48 hours prior to installation in area of installation at a minimum temperature of 65 degrees F and a maximum temperature of 85 degrees to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.
- B. Close spaces to traffic during floor tile installation and for 48 hours after floor tile installation.
- C. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 PRODUCTS

2.1 TILE FLOORING

- A. Rubber Tile - Type RFT1: Premium prefabricated vulcanized dual-durometer rubber flooring. Low-emitting, smooth surface with randomly dispersed natural coconut husk fibers.
 - 1. Manufacturers:
 - a. Provide basis of design product listed on the drawings.
 - 2. Minimum Requirements: Comply with ASTM F1344, of Class corresponding to type specified.
 - 3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
 - 4. VOC Content Limits: As specified in Section 01 61 16.
 - 5. Size: As indicated on drawings nominal.
 - 6. Total Thickness: .118 inch+/- 0.006"
 - 7. Color: As indicated on drawings.

2.2 RESILIENT BASE

- A. Resilient Wall Base - Type WB1: ASTM F1861, Type TP, rubber, thermoplastic; style as scheduled.
 - 1. Manufacturers:
 - a. Basis-of-Design Product: Provide product listed in Drawings.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
 - 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
 - 3. Height: As indicated on Drawings..
 - 4. Profile: As indicated on Drawings.

5. Thickness: 1/8"
6. Length: Roll.
7. Color: As indicated on drawings.
8. Corners: job formed inside and outside

2.3 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Adhesives: Waterproof; types recommended by flooring manufacturer.
- C. Adhesive for Rubber Flooring:
 1. Manufacturers:
 - a. Provide adhesive recommended by manufacturer..
- D. Moldings, Transition and Edge Strips: Resilient.
 1. Manufacturers:
 - a. Provide basis of design products listed on Drawings..

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 1. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- 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 resilient base.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
 1. Test as Follows:
 - a. Perform tests so that each test area does not exceed 1000 sq. ft. , and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - b. Alkalinity (pH): ASTM F710.
 - 1) Perform tests recommended by flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.
 - c. Internal Relative Humidity: ASTM F2170.
 - 1) Perform tests recommended by flooring manufacturer. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
 - d. Moisture Vapor Emission: ASTM F1869.
 - 1) Perform tests recommended by flooring manufacturer. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 2. Conduct tests by an independent testing agency acceptable to Owner.
 3. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
- D. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

- A. Remove existing resilient flooring and flooring adhesives; follow the recommendations of RFCI (RWP).
- B. Prepare floor substrates for installation of flooring in accordance with Section 09 05 61.
- C. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- D. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.
- E. Prohibit traffic until filler is fully cured.
- F. Clean substrate.
 - 1. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.
- G. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.
- H. Do not install resilient flooring until materials are the same temperature as space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.

3.3 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Adhesive-Applied Installation:
 - 1. Spread only enough adhesive to permit installation of materials before initial set.
 - 2. Fit joints and butt seams tightly, without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
 - 3. Set flooring in place, press with heavy roller to attain full adhesion.
- D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
 - 1. Resilient Strips: Attach to substrate using adhesive.
- F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints. Seal joints where dissimilar materials abut flooring.
- G. Extend floor tiles into toe spaces, door reveals, closets, and similar openings.
- H. Install flooring in recessed floor access covers, building expansion joint covers and similar maintaining floor pattern.

3.4 INSTALLATION - TILE FLOORING

- A. Install tiles according to manufacturer's installation instructions for shade variation.
- B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.
- C. Refer to install patterns indicated on drawings

3.5 INSTALLATION - RESILIENT BASE

- A. Fit joints tightly and make vertical. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned. Maintain minimum dimension of 18 inches between joints.
- B. Job-Formed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
 - a. Form without producing discoloration (whitening) at bends.

2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
 - a. Miter or cope corners to minimize open joints.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.
- E. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- F. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- G. Do not stretch resilient base during installation.
- H. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended paintable adhesive filler material, painted to match wall.

3.6 CLEANING

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient tile flooring.
- B. Remove excess adhesive from floor, base, and wall surfaces without damage.
 1. Sweep and vacuum surfaces thoroughly.
 2. Damp-mop surfaces to remove marks and soil.
- C. Clean in accordance with manufacturer's written instructions.

3.7 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.
- B. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 09 65 00

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SECTION 09 68 13 - TILE CARPETING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Carpet tile, fully adhered.

1.2 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.
- C. Section 09 05 61 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

1.3 REFERENCE STANDARDS

- A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016 (Reapproved 2021).
- B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2025a.
- C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
- D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.
- E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.
- F. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Shop Drawings: Indicate layout of joints.
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
 - 2. Carpet tile type, color, and dye lot.
 - 3. Type of installation.
 - 4. Pattern of installation.
 - 5. Pattern type, location, and direction.
 - 6. Type, color, and location of edge, transition, and other accessory strips.
 - 7. Transition details to other flooring materials.
- D. Samples: Submit two full size carpet tiles illustrating color and pattern design for each carpet color selected, labeled to match tags on Drawings.
- E. Accessory Samples: Submit two manufacturer's standard size transition strips samples for each type and color selected.
- F. Sustainable Design Submittal: Submit VOC content documentation for adhesives.
- G. Manufacturer's Installation Instructions.
- H. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

- I. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum ten years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet tile with minimum five years documented experience and approved by carpet tile manufacturer.
- C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.
- D. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, the following:
 - a. More than 10 percent edge raveling, snags, and runs.
 - b. Dimensional instability.
 - c. Excess static discharge.
 - d. Loss of tuft-bind strength.
 - e. Loss of face fiber.
 - f. Delamination.
- B. Warranty Period: 10 years from date of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with the Carpet and Rug Institute's CRI 104.

1.8 FIELD CONDITIONS

- A. Comply with the Carpet and Rug Institute's CRI 104 for temperature, humidity, and ventilation limitations.
- B. Store materials in area of installation for minimum period of 24 hours prior to installation.
- C. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
- D. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- E. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Tile Carpeting:
 - 1. Provide manufacturers listed on Drawings..

2.2 MATERIALS

- A. Tile Carpeting, Type CPT1: manufactured in one color dye lot.
 - 1. Product: Provide products listed on Drawings.
 - 2. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
 - 3. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
 - 4. VOC Content: Comply with Section 01 61 16.

2.3 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.
- B. Edge Strips: Provide products listed on Drawings..
- C. Adhesives:
 - 1. Compatible with materials being adhered; maximum VOC content as specified in Section 01 61 16.
- D. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.
 - 1. Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
 - 1. Test as Follows:
 - a. Perform tests so that each test area does not exceed 1000 sq. ft. , and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - b. Alkalinity (pH): ASTM F710.
 - 1) Perform tests recommended by flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.
 - c. Internal Relative Humidity: ASTM F2170.
 - 1) Perform tests recommended by flooring manufacturer. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
 - d. Moisture Vapor Emission: ASTM F1869.

- 1) Perform tests recommended by flooring manufacturer. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
2. Conduct tests by an independent testing agency acceptable to Owner.
3. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with the Carpet and Rug Institute's CRI 104 and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.
- B. Prepare floor substrates for installation of flooring in accordance with Section 09 05 61.
- C. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
 1. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.
 2. Metal Substrates: Clean grease, oil, soil and rust, and prime if recommended in writing by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.
- D. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.
- E. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
 1. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider, and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.
- F. Vacuum clean substrate.
 1. Immediately before installation, sweep and vacuum clean substrates to be covered by carpet products.

3.3 INSTALLATION

- A. General: Comply with the Carpet and Rug Institute's CRI 104, Section 10, "Carpet Tile," and with carpet tile manufacturer's written installation instructions.
- B. Starting installation constitutes acceptance of subfloor conditions.
- C. Install carpet tile in accordance with manufacturer's instructions.
- D. Maintain dye-lot integrity. Do not mix dye lots in same area.
- E. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
 1. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
 2. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Install patterns as indicated on Drawings.
- G. Install pattern parallel to walls and borders.
- H. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.
- I. Locate change of color or pattern between rooms under door centerline.
- J. Fully adhere carpet tile to substrate.
- K. Trim carpet tile neatly at walls and around interruptions.

- L. Complete installation of edge strips, concealing exposed edges. Locate edgestrips for change of materials between rooms under door centerline.
- M. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.
- N. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

3.4 INSTALLATION ON STAIRS OR RISERS

- A. Apply seam adhesive to all cut edges.
- B. Minimize number of joints on stair treads.
- C. Adhere carpet tight to stair treads.

3.5 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive without damage, from floor, base, and wall surfaces using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Clean and vacuum carpet surfaces as recommended by carpet tile manufacturer..
- C. Protect installed carpet tile to comply with the Carpet and Rug Institute's CRI 104, Section 13.7.
- D. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 13

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SECTION 09 90 00 - AD - PAINTING AND COATING - SHERWIN-WILLIAMS BOD

PART 2 PRODUCTS

1.1 MANUFACTURERS

- A. Basis of Design Products: Subject to compliance with requirements, provide Sherwin-Williams Company (The) products indicated; www.sherwin-williams.com/#sle.

1.2 PAINTINGS AND COATINGS

- A. General:
 - 1. Provide factory-mixed coatings unless otherwise indicated.
 - 2. Do not reduce, thin, or dilute coatings or add materials to coatings unless specifically indicated in manufacturer's instructions.
- B. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

END OF SECTION 09 90 00

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SECTION 09 90 00 - INTERIOR PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Surface preparation.
- B. Interior painting and coating systems.
- C. Scope:
 - 1. Finish surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
 - a. Interior:
 - 1) Concrete Ceilings: Poured concrete and cast-in-place concrete.
 - 2) Metal: Aluminum and galvanized.
 - 3) Metal, Galvanized: Ceilings and ductwork.
 - 4) Wood: Trim.
 - 5) Drywall: Walls, ceilings, gypsum board (previously painted and new), and similar items.
 - 6) Concrete: Floors, non-vehicular.
 - 2. Do not paint or finish the following:
 - a. Anodized Aluminum Storefronts and Entrances.

1.2 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

1.3 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.
- B. SCAQMD 1113 - Architectural Coatings; 1977, with Amendment (2016).
- C. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- D. SSPC-SP 2 - Hand Tool Cleaning; 2018.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Product characteristics.
 - 2. Surface preparation instructions and recommendations.
 - 3. Primer requirements and finish specification.
 - 4. Storage and handling requirements and recommendations.
 - 5. Application methods.
 - 6. Clean-up information.
- C. Samples: Submit four paper draw down samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
- D. Applicator's qualification statement.
- E. Maintenance Data: Submit coating maintenance manual including finish schedule showing where each product/color/finish was used, product technical data sheets, safety data sheets (SDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements for additional provisions.
2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
3. Label each container with color, type, and texture in addition to manufacturer's label.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 3 years documented experience and approved by manufacturer.

1.6 MOCK-UPS

- A. See Section 01 40 00 - Quality Requirements for general requirements for mock-ups.
- B. Provide a mock up of a minimum of 200 SF of painted overhead exposed structural systems showing coverage of existing black painted systems to new color indicated on the Drawings.
- C. Coordinate location with Architect prior to mock up..
- D. Approved mock-up may remain as part of the work.

1.7 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, product name, product code, color designation, VOC content, batch date, environmental handling, surface preparation, application, and use instructions.
- C. Paint Materials: Store at a minimum of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.8 FIELD CONDITIONS

- A. Do not apply materials when environmental conditions are outside the ranges required by manufacturer.
- B. Follow manufacturer's recommended procedures for producing the best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Products: Subject to compliance with requirements, provide Sherwin-Williams Company (The) products indicated; www.sherwin-williams.com/#sle.
- B. Comparable Products: Products of approved manufacturers will be considered in accordance with 01 60 00 - Product Requirements, and the following:

2.2 PAINTINGS AND COATINGS

- A. General:
 1. Provide factory-mixed coatings unless otherwise indicated.
 2. Do not reduce, thin, or dilute coatings or add materials to coatings unless specifically indicated in manufacturer's instructions.
- B. Volatile Organic Compound (VOC) Content:
 1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. SCAQMD 1113 Rule.

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.
- C. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

2.3 PAINT SYSTEMS - INTERIOR

- A. Concrete Ceilings: Poured concrete, precast concrete, cement board, cast-in-place concrete, and plaster.
 1. Dryfall Waterborne Topcoats:
 - a. Flat Finish:
 - 1) 1st and 2nd Coat: Sherwin-Williams Pro Industrial Waterborne Acrylic Dryfall, B42-181 Series: www.sherwin-williams.com/#sle.
(a) 6 mils wet, 1.7 mils dry per coat.
- B. Metal: Aluminum and galvanized.
 1. Epoxy Systems, Water Based:
 - a. Semi-Gloss Finish:
 - 1) 1st Coat: Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series: www.sherwin-williams.com/#sle.
(a) 5 mils wet, 2 mils dry per coat.
 - 2) 2nd and 3rd Coat: Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, K46 Series: www.sherwin-williams.com/#sle.
(a) 4 mils wet, 1.5 mils dry per coat.
- C. Metal, Galvanized: Ceilings and ductwork.
 1. Dryfall Waterborne Topcoats:
 - a. Flat Finish:
 - 1) 1st and 2nd Coat: Sherwin-Williams Pro Industrial Waterborne Acrylic Dryfall, B42-181 Series: www.sherwin-williams.com/#sle.
(a) 6 mils wet, 1.7 mils dry per coat.
- D. Wood: Walls, ceilings, doors, and trim.
 1. Latex Systems:
 - a. Semi-Gloss Finish:
 - 1) 1st Coat: Sherwin-Williams Premium Wall and Wood Primer, B28W8111: www.sherwin-williams.com/#sle.
(a) 4 mils wet, 1.8 mils dry per coat.
 - 2) 2nd and 3rd Coat: Sherwin-Williams ProClassic Waterborne Acrylic Semi-Gloss, B31 Series: www.sherwin-williams.com/#sle.
(a) 4 mils wet, 1.3 mils dry per coat.
- E. Drywall: Walls, ceilings, gypsum board, and similar items.
 1. Latex Systems:
 - a. Eg-Shel Finish Scuff Resistant Waterbase Enamel:
 - 1) 1st Coat: Sherwin-Williams ProMar 200 Zero VOC Interior Latex Primer, B28W2600: www.sherwin-williams.com/#sle.
(a) 4 mils wet, 1.5 mils dry per coat.
 - 2) 2nd and 3rd Coat: Sherwin-Williams Scuff Tuff Interior Waterbased Enamel, Eg-Shel, S24-50 Series: www.sherwin-williams.com/#sle.
(a) 4 mils wet, 1.2 mils dry per coat.
- F. Concrete: Floors, non-vehicular.
 1. Epoxy Systems:
 - a. Satin Finish:
 - 1) 1st and 2nd Coat: S-W ArmorSeal 8100 B70-8160 Series

(a) (5-12 mils. wet, 2-5 mils. dry per coat).

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.

3.2 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to 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 mildew from impervious surfaces by scrubbing with solution of water and bleach. Rinse with clean water and allow surface to dry.
- D. Gypsum Board: Fill minor defects with filler compound; sand smooth and remove dust prior to painting.
- E. Galvanized Surfaces:
 - 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
 - 2. Prepare surface according to SSPC-SP 2.
- F. Wood: Remove dust, grit, and foreign matter. Scrape, sand, and spot prime knots and pitch streaks. Fill nail holes and imperfections with wood filler and sand smooth.

3.3 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions.
- C. Apply coatings at spread rate required to achieve manufacturer's recommended dry film thickness.
- D. Regardless of number of coats specified, apply additional coats until complete hide is achieved.

3.4 PRIMING

- A. Apply primer to all surfaces unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.
- B. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to top coat manufacturers.

3.5 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. Clean surfaces immediately of overspray, splatter, and excess material.
- C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.6 PROTECTION

- A. Protect finished coatings from damage until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION 09 90 00

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SECTION 09 96 11 - HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and application of high-performance coating systems on the following substrates:
 - 1. Interior Substrates:
 - a. Concrete slab on grade construction.

1.2 REFERENCE STANDARDS

- A.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each type of coating system and each color and gloss of topcoat indicated.
- C. Product List: Use same designations indicated on Drawings and in Exterior High-Performance Coating Schedule and Interior High-Performance Coating Schedule. Include color designations and product runs (batch numbers).

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Sherwin-Williams Company (The).

2.2 HIGH-PERFORMANCE COATINGS

- A. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
 - 3. Products shall be of same manufacturer for each coat in a coating system.
- B. Colors: As indicated in color schedule .

2.3 METAL PRIMERS

- A. Epoxy Zinc-Rich Primer: Solvent-based, multi-component, epoxy-type anti-corrosive primer; formulated for use on cleaned ferrous metal surfaces that will be exposed to moderate industrial or marine environments.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Sherwin-Williams Company (The).
- B. Epoxy, Anti-Corrosive Primer: Solvent-based, two-component, epoxy, anti-corrosive primer; formulated for use on ferrous and galvanized metal surfaces.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Sherwin-Williams Company (The).

2.4 POLYURETHANE COATINGS

- A. Polyurethane, Two-Component, Pigmented, Semigloss: Solvent-based, two-component polyurethane, pigmented coating with a semigloss finish formulated for resistance to abrasion, weathering, chemical and solvent exposure, for use on interior or exterior brick, block, concrete, plaster, wood, and metal surfaces, where is required.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Sherwin-Williams Company (The).
 - 2. Gloss Level: Manufacturer's standard semigloss finish .

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- C. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions applicable to substrates and coating systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted.
 - 1. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 2. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed.
 - 3. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.
- D. Steel and Iron Substrates: Remove rust, loose mill scale, and shop primer if any.
 - 1. Clean using methods recommended in writing by manufacturer but not less than the following:
 - a. SSPC-SP 5/NACE No.1.
- E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- F. Galvanized-Steel Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.
- G. Aluminum Substrates: Remove loose surface oxidation.
- H. Wood Substrates:
 - 1. Scrape and clean knots. Before applying primer, apply coat of knot sealer that is recommended in writing by topcoat manufacturer for coating system indicated.
 - 2. Sand surfaces that will be exposed to view and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.

4. After priming, fill holes and imperfections in the finish surfaces with filler that is recommended in writing by topcoat manufacturer for coating system indicated. Sand smooth when dried.

3.3 APPLICATION

- A. Apply high-performance coatings in accordance with manufacturer's written instructions.
- B. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

- A. Steel Substrates:
 1. Pigmented Polyurethane over Epoxy Zinc-Rich Primer System:
 - a. Prime Coat: Primer, zinc rich, epoxy.
 - b. Intermediate Coat: Epoxy, gloss.
 - c. Topcoat: Polyurethane, two component, pigmented, semigloss .
- B. Galvanized-Steel Substrates:
 1. Pigmented Polyurethane over Epoxy Primer System:
 - a. Prime Coat: Primer, epoxy, anti-corrosive, for metal.
 - b. Intermediate Coat: Polyurethane, two component, pigmented, matching topcoat.
 - c. Topcoat: Polyurethane, two component, pigmented, semigloss .
- C. Aluminum (Not Anodized or Otherwise Coated) Substrates:
 1. Pigmented Polyurethane over Epoxy System:
 - a. Prime Coat: Primer, vinyl wash.
 - b. Intermediate Coat: Primer, epoxy, anti-corrosive, for metal.
 - c. First and Second Topcoat: Polyurethane, two component, pigmented, semigloss .

END OF SECTION 09 96 11

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SECTION 10 11 00 - VISUAL DISPLAY UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Glass markerboards.
- B. Glass markerboard wall.

1.2 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Blocking and supports.
- B. Section 09 22 16 - Non-Structural Metal Framing: Concealed supports in metal stud walls.

1.3 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2026.
- C. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2024, with Editorial Revision (2025).

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data on chalkboard, porcelain enamel steel markerboard, glass markerboard, tackboard, tackboard surface covering, trim, and accessories.
- C. Shop Drawings: Indicate wall elevations, dimensions, joint locations , special anchor details.
- D. Samples: Color charts for selection of color and texture of chalkboard, porcelain enamel steel markerboard, glass markerboard, tackboard, tackboard surface covering, and trim.
- E. Samples: Two, 2 by 2 inches in size illustrating materials and finish, color and texture of chalkboard, porcelain enamel steel markerboard, glass markerboard, tackboard, tackboard surfacing, and trim.
- F. Manufacturer's printed installation instructions.
- G. Maintenance Data: Include data on regular cleaning, stain removal .

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.6 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year warranty for chalkboard and markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.1 VISUAL DISPLAY UNITS

- A. Magnetic Glass Markerboards:
 - 1. Manufacturers:

- a. Claridge Products; Glass Markerboards: www.claridgeproducts.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
2. Glass: Laminated, low iron, 1/4 inch thick, with bevel edges and radiused corners, laminated to steel backing sheet for use with magnets. Coated or treated for use as dry erase board or projection surface.
3. Glass Finish: White back-coating.
4. Steel Backing Sheet Thickness: 24 gauge, 0.0239 inch .
5. Size: As indicated on drawings.
6. Mounting: Concealed Z clips.
7. Accessories: Provide magnetic marker tray and magnetic marker holder.
- B. Magnetic Glass Markerboard Wall: Room-size presentation surface made of multiple floor-to-ceiling glass panels.
 1. Manufacturers:
 - a. Claridge Products; Glass Markerboard Wall: www.claridgeproducts.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
 2. Glass: Back-coated glass, laminated, low iron, 1/4 inch thick, with bevel edges and radiused corners, laminated to steel backing sheet for use with magnets. Coated or treated for use as dry-erase board or projection surface.
 3. Glass Finish: White back-coating.
 4. Steel Backing Sheet Thickness: 24 gauge, 0.0239 inch .
 5. Size: As indicated on drawings.
 6. Mounting: Concealed Z clips.
 7. Adhesives: Manufacturer's recommended adhesive for substrate indicated on drawings.
 8. Accessories: Provide magnetic marker tray and magnetic marker holder.

2.2 MATERIALS

- A. Float Glass: Provide float-glass-based glazing unless otherwise indicated.
- B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
 1. Laminated Safety Glass: Comply with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.
- C. Verify flat wall surface for frameless adhesive-applied boards.

3.2 PREPARATION

- A. Acclimatize tackable wall panels by removing from packaging in installation area not less than 24 hours before application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install boards in accordance with manufacturer's instructions.
- B. Secure units level and plumb.
- C. Butt Joints: Install with tight hairline joints.

3.4 CLEANING

- A. Clean board surfaces in accordance with manufacturer's instructions.
- B. Cover with protective cover, taped to frame.
- C. Remove temporary protective cover at Date of Substantial Completion.

END OF SECTION 10 11 00

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SECTION 10 26 00 - WALL AND DOOR PROTECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Corner guards.
- B. Protective wall covering.

1.2 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Blocking for wall and corner guard anchors.
- B. Section 09 22 16 - Non-Structural Metal Framing: Placement of supports in stud wall construction.
- C. Section 09 72 00 - Wall Coverings: Terminating wall covering at wall and door protection.

1.3 REFERENCE STANDARDS

- A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2024.
- B. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents; 2021.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.
- D. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies; 2023.
- E. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.
- C. Shop Drawings: Include plans, elevation, sections, and attachment details. Show design and spacing of supports for protective corridor handrails, required to withstand structural loads.
- D. Samples: Submit samples illustrating component design, configurations, joinery, color and finish, labeled to match tags on drawings.
 - 1. Submit two sections of corner guards, in manufacturers standard sample lengths.
 - 2. Submit two samples of protective wall covering, 6 by 6 inches square.
- E. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.
- F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- G. Maintenance Data: Manufacturer's instructions for care and cleaning of each type of product. Include information about both recommended and potentially detrimental cleaning materials and methods.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.
- B. Protect work from moisture damage.
- C. Protect work from UV light damage.

- D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.
- E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

1.6 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 5-year manufacturer warranty for wall- and door-protection units. Complete forms in Owner's name and register with manufacturer.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including but not limited to detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
 - b. Deterioration of materials beyond that expected of normal use, as intended by manufacturer.
- C. Installer Warranty: Provide 5-year warranty for wall- and door-protection commencing on Date of Substantial Completion. Complete forms in Owner's name and register with installer.
 - 1. Failures include, but are not limited to, the following:
 - a. Detachment of wall-or door-protection system from substrate within expected normal use.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Corner Guards: Type: CG1,
 - 1. Provide Basis-of-Design Products listed on the Drawings.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Protective Wall Covering: Type: WP1
 - 1. Provide Basis-of-Design Products listed on the Drawings.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 PERFORMANCE CRITERIA

- A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for compliance with applicable provisions of ASTM D256 and/or ASTM F476.
- B. Chemical and Stain Resistance: Unless otherwise noted, provide protection products and assemblies with chemical and stain resistance complying with applicable provisions of ASTM D543.
- C. Fungal Resistance: Unless otherwise noted, provide protection products and assemblies which pass ASTM G21 testing.
- D. Surface Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.

2.3 PRODUCT TYPES

- A. Corner Guards - Surface Mounted with Vinyl Retainer:

1. Material (Vinyl Covers): Snap on cover of .080" thickness shall be made from chemical and stain resistant unplasticized polyvinyl chloride (uPVC) with the addition of impact modifiers. No plasticizers shall be added.
2. Material (Vinyl Retainers): Continuous vinyl retainers of .070 thickness with a Biopolymer Flex PVC apex shall be fabricated from polyvinyl chloride with the addition of impact modifiers.
3. Performance: Resist lateral impact force of 100 lbs at any point without damage or permanent set.
4. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
5. Width of Wings: As indicated on Drawings.
6. Corner: Square.
7. Color(s): As indicated on Drawings.
8. Length: One piece.
9. Mounting: Countersunk Screws through factory-drilled holes
- B. Rigid Sheet Wall Covering:
 1. Material: Unplasticized polyvinyl chloride (uPVC) with the addition of impact modifiers.
 2. Thickness: 0.040 inch.
 3. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 4. Color(s): As indicated on drawings.
 5. Accessories: Provide manufacturer's standard color-matched trim and moldings unless noted otherwise.
 - a. Corner:
 - 1) Inside Corner Trim: Standard angle
 - 2) Outside Corner Trim: Standard angle.
 - b. Top: Provide manufacturers standard color matched resilient top cap
 - c. Vertical Joints: Butt joints and provide color matched sealant.
 - 1) Joints of accessories to be aligned to joints of materials.
 6. Mounting: Adhesive.
- C. Adhesives and Primers: As recommended by manufacturer.
- D. Mounting Brackets and Attachment Hardware: Appropriate to component and substrate.
- E. See Section 06 10 00 for wood blocking for wall and corner guard anchors.

2.4 MATERIALS

- A. Plastic Materials: Chemical- and stain-resistant, high-impact-resistant plastic with integral color throughout; extruded and sheet material as required, thickness as indicated.
- B. Polycarbonate Plastic Sheet: ASTM D 6098, S-PC01, Class 1 or Class 2, abrasion resistant; with a minimum impact-resistance rating of 15 ft.-lbf/in. of notch when tested according to ASTM D 256, Test Method A.
- C. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.
- D. Adhesive: As recommended by protection product manufacturer.

2.5 FABRICATION

- A. Fabricate components with tight joints, corners and seams.
- B. Pre-drill holes for attachment.
- C. Form end trim closure by capping and finishing smooth.

2.6 SOURCE QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Provide wall and door protection systems of each type from a single source and manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.
- B. Verify field measurements prior to installation.
- C. Verify that substrate surfaces for adhered items are clean and smooth.
 - 1. Test painted or wall covering surfaces for adhesion in inconspicuous area, as recommended by manufacturer. Follow adhesive manufacturer's recommendations for remedial measures at locations and/or application conditions where adhesion test's results are unsatisfactory.
- D. Start of installation constitutes acceptance of project conditions.

3.2 INSTALLATION

- A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.
- B. Position corner guard as indicated on drawings.
- C. Coordinate installation of vinyl fabric wall covering specified in Section 09 72 00 with corner guard cover.
- D. Accessories: Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.
 - 1. Provide anchoring devices and suitable locations to withstand imposed loads.
 - 2. Where splices occur in horizontal runs of more than 20 feet, splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches apart.
 - 3. Adjust end and top caps as required to ensure tight seams.
- E. Position protective wall covering to allow for floor level variation as indicated on drawings.
 - 1. Full-Height Installation: Establish a plumb line located at edge of starting point of first sheet to ensure following sheets will be installed plumb.
 - 2. Wainscot Installation: Establish a level line at the specified height for entire length of run. Install by aligning top of edge of covering with this line.
 - a. Manufacturers finished edge to be installed at top
 - 3. Apply adhesive with 1/8 inch V-notch trowel to an area of wall surface that can be completed within cure time of the adhesive.
 - 4. Install trim pieces as required for a complete installation. Allow tolerance for thermal movement.
 - 5. At joints indicated to be caulked, allow for a minimum 1/16 inch wide gap between edges of sheets. Gaps are required to be of consistent width throughout the project.
 - 6. Use a roller to ensure maximum contact with adhesive.
 - 7. At inside and outside corners cut covering sheets to facilitate installation of trim pieces or corner guards.

3.3 TOLERANCES

- A. Maximum Variation From Required Height: 1/8 inch.
- B. Maximum Variation From Level or Plane For Visible Length: 1/8 inch.

3.4 CLEANING

- A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.
- B. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants immediately after installation.
- C. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 10 26 00

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SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Commercial toilet accessories.
- B. Commercial shower and bath accessories.
- C. Residential toilet, shower, and bath accessories.

1.2 RELATED REQUIREMENTS

- A. Section 06 10 53 Miscellaneous Rough Carpentry: Concealed supports for accessories, including in wall framing and plates.

1.3 REFERENCE STANDARDS

- A. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2022.
- B. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.
- C. ASTM C1036 - Standard Specification for Flat Glass; 2025.
- D. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2024.

1.4 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.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

1.6 WARRANTY

- A. Manufacturer's Warranty for Washroom Accessories: Manufacturer's standard 1 year warranty for materials and workmanship.
- B. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, visible silver spoilage defects.
 - 2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Commercial Toilet, Shower, and Bath Accessories:
 - 1. Basis of Design: Bobrick Washroom Equipment, Inc; www.bobrick.com
 - 2. Substitutions: Section 01 60 00 - Product Requirements.

2.2 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.
- B. Stainless Steel Sheet: ASTM A666/A666M, Type 304.
- C. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- D. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.
- E. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.3 FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.

2.4 COMMERCIAL TOILET ACCESSORIES

- A. Toilet Paper Dispenser: Single roll, surface mounted bracket type, stainless steel.
 - 1. Products:
 - a. Basis of Design: Bobrick B-6857
 - b. Substitutions: Section 01 60 00 - Product Requirements.
- B. Grab Bars: Stainless steel, smooth surface.
 - 1. Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 pound-force, minimum.
 - b. Dimensions: 1-1/2 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
 - c. Finish: Satin.
 - d. Length and Configuration: As indicated on drawings.
 - e. Products:
 - 1) Basis of Design: Bobrick B6806 Series.
 - 2) Substitutions: Section 01 60 00 - Product Requirements.

2.5 COMMERCIAL SHOWER AND BATH ACCESSORIES

- A. Shower Curtain Rod: Stainless steel tube, 1 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 2-1/2 inch square, minimum 0.04 inch thick satin-finished stainless steel flanges, for installation with exposed fasteners.
 - 1. Products:
 - a. Basis of Design: Bobrick B-6107
 - b. Substitutions: Section 01 60 00 - Product Requirements.
- B. Shower Curtain:
 - 1. Material: Opaque vinyl, 0.008 inch thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
 - 2. Size: 70 x 72 inches, hemmed edges.
 - 3. Grommets: White HDPE grommets; pierced through top hem on 6 inch centers.
 - 4. Shower Curtain Hooks: Chrome-plated or stainless steel spring wire designed for snap closure.
 - 5. Products:
 - a. Basis of Design: Bobrick B-204 series
- C. Shower Seat: Portable adjustable height bath and shower transfer bench with back and side arm.
 - 1. Seat: Polyethylene, White.
 - 2. Frame: Height Adjustable Corrosion Proof Aluminum Frame w/ rubber feet grips.
 - 3. Weight Capacity: 300 lbs

- 4. Products:
 - a. Basis of Design: Flash Furniture, Hurcules Series 300lb Capacity Adjustable Shower Transfer Bench with Back and Side Arm, DC-HY3510L-WH-GG
 - b. Substitutions: Section 01 60 00 - Product Requirements.
- D. Towel Bar: Stainless steel, 1/2 inch round tubular bar; round brackets, concealed attachment, satin finish.
 - 1. Length: 18 inches.
 - 2. Products:
 - a. Basis of Design: Bobrick B-545.
 - b. Substitutions: Section 01 60 00 - Product Requirements.

2.6 RESIDENTIAL TOILET, SHOWER, AND BATH ACCESSORIES

- A. Illuminated Mirrors: Polished edge mirror with backlit LED lighting.
 - 1. Mirror Shape: Rectangle.
 - 2. Mirror Mounting: Surface.
 - 3. Rectangle Size: 24 inches by 30 inches.
 - 4. Mirror Depth: 1-3/4 inches.
 - 5. Standard Features: Mirror defogger and lighting touch sensor.
 - 6. Power Requirement: 120V, 60 Hz. Hardwired.
 - 7. Products:
 - a. Basis of Design product as listed on drawings..
 - b. Substitutions: Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.1 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 06 10 53 Miscellaneous Rough Carpentry for installation of blocking, reinforcing plates, and concealed anchors in walls.

3.2 PREPARATION

- A. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.
- D. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
 - 1. Grab Bars: As indicated on drawings.
 - 2. Mirrors: As indicated on drawings.
 - 3. Other Accessories: As indicated on drawings.

3.4 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

3.5 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION 10 28 00

SECTION 11 30 13 - RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Kitchen appliances.
- B. Laundry appliances.

1.2 RELATED REQUIREMENTS

- A. Section 22 10 05 - Plumbing Piping: Plumbing connections for appliances.
- B. Section 26 05 83 - Wiring Connections: Electrical connections for appliances.

1.3 REFERENCE STANDARDS

- A. UL (DIR) - Online Certifications Directory; Current Edition.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.
- C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

1.6 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.
- C. Provide ten (10) year manufacturer warranty on magnetron tube of microwave ovens.
- D. Provide ten (10) year manufacturer warranty on tub and door liner of dishwashers.

PART 2 PRODUCTS

2.1 KITCHEN APPLIANCES

- A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.
- B. Refrigerator, Type 101: Free-standing, 3-Door French Door, and frost-free.
 - 1. Capacity: Total minimum storage of 28 cubic ft; minimum 15 percent freezer capacity.
 - 2. Energy Usage: Minimum 20 percent more energy efficient than energy efficiency standards set by U.S. Department of Energy (DOE).
 - 3. Features: Include glass shelves, automatic icemaker, light in freezer compartment, in-door water and ice dispenser, and ThinQ Smart Technology.
 - 4. Exterior Finish: Stainless steel.
- C. Range, Type 104: Electric, free-standing, with glass-ceramic cooktop.

1. Size: 30 inches wide.
 2. Oven: Self-cleaning with electronic ignition.
 3. Elements: Four (4).
 4. Controls: Solid state electronic.
 5. Features: Include built-in air-fry, storage drawer, oven door window, oven light, and ThinQ Smart Technology.
 6. Exterior Finish: Stainless steel.
- D. Modular Cooktop, Type 105: Electric, with glass-ceramic cooktop.
1. Size: 30 inches wide.
 2. Elements: Five (5).
 3. Features: Include ThinQ Smart Technology.
 4. Exterior Finish: Porcelain enameled steel, color as indicated.
- E. Wall Oven, Type 106: Electric, single oven.
1. Size: 30 inches wide.
 2. Oven: Self-cleaning with electronic ignition.
 3. Controls: Solid state electronic.
 4. Features: Include built-in air-fry, oven door window, oven light, and ThinQ Smart Technology.
 5. Exterior Finish: Stainless Steel.
- F. Microwave, Type 103: Over-the-range.
1. Capacity: 1.8 cubic ft.
 2. Power: 1000 watts.
 3. Features: Include turntable, cooktop light, night light, 2-speed exhaust fan, built-in trim kit, undercabinet mounting kit, and ThinQ Smart Technology.
 4. Exterior Finish: Stainless Steel..
- G. Microwave, Type[110]: Countertop.
1. Capacity: 2.0 cubic ft.
 2. Power: 1200 watts.
 3. Features: Include turntable, and bright LED lighting.
 4. Exterior Finish: Stainless Steel.
- H. Dishwasher, Type 102: Undercounter.
1. Controls: Solid state electronic.
 2. Wash Levels: Two (2).
 3. Cycles: Five (5), including normal, rinse and hold, short, china/crystal, and pot and pan.
 4. Features: Include rinse aid dispenser, optional no-heat dry, optional water temperature boost, adjustable upper rack, adjustable lower rack, and ThinQ Smart Technology.
 5. Finish: Stainless steel .

2.2 LAUNDRY APPLIANCES

- A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.
- B. Clothes Washer, Type 107: Top-loading stationary.
1. Size: Large capacity.
 2. Controls: Solid state electronic.
 3. Cycles: Include normal, permanent press, delicate, soak, and automatic soak.
 4. Number of wash speeds: 5.
 5. Features: Include optional second rinse, bleach dispenser, fabric softener dispenser, self-cleaning lint filter, sound insulation, end of cycle signal, and ThinQ Smart Technology.
 6. Finish: Painted steel , color Matte Black.
- C. Clothes Dryer, Type 108: Electric, stationary.
1. Size: Large capacity.
 2. Controls: Solid state electronic, with electronic moisture-sensing dry control.

3. Temperature Selections: Three.
4. Cycles: Include normal, permanent press, knit/delicate, and air only.
5. Features: Include interior light, reversible door, sound insulation, end of cycle signal, and ThinQ Smart Technology.
6. Finish: Painted steel , color Matte Black.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify utility rough-ins are provided and correctly located.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Anchor built-in equipment in place.

3.3 ADJUSTING

- A. Adjust equipment to provide efficient operation.

3.4 CLEANING

- A. Remove packing materials from equipment and properly discard.
- B. Wash and clean equipment.

END OF SECTION 11 30 13

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SECTION 12 24 00 - WINDOW SHADES

PART 2 PRODUCTS

END OF SECTION 12 24 00

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SECTION 12 32 16 - MANUFACTURED PLASTIC-LAMINATE-CLAD CASEWORK

PART 1 – GENERAL

1.1 REFERENCE STANDARDS

- A. ANSI A208.1 - American National Standard for Particleboard; 2022.
- B. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.
- C. AWI (QCP) - Quality Certification Program; Current Edition.

1.2 SECTION INCLUDES

- A. Fixed modular laminate clad casework and components.

1.3 RELATED SECTIONS

- A. Section 06 10 00 - Rough Carpentry, for blocking within walls where required for installing casework.
- B. Section 09 65 13 - Base molding.
- C. Section 11 30 13 - Residential Appliances.
- D. Division 22: Sinks and service fixtures, service waste lines, connections, and vents.
- E. Division 26: Electrical service fixtures.

1.4 DEFINITIONS

- A. Identification of casework components and related products by surface visibility.
 - 1. Open Interiors: Any open storage unit without solid door or drawer fronts, units with full glass insert doors and/or acrylic doors, and units with sliding solid doors.
 - 2. Closed Interiors: Any closed storage unit behind solid door or drawer fronts.
 - 3. Exposed Ends: Any storage unit exterior side surface that is visible after installation.
 - 4. Other Exposed Surfaces: Faces of doors and drawers when closed, and tops of cabinets less than 72 inches above furnished floor.
 - 5. Semi-Exposed Surfaces: Interior surfaces which are visible, bottoms of wall cabinets and tops of cabinets 72 inches or more above finished floor.
 - 6. Concealed Surfaces: Any surface not visible after installation.

1.5 QUALITY ASSURANCE

- A. Manufacturer: Minimum of 5 years experience in providing manufactured casework systems for similar types of projects, produce evidence of financial stability, bonding capacity, and adequate facilities and personnel required to perform on this project.
- B. Manufacturer: Provide products certified as meeting or exceeding ANSI-A 161.1-2000 testing standards.
- C. Single Source Manufacturer: Casework, countertops and architectural millwork products must all be engineered and built by a single source manufacturer in order to ensure consistency and quality for these related products. Splitting casework, countertops and/or architectural millwork between multiple manufacturers will not be permitted.
- D. Quality Standard: Unless otherwise indicated, comply with AWI's Architectural Woodwork Quality Standards for grades of interior architectural woodwork, construction, finishes and other requirements.

1. Provide AWI Quality Certification Program LABELS indicating that the woodwork complies with requirements of the grade specified. This project has been registered as AWI (QCP) project number (ENTER NUMBER HERE).
2. Provide AWI Quality Certification Program CERTIFICATE indicating that the woodwork complies with requirements of the grade specified. This project has been registered as AWI (QCP) project number (ENTER NUMBER HERE).
3. The contractor, upon award of work, shall register the work under this section with the AWI Quality Certification Program (Phone: 800.449.8811).

1.6 SUBMITTALS

- A. Comply with Section 01330, unless otherwise indicated.
- B. Product Data: Manufacturer's catalog with specifications and construction details.
- C. Shop Drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, plus the following specific requirements.
 1. Include section drawings of typical and special casework, work surfaces and accessories.
 2. Indicate locations of plumbing and electrical service field connection by others.
 3. Provide one set of shop drawings which includes all products within this section, engineered and built by a single source manufacturer, with seamless coordination amongst all products.
- D. Casework Samples (To be available upon request):
 1. Base cabinet: Cabinet conforming to specifications, with drawer and door.
 2. Wall cabinet: Cabinet conforming to specifications, with door.
 3. Cabinet samples shall be complete with specified hardware for doors, drawers and shelves.
 4. Component samples: Two sets of samples for each of the following:
 - a. Decorative laminate color charts / PVC and ABS edgings.

1.7 PRODUCT HANDLING

- A. Deliver completed laminate clad casework, countertops, and related products only after wet operations in building are completed, store in ventilated place, protected from the weather, with relative humidity range of 25 percent to 55 percent.
- B. Protect finished surfaces from soiling and damage during handling and installation with a protective covering.

1.8 JOB CONDITIONS

- A. Environmental Requirements: Do not install casework until permanent HVAC systems are operating and temperature and humidity have been stabilized for at least 1 week.
 1. Manufacturer/Supplier shall advise Contractor of temperature and humidity requirements for architectural casework installation areas.
 2. After installation, control temperature and humidity to maintain relative humidity between 25 percent and 55 percent.
- B. Conditions: Do not install casework until interior concrete work, masonry, plastering and other wet operations are complete.

1.9 WARRANTY

- A. All materials and workmanship covered by this section will carry a five (5) year warranty from date of acceptance.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Basis of Design Manufacturer:
 - 1. TMI Systems Corporation, 50 South Third Avenue West, Dickinson, North Dakota, 58601, Phone: 800-456-6716
 - a. Specification and Drawings are based on product characteristics, capabilities, and performance indicated by manufacturer's published literature and listed capability
- B. Acceptable Equal:
 - 1. Euronique, Inc., 7633 St. Johns Road, Eberfield, IN, 47613 (812) 983-3337
- C. Substitutions: Submitted to and Approved by Architect prior to Bidding.
 - 1. Comply with requirements of Section 01 25 00 Substitutions.
 - 2. Manufacturers meet or exceed all minimum levels of material and detailing indicated on the drawings or as specified will be be.

2.2 MATERIALS

- A. Core Materials:
 - 1. Particleboard up to 7/8 inch thick: Industrial Grade average 45-pound density particleboard, ANSI A208.1-2009, M-2 requirements.
 - 2. Particleboard 1 inch thick and thicker: Industrial Grade average 45-pound density particleboard, ANSI A208.1-2009, M-2 requirements.
 - 3. Medium Density Fiberboard 1/4 inch thick: Minimum average density 45-50 lbs., ANSI A208.2-2009 requirements.
 - 4. MR Moisture Resistant Particleboard: Average 45-pound density particleboard, ANSI A208.1-2009, M-2 requirements.
 - 5. Toe Base Plywood: 3/4 inch thickness, CC/CD/CDC grades, of western softwood veneers, with NAUF exterior fully water resistant phenolic glues.
- B. Decorative Laminates: GREENGAURD Indoor Air Quality Certified
 - 1. High-pressure decorative laminate VGS (.028), NEMA Test LD 3-2005.
 - 2. High-pressure decorative laminate HGS (.048), NEMA Test LD 3-2005.
 - 3. High-pressure decorative laminate HGP (.039), NEMA Test LD 3-2005.
 - 4. High-pressure cabinet liner CLS (.020), NEMA Test LD 3-2005.
 - 5. High-pressure backer BKH (.048), (.039), (.028), NEMA Test LD3-2005.
 - 6. Thermally fused melamine TFL laminate, NEMA Test LD 3-2005. (TFL allowed on casework interiors only, as specified below. Utilization of TFL on any exterior casework surfaces, including door and drawer faces and finished ends, will not be permitted.)
- C. Laminate Color Selection: Maximum 1 color per unit face and 5 colors per project. (See Color Selection in section 3.05).
- D. Edging Materials:
 - 1. 1mm PVC banding, machine applied.
 - 2. 3mm PVC banding, machine applied and machine profiled to 1/8 inch radius.

2.3 SPECIALTY ITEMS

- A. Support Members:
 - 1. Countertop support brackets: Epoxy powder coated, 11 gauge steel with integral cleat mount opening and wire management opening.
 - 2. Undercounter support frames: Epoxy powder coated.

2.4 CABINET HARDWARE

- A. Hinges:
 - 1. Five knuckle, epoxy powder coated, institutional grade, 2-3/4 inch overlay type with hospital tip. 0.095 inch thick. ANSI-BHMA standard A156.9, Grade 1.
 - a. Doors 48 inches and over in height have 3 hinges per door.
 - b. Magnetic door catch with maximum 5 pound pull provided, attached with screws and slotted for adjustment.
- B. Pulls:
 - 1. Petite Bow Pull (Finish option: Brushed Nickel)
 - 2. All pulls with 96mm spacing on screws. Pull designs shall comply with the Americans with Disability Act (ADA).
- C. Drawer Slides:
 - 1. Regular, kneespace and pencil: 100-pound load rated epoxy coated steel, bottom corner mounted with smooth and quiet nylon rollers. Positive stop both directions with self-closing feature. Paper storage, 150-pound load rated epoxy coated steel slides.
 - 2. File: Full extension, 150-pound load rated epoxy coated steel, bottom corner mounted with smooth and quiet nylon rollers. Positive stop both directions with self-closing feature.
- D. Adjustable Shelf Supports:
 - 1. Injection molded transparent polycarbonate friction fit into cabinet end panels and vertical dividers, adjustable on 32mm centers. Each shelf support has 2 integral support pins, 5mm diameter, to interface pre-drilled holes, and to prevent accidental rotation of support. The support automatically adapts to 3/4 inch or 1 inch thick shelving and provides non-tip feature for shelving. Supports may be field fixed if desired. Structural load to 1200 pounds (300 pounds per support) without failure.
- E. Locks:
 - 1. Removable core, disc tumbler, cam style lock with strike. Lock for sliding 3/4 inch thick doors is a disc type plunger lock, sliding door type with strike. Lock for sliding glass/acrylic doors is a ratchet type sliding showcase lock.
 - 2. Elbow catch or chain bolt used to secure inactive door on all locked cabinets.
- F. Sliding Door Track: Anodized aluminum double channel.
- G. Coat Rods: 1 inch diameter, 14-gauge chrome plated steel installed in captive mounting hardware.
- H. File Suspension System: Extruded molding integral with top of drawer box sides to accept standard hanging file folders.
- I. Mirrors: 1/8 inch thick mirrored acrylic, break and impact resistant.
- J. Door Restraints: Chain, anchored to door and cabinet with sufficient length to prevent pulls from impacting adjacent walls, equipment, or casework.

2.5 FABRICATION:

- A. Fabricate casework, countertops and related products to dimensions, profiles, and details shown.
- B. All casework panel components must go through a supplemental sizing process after cutting, producing a panel precisely finished in size and square to within 0.010 inches, ensuring strict dimensional quality and structural integrity in the final fabricated product.
- C. Cabinet Body Construction:
 - 1. Tops and bottoms are glued and doweled to cabinet sides and internal cabinet components such as fixed horizontals, rails and verticals. Minimum 6 dowels each joint for 24 inch deep cabinets and a minimum of 4 dowels each joint for 12 inch deep cabinets. (Mechanical or metal hardware fasteners joining cabinet top and bottom panels to the sides will not be accepted.)
 - a. Tops, bottoms and sides of all cabinets are particleboard core.

2. Cabinet backs: 1/4 inch thick medium density fiberboard panel fully captured by the cabinet top, bottom and side panels. Finish to match cabinet interior. 3/4 inch x 4 inch particleboard rails will be placed behind the back panel at the top and bottom, and doweled to the sides utilizing 10mm hardwood fluted dowels. A third intermediate rail will be included on all cabinets taller than 56 inches. Utilize hot melt glue to further secure back and increase overall strength.
 - a. Exposed back on fixed or movable cabinets: 3/4 inch thick particleboard with the exterior surface finished in VGS laminate as selected.
 3. Fixed base and tall units have an individual factory-applied base, constructed of 3/4 inch thick plywood. Base is 102mm (nominal 4 inch) high unless otherwise indicated on the drawings.
 4. Base units, except sink base units: Full sub-top glued and doweled to cabinet sides. (Mechanical or metal hardware fasteners joining cabinet sub-top panel to the sides will not be accepted.)
 - a. Sink base units are provided with open top and a stretcher at the front, attached to the sides. Back to be split removable access panel.
 5. Side panels and vertical dividers shall receive adjustable shelf hardware at 32mm line boring centers. Mount door hinges, drawer slides and pull-out shelves in the line boring for consistent alignment.
 6. Exposed and semi exposed edges.
 - a. Edging: 1mm PVC machine applied.
 7. Adjustable Shelves in Cabinets
 - a. Core: Particleboard.
 - b. Core Thickness: 3/4 inch up to 30 inches wide, 1 inch over 30 inches wide.
 - c. Edge: 1mm PVC on Front Edge Only.
 8. Interior finish, units with open Interiors:
 - a. Top, bottom, back, sides, horizontal and vertical members, and adjustable shelving faces with high-pressure decorative VGS laminate. Use of TFL on exposed open interiors will not be permitted.
 9. Interior finish, units with closed Interiors:
 - a. Top, bottom, back, sides, horizontal and vertical members, and adjustable shelving faces with TFL Thermally Fused Melamine laminate.
 10. Exposed ends:
 - a. Faced with high-pressure decorative VGS laminate. Use of TFL on exposed ends will not be permitted.
 11. Wall unit bottom:
 - a. Faced with high-pressure decorative VGS laminate. Use of TFL on wall unit bottoms will not be permitted.
 12. Balanced construction of all laminated panels is mandatory. Unfinished core stock surfaces, even on concealed surfaces (excluding edges), are not permitted.
- D. Drawers:
1. Sides, back and sub front: Minimum 1/2 inch thick particleboard, laminated with TFL Thermally Fused Melamine, doweled and glued into sides. Top edge banded with 1mm PVC.
 2. Drawer bottom: Minimum 1/2 inch thick particleboard laminated with TFL Thermally Fused Melamine, screwed directly to the bottom edges of drawer box.
- E. Door/Drawer Fronts:
1. Core: 3/4 inch thick particleboard.
 2. High-pressure decorative VGS laminate exterior, balanced with high-pressure cabinet liner CLS. Use of TFL on exterior or interior surfaces of door/drawer fronts will not be permitted.
 3. Edges: 3mm PVC, machine applied, external edges and outside corners machine profiled to 1/8 inch radius.
 4. Provide double doors in opening in excess of 24 inches wide.

- F. Miscellaneous Shelving (not in Cabinets):
 - 1. Core material: 1 inch thick particleboard.
 - 2. High-pressure decorative VGS laminate on both faces.
 - 3. Edges: 3mm PVC, external edges and outside corners machine profiled to 1/8 inch radius.

PART 3- EXECUTION

3.1 INSPECTION:

- A. The casework contractor must examine the job site and the conditions under which the work under this section is to be performed, and notify the building owner in writing of unsatisfactory conditions. Do not proceed with work under this Section until satisfactory conditions have been corrected in a manner acceptable to the installer.

3.2 PREPARATION:

- A. Condition casework to average prevailing humidity conditions in installation areas prior to installing.

3.3 INSTALLATION:

- A. Erect casework, plumb, level, true and straight with no distortions. Shim as required. Where laminate clad casework abuts other finished work, scribe and cut to accurate fit.
- B. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind.
- C. Repair minor damage per plastic laminate manufacturer's recommendations.

3.4 CLEANING:

- A. Remove and dispose of all packing materials and related construction debris.
- B. Clean cabinets inside and out. Wipe off fingerprints, pencil marks, and surface soil etc., in preparation for final cleaning by the building owner.

END OF SECTION 12 32 16

SECTION 12 36 00 - COUNTERTOPS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Countertops for manufactured casework.
- B. Wall-hung counters and vanity tops.
- C. Sinks molded into countertops.

1.2 RELATED REQUIREMENTS

1.3 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.
- B. AWI (QCP) - Quality Certification Program; Current Edition.
- C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- E. IAPMO Z124 - Plastic Plumbing Fixtures; 2022, with Editorial Revision.
- F. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.
- G. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- H. PS 1 - Structural Plywood; 2023.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Specimen warranty.
- C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.
- D. Verification Samples: For each finish product specified, minimum size 4 inches square, representing actual product, color, and patterns.
- E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
- F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- G. Installation Instructions: Manufacturer's installation instructions and recommendations.
- H. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Minimum three years documented experience in fabricating solid surfacing countertops similar in scope and complexity to this Proejct.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.
- C. Quality Certification:

1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
2. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
3. Provide designated labels on shop drawings as required by certification program.
4. Provide designated labels on installed products as required by certification program.
5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 FIELD CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed before countertop fabrication is complete.
- C. Coordinate locations of utilities that will penetrate countertops or backsplashes.

1.8 WARRANTY

- A. Manufacturer's Limited Warranty: Provide manufacturer's standard 10 Year Commerical Warranty against defects in solid surface sheet materials.

PART 2 PRODUCTS

2.1 COUNTERTOPS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Solid Surfacing Countertops: Solid surfacing sheet over continuous substrate.
 1. Flat Sheet Thickness: 1/2 inch, minimum.
 2. Solid Surfacing Sheet: Complying with ISFA 2-01 and NEMA LD 3; acrylic resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Manufacturers: Provide Basis-of-Design product listed on Drawings.
 - b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 - c. NSF approved for food contact.
 - d. Sinks and Bowls: Integral castings; minimum 3/4 inch wall thickness; comply with IAPMO Z124.
 - 1) Basis of Designs as listed below. Provide product specified, or approved equal submitted in accordance with 01 60 00 - Product Requirements
 - e. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 - f. Color and Pattern: As indicated on drawings.
 3. Other Components Thickness: 1/2 inch, minimum.
 4. Exposed Edge Treatment: Built up to minimum 1-1/2" thick; square edge.

5. Back and End Splashes where shown on Drawings: Same sheet material, square top; height as indicated on drawings.

2.2 MATERIALS

- A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.
- B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- C. Joint Sealant: Mildew-resistant silicone sealant, clear.

2.3 ACCESSORIES

- A. Fixed Top-Mounted Countertop Support Brackets:
 1. Material: Steel.
 2. Finish: Manufacturer's standard, factory-applied, textured powder coat.
 3. Color: White.
 4. Products:
 - a. Provide basis of design products listed on drawings..
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.4 FABRICATION

- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
 1. Grade: Custom
- B. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
 1. Join lengths of tops using best method recommended by manufacturer.
 - a. Joint Locations: Not within 450 mm (18 inches) of a sink or cooktop and not where a countertop section less than 900 mm (36 inches) long would result, unless unavoidable.
 - b. Identify all joints required in the shop drawings for approval.
 2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall, or otherwise indicated on Drawings.
 3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
 4. Cut-outs and Holes:
 - a. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
 - 1) Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch (5 mm) into fixture opening.
 - b. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
- C. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
 1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
 2. Height: 4 inches, unless otherwise indicated.
- D. Solid Surfacing: Fabricate tops and wall panels up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.
 1. Integral sinks: Shop-mount securely to countertop with adhesives, using flush configuration, as per manufacturer's instructions.
- E. Wall-Mounted Counters: Provide skirts, aprons, brackets, and braces as indicated on drawings, finished to match.

- F. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 3 EXECUTION

3.1 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.
- C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install vanities in accordance with manufacturer's instructions and approved shop drawings
- B. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- C. Seal joint between back/end splashes and vertical surfaces.
- D. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- E. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- F. Fasten wall protection to walls with adhesive as recommended by manufacturer. Provide sealant in color to match solid surface at interior corners and around full perimeter of panel.
- G. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
- H. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

3.4 TOLERANCES

- A. Variation From Horizontal: 1/8 inch in 10 feet, with a 1/4 inch maximum.
- B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.
- C. Field Joints: 1/8 inch wide, maximum.

3.5 CLEANING

- A. Clean countertops surfaces thoroughly.

3.6 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 12 36 00

SECTION 12 61 00 - CLASSROOM FURNITURE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Loose tables, chairs, and seating furniture.

1.2 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary of Work for alternates affecting work of this section.

1.3 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed data sheets for products specified.
- C. Selection Samples: Manufacturer's color charts and swatches for fabric upholstery, indicating full range of materials, colors, and patterns available.
- D. Verification Samples: Full-size two-seat fabricated sample of each type of chair specified, including all accessories and one end panel, illustrating all finishes and workmanship to be expected in the finished Work; approved sample may be incorporated into the Work.
- E. Installer's qualification statement.
- F. Warranty: Submit installer warranty and ensure that forms have been completed in Owner's name and registered with installer.
- G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- H. Maintenance Materials:
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer certified in writing by the furniture manufacturer to be qualified for installation of specified seating.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver furniture to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.
- B. Store furniture in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

1.7 FIELD CONDITIONS

- A. Ambient Conditions: Continuously maintain ambient temperature and humidity conditions at values near those indicated for final occupancy for minimum of one week before, during, and after installation of seating.

1.8 WARRANTY

- A. Manufacturer Warranty: Provide 10-year manufacturer warranty for interior fixed seating. Complete forms in Owner's name and register with manufacturer.

- B. Installer Warranty: Provide 10-year warranty for installation of interior fixed seating commencing on the Date of Substantial Completion. Complete forms in Owner's name and register with installer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Classroom tables, chairs, and stools:
 - 1. KI, 1330 Bellevue Street, Greenbay, WI 54302.
 - a. Sales Representative Contact: Char Bennett, (317) 313-1742, char.bennett@ki.com

2.2 LOOSE CLASSROOM TABLES

- A. As indicated in Furniture Schedule.

2.3 LOOSE CLASSROOM CHAIRS

- A. As indicate in the Furniture Schedule.

2.4 LOOSE COUNTER STOOLS

- A. As indicated on the Furniture Schedule.

2.5 MATERIALS

- A. As indicated in the Furniture Schedule.

2.6 FINISHES

- A. As indicated in the Furniture Schedule.

2.7 ACCESSORIES

- A. As indicated in the Furniture Schedule.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates for conditions detrimental to installation of fixed audience seating. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's installation instructions.

3.3 ADJUSTING

- A. Repair minor abrasions and imperfections in painted finishes with a coating that matches factory-applied finish; replace units that cannot be repaired to unblemished appearance.
- B. Replace upholstery fabric damaged or soiled during installation.

3.4 SCHEDULE - IMMEDIATELY FOLLOWING THIS SECTION.

ENDOF SECTION 12 61 00



CREATED 7/23/2026
VALID THROUGH
Prepared By Char Bennett
Quote Filename Indiana State University: Occupational Therapy - 26CAB-805650/C

Line	Model	Qty.	Sell Price	Extended Total	TBD Options
Tag 1: Classroom					
1.1	PINR1860T-74P	Pirouette,Nesting Training,Rectangular,18x60",74P Edge			
		TOP SELLER Edge Color Designer White edge /EDR Grommet/Power Option No grommets, power, wire management/No cutouts /NNN Leg Finish Cool Grey /CG Casters/Glides 4 black casters w/silver hub (2 locking) /4EC Modesty Panel No modesty panel /NMP Laminate Laminate Grade 1 LAMG1 Laminate Finish Grade 1 KI standard laminates LAMGRD1STD Grade 1 KI standard laminates DESIGNER WHITE D354-60 /LDR Lead Time: 3 - 5 Weeks; Ships from BONDUEL, WI Please Note: Leadtime calculated on 7/28/2026 and is subject to change.			
1.2	SNNAU	Strive Nesting Armless Chair,Uphol Seat			
		TOP SELLER Frame Color Cool Grey /CG Upholstery Grade/Color Pallas Fabric Group P0 GRPP0 P0 Fabric PALLAS LUMIERE LUMIERE PALLAS LUMIERE MIDNIGHT /27.341.103 Poly Seat & Back Color Cool Grey /PCG Base Option Carpet casters (black only) /C Lead Time: 4 - 6 Weeks; Ships from GREEN BAY, WI Please Note: Leadtime calculated on 7/28/2026 and is subject to change.			
Tag 1: Classroom				Workgroup Product Subtotal	
Tag 1: OT Clinic					
2.1	ZYLNCC	Zoetry Lounge Loveseat			
		Upholstery Grade/Color Fabric Grade F F Fabric PALLAS LUMIERE LUMIERE PALLAS LUMIERE HAZE /27.341.082 Armcap Material No armcap /NAC Power Option No power /NP Glide option Plastic glides /GPL Base/Leg Finish Cool Grey /CG Thread Color Coordinating Color (closest matching thread color will be selected by the factory-reference the sample thread color card) /TXX Lead Time: 7 - 9 Weeks; Ships from HIGH POINT, NC Please Note: Leadtime calculated on 7/28/2026 and is subject to change.			
2.2	ZYT2244T	Zoetry Cocktail Table, 22 x 44, Laminate Top			
		Power Option No power /NP Glide option Plastic glides /GPL Base/Leg Finish Cool Grey /CG Laminate Laminate Grade 1 LAMG1 Laminate Finish Grade 1 KI standard laminates LAMGRD1STD Grade 1 KI standard laminates DESIGNER WHITE D354-60 /LDR Edge Pick (73P) Designer White edge /EDR Lead Time: 8 - 10 Weeks; Ships from HIGH POINT, NC Please Note: Leadtime calculated on 7/28/2026 and is subject to change.			



CREATED 7/23/2026
VALID THROUGH 8/22/2026
Prepared By Char Bennett
Quote Filename Indiana State University: Occupational Therapy - 26CAB-805650/C

Line	Model	Qty.		Sell Price	Extended Total	TBD Options
2.3	ZYT2222T		Zoetry End Table, 22 x 22, Laminate Top			
			Power Option Glide option Base/Leg Finish Laminate Laminate Finish Grade 1 KI standard laminates Edge Pick (73P)	No power Plastic glides Cool Grey Laminate Grade 1 Grade 1 KI standard laminates DESIGNER WHITE D354-60 Designer White edge	/NP /GPL /CG LAMG1 LAMGRD1STD /LDR /EDR	
			Lead Time: 8 - 10 Weeks; Ships from HIGH POINT, NC Please Note: Leadtime calculated on 7/28/2026 and is subject to change.			
2.4	LL1200		Limelite Four-Leg Armless Chair with Glides, Uph Seat/Poly Back			
			TOP SELLER Shell Color Frame finish Glide Option Upholstery Grade/Color P0 Fabric PALLAS LUMIERE	Nordic Cool Grey Plastic glides Pallas Fabric Group P0 PALLAS LUMIERE MIDNIGHT	/PND /CG /GPL GRPP0 LUMIERE /27.341.103	
			Lead Time: 3 - 5 Weeks; Ships from GREEN BAY, WI Please Note: Leadtime calculated on 7/28/2026 and is subject to change.			
2.5	LL4200H24		Limelite Four-Leg Armless Cafe Stool, Uph Seat/Poly Back, 24" High			
			TOP SELLER Shell Color Frame finish Glide Option Upholstery Grade/Color P0 Fabric PALLAS LUMIERE	Nordic Cool Grey Plastic glides Pallas Fabric Group P0 PALLAS LUMIERE MIDNIGHT	/PND /CG /GPL GRPP0 LUMIERE /27.341.103	
			Lead Time: 3 - 5 Weeks; Ships from GREEN BAY, WI Please Note: Leadtime calculated on 7/28/2026 and is subject to change.			
2.6	PINR1860T-74P		Pirouette, Nesting Training, Rectangular, 18x60", 74P Edge			
			TOP SELLER Edge Color Grommet/Power Option Leg Finish Casters/Glides Modesty Panel Laminate Laminate Finish Grade 1 KI standard laminates	Designer White edge No grommets, power, wire management/No cutouts Cool Grey 4 black casters w/silver hub (2 locking) No modesty panel Laminate Grade 1 Grade 1 KI standard laminates DESIGNER WHITE D354-60	/EDR /NNN /CG /4EC /NMP LAMG1 LAMGRD1STD /LDR	
			Lead Time: 3 - 5 Weeks; Ships from BONDUEL, WI Please Note: Leadtime calculated on 7/28/2026 and is subject to change.			
2.7	SNNAU		Strive Nesting Armless Chair, Uphol Seat			
			TOP SELLER Frame Color Upholstery Grade/Color P0 Fabric PALLAS LUMIERE Poly Seat & Back Color Base Option	Cool Grey Pallas Fabric Group P0 PALLAS LUMIERE MIDNIGHT Cool Grey Carpet casters (black only)	/CG GRPP0 LUMIERE /27.341.103 /PCG /C	
			Lead Time: 4 - 6 Weeks; Ships from GREEN BAY, WI Please Note: Leadtime calculated on 7/28/2026 and is subject to change.			
2.8	RMWFD363		Roomscape Freestanding Dresser, 3 Drawer, Lam Front, 10-1/2" Drawers			
			Lock Option Finish Color Laminate Color	No lock (standard) Cool Grey River Cherry	/NL /CG /LRY	
			Lead Time: 4 - 6 Weeks; Ships from PEMBROKE, ONT Please Note: Leadtime calculated on 7/28/2026 and is subject to change.			



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VALID THROUGH 8/22/2026
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Line	Model	Qty.	Sell Price	Extended Total	TBD Options
2.9	RMWMP24BBF				
	Lock Option	No lock (standard)	/NL		
	Finish Color	Cool Grey	/CG		
	Laminate Color	River Cherry	/LRY		
	Lead Time: 4 - 6 Weeks; Ships from PEMBROKE, ONT				
	Please Note: Leadtime calculated on 7/28/2026 and is subject to change.				
Tag 1: OT Clinic				Workgroup Product Subtotal	

SECTION 20 00 10 – COMMON WORK RESULTS FOR FIRE SUPPRESSION, PLUMBING AND HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this and all Sections of Divisions 20, 21, 22 and 23.

1.2 SUMMARY

- A. This Section includes general administrative and procedural requirements for mechanical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 1:
 - 1. Requirements of Regulatory Agencies.
 - 2. Abbreviations Contained in Specifications.
 - 3. Shop Drawings.
 - 4. Record Drawings
 - 5. Operation and Maintenance Manuals.
 - 6. Drawings.
 - 7. Construction Documents.
 - 8. Work and Workmanship.
 - 9. Coordination between Contractors.
 - 10. Assignment of Miscellaneous Work.
 - 11. Equipment Warranty and Early Equipment Startup.
 - 12. Material Equipment Transport
 - 13. Material Storage.
 - 14. Product and Material Approval.
 - 15. Protection and Treatment of Property.
 - 16. Demolition and Removal of Equipment.
 - 17. Electrical Connections to Equipment and Control Wiring.
 - 18. Attaching to Building Construction.
 - 19. Rough-ins.
 - 20. Mechanical Installations.
 - 21. Cleaning and Touch-up.
 - 22. General Completion Startup/Owner Orientation.
 - 23. Air Filters.

1.3 REQUIREMENT OF REGULATORY AGENCIES

- A. All materials and workmanship shall comply with all applicable codes, specifications, local ordinances, industry standards and utility company regulations.
- B. In case of difference between building codes, specifications, state laws, local ordinances, industry standards, utility company regulations and Contract Documents, the most stringent shall govern. Contractor shall promptly notify Engineer in writing of any such difference.

- C. Non-compliance: should Contractor perform any work that does not comply with requirements of applicable building codes, state laws, local ordinances, industry standards and utility company regulations, he shall bear all costs arising in correcting the deficiencies.
- D. Applicable codes and standards shall include all state laws, local ordinances, utility company regulations and applicable requirements of the most recent editions of the following nationally accepted codes and standards:
 - 1. The Indiana Building Code. (IBC)
 - 2. The Indiana Electric Code.
 - 3. The Indiana Mechanical Code. (IMC)
 - 4. The Indiana Fuel-Gas Code.
 - 5. The Indiana Fire Code.
 - 6. The Indiana Plumbing Code. (IPC)
 - 7. The Indiana Elevator Code.
 - 8. The Indiana Handicapped Accessibility Code.
 - 9. National Fire Protection Associates (NFPA) codes and regulations.
 - 10. Regulations of the Indiana State Board of Health.
 - 11. Regulations of the Insurance Bureau of Indiana.
 - 12. Requirements of Factory Mutual (FM).
 - 13. Regulations of the Indiana Department of Fire Prevention and Building Services.
 - 14. The Americans with Disabilities Act (ADA).
 - 15. All local and municipal codes and/or regulations.
- E. Except as otherwise specified herein, all piping work and materials are to conform to the American Standards Association Code for Pressure Piping.
- F. All fired and unfired pressure vessels furnished and installed under this contract are to conform to all requirements of current edition of State of Indiana Rules and Regulations for Boilers and Unfired Pressure Vessels. Copies of all certificates of tests and construction as required by this code to be turned over to Owner.
- G. Permits: Contractor shall pay for all building permits required by work and permits for opening streets and for connection to various utilities, including fees for water meter installation and any other requirements necessary to carry out his work. Where streets or sidewalks are cut, same must be repaired to at least as good a condition as they were before, all at expense of this Contractor. Permits shall be posted in a prominent place at building site properly protected from weather and physical damage. Where applicable (i.e. ESSER-funded), acquire and display required workplace posters. Maintain and adhere to all project, wage-rate and payroll documentation processes and requirements.

1.4 ABBREVIATIONS CONTAINED IN SPECIFICATIONS

- A. AABC Associated Air Balance Council
- B. AASHTO American Assn. of State Highway and Transportation Officials
- C. ABMA American Bearing Manufacturers Association (formerly Anti-Friction Bearing Manufacturers Associates)
- D. ABMA American Boiler Manufacturers Association
- E. ACI American Concrete Institute
- F. ACIL The Association of Independent Scientific, Engineering, and Testing Firms
- G. ACPA American Concrete Pipe Association
- H. ADA Americans with Disabilities Act
- I. ADC Air Diffusion Council

J.	AFBMA	Anti-Friction Bearing Manufacturers Association (see ABMA)
K.	AGA	American Gas Association
L.	AIA	American Insurance Association
M.	AIHA	American Industrial Hygiene Association
N.	AISC	American Institute of Steel Construction
O.	AISI	American Iron and Steel Institute
P.	AMA	Air Moving & Conditioning Association
Q.	AMCA	Air Movement and Control Association International, Inc.
R.	ANSI	American National Standards Institute
S.	API	American Petroleum Institute
T.	AREA	American Railway Engineering Association
U.	ARI	Air-Conditioning and Refrigeration Institute
V.	ASA	American Standards Association
W.	ASA	Acoustical Society of America
X.	ASC	Adhesive and Sealant Council
Y.	ASHRAE	American Society of Heating, Refrigerating & Air-Conditioning Engineers
Z.	ASME	American Society of Mechanical Engineers
AA.	ASPE	American Society of Plumbing Engineers
BB.	ASTM	American Society for Testing Materials
CC.	AWS	American Welding Society
DD.	AWWA	American Water Works Association
EE.	AABC	Associated Air Balance Council
FF.	CAGI	Compressed Air and Gas Institute
GG.	CE	Corps of Engineers (U.S. Department of the Army)
HH.	CGA	Compressed Gas Association
II.	CISPI	Cast Iron Soil Pipe Institute
JJ.	CPPA	Corrugated Polyethylene Pipe Association
KK.	CTI	Cooling Tower Institute
LL.	DIPRA	Ductile Iron Pipe Research Association
MM.	DOT	Department of Transportation
NN.	EPA	Environmental Protection Agency
OO.	FAA	Federal Aviation Administration
PP.	FCC	Federal Communications Commission
QQ.	FDA	Food and Drug Administration
RR.	FIA	Factory Insurance Association
SS.	FCI	Fluid Controls Institute
TT.	FM	Factory Mutual System
UU.	HEI	Heat Exchange Institute
VV.	HI	Hydraulic Institute
WW.	HI	Hydronics Institute (Division of Gas Appliance Manufacturers Association)
XX.	INCE	Institute of Noise Control Engineering
YY.	IEEE	Institute of Electrical & Electronic Engineers
ZZ.	IRI	Industrial Risk Insurance
AAA.	ISA	International Society for Measurement and Control
BBB.	ITS	Intertek Testing Services (Formerly Inchcape Testing Services)
CCC.	MCAA	Mechanical Contractors Association of America
DDD.	MSS	Manufacturing Standardization Society of the Valve and Fittings Industry
EEE.	NACE	National Association of Corrosion Engineers
FFF.	NBS	National Bureau of Standards
GGG.	NCAC	National Council of Acoustical Consultants
HHH.	NCCA	National Coil Coaters Association
III.	NCPI	National Clay Pipe Institute
JJJ.	NCSPA	National Corrugated Steel Pipe Association
KKK.	NEBB	National Environmental Balancing Bureau

LLL.	NEC	National Electric Code
MMM.	NECA	National Electrical Contractors Association
NNN.	NEMA	National Electrical Manufacturers Association
OOO.	NETA	InterNational Electrical Testing Association
PPP.	NFPA	National Fire Protection Association
QQQ.	NIA	National Insulation Association (Formerly National Insulation and Abatement)
RRR.	NIST	National Institute of Standards and Technology (U.S. Department of Commerce)
SSS.	NUSIG	National Uniform Seismic Installation Guidelines
TTT.	OSHA	Occupational Safety & Health Administration (U.S. Department of Labor)
UUU.	PCA	Portland Cement Association
VVV.	PDI	Plumbing and Drainage Institute
WWW.	PPFA	Plastic Pipe and Fittings Association
XXX.	PPI	Plastics Pipe Institute
YYY.	RMA	Rubber Manufacturers Association
ZZZ.	SAE	SAE International
AAAA.	SAE	Society of Automotive Engineers
BBBB.	SMACNA	Sheet Metal & Air Conditioning Contractors' National Association
CCCC.	STI	Steel Tank Institute
DDDD.	SWPA	Submersible Wastewater Pump Association
EEEE.	UL	Underwriters Laboratories
FFFF.	UNI	Uni-Bell PVC Pipe Association
GGGG.	WSC	Water Systems Council

1.5 SHOP DRAWINGS

- A. Review of Shop Drawings does not relieve Contractor of responsibility for correct ordering of material and equipment.
- B. Contractor review should ensure that equipment will fit into available space.
- C. Shop Drawings shall be prepared and submitted in accordance with Division 1 "Submittals".
- D. Include all significant data on Shop Drawing Submittals shown in Specifications and Equipment Schedule. Including, but not limited to the following:
 - 1. Name each piece of equipment by scheduled name, noted as: "Mark No." as indicated on drawings, i.e., FC-A, CSAC-A, etc.
 - 2. Pressure drops at design flow.
 - 3. Electrical characteristics and wiring diagrams: Power, signal, and control wiring. Wiring diagrams must match the equipment provided. Custom factory wiring such as terminal strip designations must be provided. Costs associated with field changes required if accurate wiring diagrams are not provided shall be borne by the equipment manufacturer.
 - 4. Description of construction and material types and gauge of materials used.
 - 5. Entering and leaving air and or water temperature at design conditions.
 - 6. Performance characteristics/efficiency.
 - 7. Dimensional drawing showing locations of all field connections including piping, control, power and sheet metal as well as equipment configuration.
 - 8. Dimensional drawing showing locations of all field connections including piping, control, power and sheet metal as well as equipment configuration.
 - 9. Note any special tools required for equipment service.
- E. Items Requiring Submittals:

1. Each individual section lists the required items to be submitted.

1.6 RECORD DRAWINGS

- A. Contractor shall be responsible for furnishing to Engineer a complete, accurate and neat set of marked-up blueline drawings in accordance with Division 1. This set shall contain all deviations between actual construction and Contract Drawings.
- B. Contractor shall maintain a mark-up set of as-built drawings on the project site and shall keep all drawings up-to-date as construction progresses. This marked-up set shall be returned to Contractor, as many times as necessary, in order to obtain desired results.
- C. Engineer's employees shall inspect Drawings regularly on project site for accuracy and omissions. Pay request will not be approved if marked-up record drawings are not onsite and up to date.
- D. Refer to Division 1 "PROJECT CLOSEOUT" for further instructions.

1.7 CONSTRUCTION DOCUMENTS

- A. Construction documents shall include all divisions of specifications, all drawings and all issued addenda.
- B. In a case of conflict between the drawings and specifications, or between divisions of specifications, the most stringent condition shall apply.

1.8 OPERATION AND MAINTENANCE MANUALS

- A. Prepare Operation and Maintenance Manuals including the following information for equipment items:
 1. Complete index identifying contents of manual. Also provide a comprehensive list of manufacturers, suppliers, subcontractors, etc., with name of contact person, address and phone number for each manufacturer, supplier and subcontractor.
 2. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and exploded drawing of devices with names and part numbers of replacement parts.
 3. Complete set of reviewed shop drawings.
 4. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
 5. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
 6. Servicing instructions and lubrication charts and schedules.
 7. Warranty letter from contractor stating general warranty and any extended warranty items included in this contract.
 8. Refer to Division 1 "Contract Closeout" for additional instructions.
 9. O&M Manuals shall also be submitted in electronic format and neatly organized to the satisfaction of the engineer.

1.9 DRAWINGS

- A. Mechanical Drawings show general arrangement of all piping, equipment and appurtenances. They shall be followed as closely as actual building construction and work of other trades will permit. Mechanical work shall conform to requirements shown on all Drawings. General and Structural Drawings shall take precedence over Mechanical Drawings. Because of small scale of Mechanical Drawings, it is not possible to indicate all offsets, fittings and accessories, which may be required. Contractor shall investigate structural and finish conditions affecting work and shall arrange his work accordingly, providing such fittings, valves and accessories as may be required to meet such conditions.
- B. For purpose of clarity and legibility, Drawings are essentially diagrammatic, although size and location of equipment and piping are drawn to scale wherever possible. Verify Contract Document information at site.
- C. Drawings indicate required sizes and points of termination of pipes and ducts and suggested routes. It is not the intention of Drawings to indicate all necessary offsets. Install work in manner to conform to structure, avoid obstructions, preserve headroom and keep openings and passageways clear. Do not scale from Drawings.
- D. In case of a conflict in construction documents and or the specifications, Contractor shall receive clarification, prior to bidding, in the form of an addendum or include in his price, the greater amount of work of the conflicts shown. (i.e., if two pipe sizes are indicated for the same pipe, the Contractor shall price the larger of the two pipes.)

1.10 WORK AND WORKMANSHIP

- A. Provide all required labor, materials, equipment and Contractor's services necessary for complete installation of systems required in full conformity with requirements of authorities having jurisdiction; and as indicated on Drawings and herein specified.
- B. Finished job shall be functional and complete in every detail, including any and all such items required for a complete system, whether or not these items are specified or shown on drawings.
- C. Any apparatus, material or work not shown on Contract Drawings but mentioned in the Specifications, or vice versa, or any incidental accessories or minor details not shown but necessary to make the work complete in all respects and ready for operation, even if not particularly specified, shall be provided without additional expense to the Owner.
- D. Special attention shall be given to accessibility of working parts and controlling parts. Adjustable parts shall be within easy reach. Removable parts shall have space for removal.
- E. Each Contractor shall acquaint himself with details of all work to be performed by other trades and take necessary steps to integrate and coordinate his work with other trades.
- F. It is assumed the Mechanical Contractor is familiar with standard first-class installation procedures. Therefore, these Specifications do not attempt to include every detail or operation necessary for the complete installation.
- G. It should be particularly noted that the terms "furnish" and "provide" are interchangeable and that each of these terms means to provide, install and connect, unless otherwise stated.

- H. Whenever tables or schedules show quantities of materials, they shall not be used as a guide to Contractor. Each Contractor shall be responsible for furnishing all materials noted on Drawings and as specified.
- I. Craftsman trained in each respective trade shall install work in that trade.

1.11 COORDINATION BETWEEN CONTRACTORS

- A. Note: Respective contractor infers the contractor installing the work.
- B. Each Contractor and Subcontractor shall study all Drawings applicable to this work so complete coordination between trades will be affected. Special attention shall be given to points where ducts cross other ducts or piping, where lights fit into ceilings and where pipe, ducts and conduit pass through walls and columns. Temperature controls interface, where applicable, shall be given attention.
- C. It is responsibility of each Contractor and Subcontractor to leave necessary room for other trades. No extra compensation will be allowed to cover cost of removing piping, conduit, ducts or equipment found encroaching on space required by others.

1.12 ASSIGNMENT OF MISCELLANEOUS WORK

- A. Lintels required by Contractor in new or existing walls shall be furnished by **Respective Contractor**. Contractor shall be responsible for notifying other Contractor of correct size and locations for all lintels prior to wall construction.
- B. Painting: **Respective Contractor** will provide prime painting on all ferrous metals such as supporting steel or hangers for mechanical piping and equipment. Piping itself is not to be primed. Any finish painting required, including painting of all mechanical items exposed to outside environment will be painted by **Respective Contractor**.
- C. Flashing: for roof curbs and bases shall be furnished by **Respective Contractor**.
- D. Sanitary Vent Lead Pans and Flashing: by **Respective Contractor**.
- E. Penetrations: holes required for piping or ductwork shall be cut in field at expense of **Respective Contractor**. Engineer shall give approval prior to any cutting.
- F. Holes required for piping or ductwork shall be **cut or installed as walls are erected** at the expense of the **Respective Contractor**. Mechanical Contractor to coordinate location and size of all openings prior to building erection or he will assume all costs for providing openings.
- G. Penetrations through Structure: **Respective Contractor** shall cut openings through structure unless otherwise indicated by others on structural drawings. Engineer shall give approval prior to cutting.
- H. Caulking of all plumbing fixtures shall be by Mechanical Contractor.
- I. All fire stopping of mechanical penetrations by **Respective Contractor**.

- J. All caulking of mechanical penetrations through interior partitions by **Respective** Contractor. All sleeve seals for mechanical penetrations through exterior below grade penetrations by Mechanical Contractor.
- K. Mechanical Contractor will install all taps, control valves and thermowells in piping for all temperature sensors, flow switches, pressure sensors and any other control device installed in piping whether shown or not on the Drawings.
- L. Dust Protection:
 - 1. Temporary partitions or barriers required to protect existing building or facilities specifically in areas requiring primarily mechanical work; i.e., cross country pipe, etc., shall be provided by **Respective** Contractor. **Respective** Contractor shall coordinate necessity and location of such protection with Owner.
 - 2. Temporary filters and covers for protection of new and existing ductwork, piping, and equipment is required during construction and shall be by **Respective** Contractor.
- M. Pipe identification shall be by Mechanical Contractor as specified in Section 20 00 50.
- N. Kitchen Equipment: furnished and set in place by **Respective** Contractor. Rough-in shall be by **Respective** Contractor. Final connections shall be by **Respective** Contractor.
- O. Temporary Use of Equipment: should it become necessary or desirable to operate any equipment before final acceptance, Owner shall be allowed to do so, ONLY after proper adjustments and trial operation by Contractor specified. **Respective** Contractor shall be responsible for instructing Owner, or his Representative, as to proper operation and care of equipment so used. If equipment is used prior to final acceptance of job, date of first usage will begin warrantee period.
- P. All electrical control wiring between mechanical equipment (i.e., air cooled chiller and condensing unit, respective indoor and outdoor equipment, etc.) shall be by **Control** Contractor. Conduit and wiring requirements shall adhere to those specified in Division 26.
- Q. Cutting and Patching: **Respective** Contractor shall cut and patch finished areas as required by Mechanical Contractor.
- R. Wall Sleeves in existing construction shall be provided and installed by the **Respective** Contractor.

1.13 EQUIPMENT WARRANTY AND EARLY EQUIPMENT STARTUP

- A. Contractor shall provide a complete warranty for all equipment, controls, etc. that includes parts and labor, any equipment that fails shall be repaired and/or replaced at no cost to owner.
- B. The warranty shall start on the date of substantial completion. On projects with multiple phases, the date of substantial completion of the final phase shall be the date that the warranty starts for all phases, i.e. the entire project. No exceptions.
- C. If special extended warranties exist, they will be noted in the respective sections. Extended warranty starts on the date of Substantial Completion of the final phase, unless another date is agreed to by all parties.

- D. If equipment startup is required to provide suitable climate conditions for carpentry finish trim, painting, ceiling tile installation, etc., then this contractor is responsible for starting, operating equipment and providing an extended warranty.
- E. Respective Contractor shall provide and change temporary filters over ductwork openings or grilles connected to air handling equipment operated prior to Owner occupancy and Substantial Completion for temporary heating and cooling. Respective Contractor shall submit equipment and ductwork dust protection measures prior to installation of equipment and ductwork.
- F. Some devices such as Control Valves, VFD's, etc. require extended warranties. Extended warranties are noted in the Specification Section for that piece of equipment. The prime Contractor shall be responsible for all implementation and cost of extended warranty work.

1.14 MATERIAL AND EQUIPMENT TRANSPORT

- A. All material and equipment, shipped to site, shall be suitably covered and protected during shipment to site.
- B. Protection shall include shrink wrapping and desiccant bags for humidity controls.
- C. Protect equipment from weather, road salts, road dirt, condensation, damage and all other situations that can be detrimental to the condition of the equipment and material being shipped.
- D. Engineer will not be on site during delivery; however, Engineer reserves the right to reject material or equipment after the fact that is delivered to site in unsatisfactory condition.

1.15 MATERIAL STORAGE

- A. Provide suitable protection from weather and vandalism for all materials and equipment to be installed. Storage shall be dry, clean and safe. Provide heat as required to stop condensation. Condensation occurs during periods of large ambient temperature swings, i.e. spring or fall. Any materials or equipment damaged, deteriorated, rusted or defaced due to improper storage shall be fully repaired, refinished or replaced, as directed by Engineer at no additional cost.

PART 2 - PRODUCTS

2.1 PRODUCT AND MATERIAL APPROVAL

- A. A Specification followed by one or more manufacturers is limited to those manufacturers. Names of other manufacturers may be submitted for approval, to the Engineer, a minimum of ten calendar days prior to receiving bids. Approval will be issued by Addendum if approval is granted.
- B. The mechanical equipment shall be new, listed by UL and shall confirm to NEMA requirements.
- C. If changes in pipe, ductwork, conduit, wiring, structural support, ceiling space, etc. are required as a result of the contractor's decision to purchase equipment with a different arrangement than shown on the Drawings, the Contractor shall be responsible for including all associated costs in their bid. Manufacturers listed on schedules shall be considered "Basis of Design" (BOD). Note that manufacturers listed as equals may have physical characteristics such as weight, footprint,

sound levels, electrical, etc., which require more coordination, piping, wiring, and/or general construction changes. The Mechanical Contractor will be responsible for all additional costs associated with the installation of this equipment. Contractors should seek clarification prior to bid for any equipment that does not meet or exceed the scheduled or specified characteristics.

- D. Manufacturers listed for products and equipment does not imply that their standard construction or configuration is acceptable or meets the specifications. Equipment proposed "as equal", must meet the specifications including all architectural, mechanical, electrical, and structural details, all scheduled performance and the job design, plans and specifications.

PART 3 - EXECUTION

3.1 PROTECTION AND TREATMENT OF PROPERTY

- A. All property in existing facilities that is damaged/removed, by contractor operations shall be repaired/replaced to previous operating and appearance condition.

3.2 DEMOLITION AND REMOVAL OF EQUIPMENT

- A. Contractor shall remove all equipment, hangers and support for portion of mechanical system in present building as indicated on Drawings and/or implied by nature of the work to be removed. Contractor shall remove all pipes and ductwork back to source made obsolete by removing equipment unless specifically instructed otherwise.
- B. Contractor shall properly support remaining portions of the work. Contractor shall provide valves, plugs, vents, etc. as required so existing systems remain operational.
- C. Owner shall have first right of refusal on all equipment, piping, etc., being removed. If owner decides to keep removed items, then the contractor shall move items to a location on this project site as directed by owner.
- D. Openings remaining after equipment has been removed shall be patched to match surrounding surfaces and in conformance with good practice.

3.3 ELECTRICAL CONNECTIONS TO EQUIPMENT AND CONTROL WIRING

- A. All electrical work shall be done in accordance with the latest edition of the National Electric Code.
- B. All above ground wiring shall be installed in metallic conduit with a minimum conduit size of $\frac{3}{4}$ inch. All wiring shall be concealed, except in equipment rooms, crawl spaces, tunnels and mechanical or electrical closets. Conduit shall be fastened securely at regular intervals and shall be run parallel to the building lines.
- C. Running low voltage wire above bar joist in roof/floor metal deck flutes is not permitted. Wire to be run above bottom chord of truss and fastened to structure with wire ties at maximum 4'-0" o.c.
- D. All flexible conduits shall not exceed 2'-0".

- E. All below ground wiring shall be installed in rigid conduit with minimum size of $\frac{3}{4}$ ". Conduit system shall be sealed watertight.
- F. Provide all wire, conduit, fittings, miscellaneous materials and labor as required for mounting and connecting the electrical control devices furnished in this contract.
- G. All wiring shall be continuous from point to point. No splicing between terminations allowed.
- H. In the event that a Supplier of equipment requires a larger starter, disconnect wiring conduit, etc. than those indicated in Contract Documents, he shall reimburse Contractor supplying these items for the difference.
- I. Connections and wiring diagrams shown on Drawings or described in Specifications are typical and for bidding purposes only. Detailed diagrams and instructions shall be provided by Contractor supplying the equipment. If connections are different from those shown on Drawings, Mechanical Contractor shall reimburse Electrical Contractor for those differences.
- J. Additional relays switches, contactors, etc. which may be required for control purposes in addition to those specified and indicated on Drawings shall be provided by Mechanical Contractor.
- K. In the event that several pieces of mechanical equipment from different Suppliers are combined in one system, Mechanical Contractor shall furnish complete wiring and control diagrams to enable Electrical Contractor to make proper connections. Diagrams shall be submitted to Engineer for review, prior to actual wiring.
- L. Mechanical Contractor shall furnish to Electrical Contractor written notice of approval and acceptance for all control wiring installed for mechanical systems by Electrical Contractor. Such approval shall be given within 30 days of completion of all such control wiring. Two copies of letter shall be sent to Engineer.

3.4 ATTACHING TO BUILDING CONSTRUCTION

- A. Equipment and pipe supports shall be attached to structural members (beams, joists, etc.) rather than to floor or roof slabs. Support from structural members shall be in accordance with manufacturer recommendation of structural member and/or approved by Structural Engineer.
- B. Where piping is suspended from new concrete construction, furnish, locate and install black steel channel type concrete inserts before concrete is placed. Fasten inserts to forms and install reinforcing bars through openings at top of inserts. Inserts shall provide for horizontal and vertical adjustments.
- C. Where piping is suspended from existing concrete or masonry construction, use expansion shields to attach pipe supports to construction.
 - 1. Anchors shall be installed horizontally into the sides (vertical portion) of concrete beams at a minimum of 5" from the bottom of the beam.
 - 2. When support location is between concrete beams, then Unistrut shall be attached to sides of concrete beams and span continuously between the concrete beams. Unistrut shall be sized per manufacturer's data to carry load.
 - 3. Contractor must receive prior approval before attaching to the underside of concrete slabs or concrete beams.

4. Install all anchors according to manufacturer's written instructions. Expansion shield bolt diameter shall be same size as support rod diameter hereinafter specified. If, in the opinion of the Owner/Engineer, existing structure is questionable, an angle will be required with two expansion shields to carry each vertical support rod. Expansion shields shall be combined friction and keying hold type wedge anchor like HILTI Red Head or approved equal.
- D. Where existing masonry is not suitable to receive and hold expansion shields or where other means of attachment is advantageous, Contractor shall submit alternate method for approval of Engineer.
- E. Where piping is suspended from structural steel building framing or supporting members, furnish and install beam clamps for attaching piping support device to building member.
- F. Obtain approval from **Engineer** before cutting or welding to structural member or before hanging heavy equipment.
- G. Support piping and ductwork from structure so that equipment connections are not being used for support.

3.5 ROUGH-IN

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be installed.
- B. Refer to shop drawings for equipment rough-in requirements.

3.6 MECHANICAL INSTALLATIONS

- A. General: Sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment. Comply with the following requirements:
 1. Keep all major equipment covered, in buildings, until major dust producing activities are complete. Equipment to be covered includes chillers, pumps, VFD's and AHU's.
 2. All equipment must be installed such that maintenance and service may be properly accomplished. If necessary, the Owner, at their option, may require the contractor to demonstrate the service on any piece of equipment to determine sufficient service space exists. If the service space is not adequate, the equipment shall be relocated at no additional cost to the Owner such that sufficient service space is achieved.
 3. Coordinate mechanical systems, equipment, and materials installation with other building components.
 4. Verify all dimensions by field measurements.
 5. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for mechanical installations.
 6. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
 7. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
 8. Where mounting heights are not detailed or dimensioned, install systems, material, and equipment to provide the maximum headroom possible.

9. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
10. Install systems, materials, and equipment to conform with engineer reviewed submittal data. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect/Engineer.
11. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components.
12. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
13. Extend grease fittings to an accessible location.
14. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at specified slope.
15. All shutdowns required to connect to existing systems shall be scheduled and coordinated with the Owner. Contractor shall prefabricate and install new materials as much as possible to keep shutdown duration to a minimum.
16. All pipe, duct and mechanical equipment shall be installed as high above floor (close to structure) as possible. When any pipe, duct or mechanical piece of equipment is installed lower than 7'-0" above finished floor, foam type insulation with black and yellow caution marker tape shall be installed on bottom leading edges.
17. Contractor shall field verify all locations, sizes and connection points to existing piping, ductwork and systems as shown on the drawings. Contact Engineer with any discrepancies.
18. Provide all contact information to Test and Balance Contractor 30 days prior to start-up of equipment.
19. Contact Test and Balance Contractor after leakage and pressure test on air and water systems has been successfully completed.

3.7 CLEANING AND TOUCH UP

- A. All mechanical equipment, cabinets, control panels and other enclosures shall be cleaned and have paint touched up as necessary to duplicate factory finished appearance. Touch up paint shall exactly match color, composition and quality of factory applied finish.
- B. Equipment furnished with factory applied finish shall be protected from damage by the installing Contractor. Any damaged surface shall be repaired or replaced by the installing Contractor to match original finish or shall be replaced before final acceptance.

3.8 GENERAL COMPLETION, STARTUP

- A. Work Included: furnish materials and labor required to perform startup of equipment and systems installed on project and provide operating instructions to Owner.
- B. It is Mechanical Contractors' responsibility to conduct an owner orientation meeting which will review all systems, their operation and operation of all equipment.
- C. General Requirements.

1. Inspect bearings for cleanliness and alignment and remove any foreign materials found. Grease as necessary and in accordance with manufacturer's recommendations. Replace bearings that run rough or noisy.
2. Tighten flanges and packing glands after system has been placed in operation. Replace gaskets in flanges that show any signs of leakage after tightening.
3. Inspect screwed joints for leakage and remake each joint that appears to be faulty. Do not wait for rust to form. Clean threads on both parts, apply compound and remake joint.
4. Adjust pipe hangers and supports for correct pitch and alignment.
5. **Flush systems and clean all strainers. After 30 days of operation clean strainers again.**
6. Provide such continuing adjustment services as is necessary to ensure proper functioning of all mechanical systems after building occupancy and during guarantee period.
7. Provide duct stiffeners, air straighteners, or turning vanes as required to stop any oil canning, drumming or fan surge to the satisfaction of the engineer.

3.9 AIR FILTERS

- A. Provide a total of three (3) sets of air filters for each piece of equipment(AHU's, RTU's, VUV's, CUH's, FC's BC's, etc.) for Owner use after Substantial Completion has been awarded.
- B. Never operate equipment without air filters. Contractor shall provide and change air filters, as needed during construction for equipment operation prior to Substantial Completion.
- C. Replace temporary construction air filters in each and every piece of equipment within 2 weeks after substantial completion. Testing and Balancing shall not commence until filter has been changed within respective equipment.

END OF SECTION 20 00 10

SECTION 20 00 50 – COMMON MATERIALS AND METHODS FOR FIRE SUPPRESSION, PLUMBING AND HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this and all Sections of Divisions 20, 21, 22 and 23.

1.2 SUMMARY

- A. Provide equipment, materials, labor and services common to more than one section of Divisions 20, 21, 22 and 23. The work generally includes, but is not limited to the following:
 - 1. Vibration Isolators
 - 2. Separable Sockets
 - 3. Pressure and Temperature Test Plugs (Pete's Plugs)
 - 4. Sleeves
 - 5. Firestop Sealants and Caulks
 - 6. Mechanical Sleeve Seals
 - 7. Elastomeric Joint Sealants
 - 8. Pipe Identification
 - 9. Equipment Identification
 - 10. Paint
 - 11. Concrete
 - 12. Grout
 - 13. Ceiling and Wall Access Panels
 - 14. Thermostats and Sensors

1.3 SUBMITTALS

- A. Provide submittals for all applicable products provided within this section.
- B. If it is desired to use products that are not specified, then those products must be submitted for review by Engineer prior to submittals and ordering said products.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

- A. General: Mount equipment on isolators as noted in Schedule of Usage and as noted in specific specification sections. Isolators shall be furnished by manufacturer of isolators. They shall be engineered for specific piece of equipment.
 - 1. Manufacturers:

- a. Mason Industries, Inc.
- b. Kinetics Noise Control, Inc.

B. Types of Isolators

1. Neoprene Pad: Cross ribbed pad 3/8" thick.
2. Cork Rib Pad: 1" thick laminated pad consisting of cork bonded between 2 layers of ribbed neoprene. Vibration Mountings Cork Rib Pak.
3. Steel Spring Mounting: Steel housing containing steel springs with top plate, leveling bolt, snubber fastening slots and neoprene pad bonded to bottom.
4. Rubber in Shear Hanger: Neoprene single or double deflection as required.
5. Spring Type Hangers: Deflection to 2".
6. Combination Spring and Rubber in Shear Hangers: Deflection to 2 1/2".

C. Submittals shall show frequency, required efficiency and designed deflection.

D. All vibration isolators shall be selected at 95% efficiency.

E. Schedule of Usage.

1. Blower Unit Heaters: Rubber in shear hangers.
2. Air-Handling Units: Internally Spring Isolated.
3. Inline Exhaust Fans: Spring Type Hangers.

2.2 SEPARABLE SOCKETS

A. Description: Fitting with protective socket for installation in threaded pipe fitting to hold fixed thermometer stem.

1. Material: Brass, for use in copper piping.
2. Material: Stainless steel, for use in steel piping.
3. Material: Steel, for use in steel piping
4. Extension-Neck Length: Nominal thickness of 2 inches (50 mm), but not less than thickness of insulation. Omit extension neck for sockets in piping not insulated.
5. Insertion Length: To extend to a minimum of 1/3 (one-third) of diameter of pipe.

2.3 PRESSURE AND TEMPERATURE TEST PLUGS (PETE'S PLUGS)

A. Plug shall be brass or stainless steel arranged for a 1/8" diameter shaft to enter into the plug. The plug shall be rated for 350°F for water and 200°F for gases. The plug shall be equipped with a pipe cap. The plug system shall be rated for zero leakage to 250 PSIG.

B. Manufacturer:

1. Sisco
2. Trerice
3. Peterson Equipment

2.4 SLEEVES

- A. Steel Sheet Metal: 0.0239-inch (0.6-mm) minimum thickness, galvanized, round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, plain ends.
- C. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
- D. Sleeves shall be in accordance with the schedule unless otherwise specified.

PIPE SIZE	UNINSUL.	1" INSUL.	1-1/2" INSUL.	2" INSUL.
1"	2	4	6	6
1-1/2"	3	4	6	8
2"	3	6	8	8
3"	4	6	8	10
4"	6	8	10	10
6"	8	10	12	12
8"	10	12	12	14

2.5 FIRESTOP SEALANTS AND CAULKS

- A. Penetration Sealant:
 - 1. 3M Brand "Moldable Putty Pads and "Moldable Putty Stix".
 - 2. 3M Brand "Fire Barrier" Caulk, Putty or Penetrating Sealing Systems.
 - 3. Dow Corning "Fire Stop Foam" and "Fire Stop Sealant" systems.
 - 4. Insta-Foam Products, Inc. "Insta-Fire Seal Silicone RTV Foam".
 - 5. Standard Oil Engineering Materials Company "Fyre Putty".
- B. Intumescent Sealant:
 - 1. 3M Brand "Fire Barrier" caulk or putty, FS-195 Wrap Strip and CS-195 Composite Sheet.
 - 2. Dow Corning "Fire Stop Intumescent Wrap Strip".
 - 3. Fox Couplings, Inc. "The Fox Cast-in-Place Coupling".
 - 4. For plastic pipe penetrations up to 4" diameter: Use 3M pre-manufactured fire barrier plastic pipe devices or equal.
 - 5. For plastic pipe penetrations larger than 4" diameter: Use 3M fire barrier RC-1 restricting collar with FS-195+ wrap/strip or equal.
- C. Performance Characteristics: Firestopping materials shall conform to both Flame (F) and Temperature (T) rating as tested by nationally accepted test agencies per ASTM E814 or UL 1479 fire tests.
 - 1. F Rating shall be a minimum of one hour but not less than the fire resistance rating of the assembly being penetrated.
 - 2. Conduct the fire test with a minimum positive pressure differential of 0.01" of water column.
- D. Quality Assurance: Installer qualifications – firm specializing in firestopping installation with not less than two years of experience or trained and approved by firestopping manufacturer.

2.6 MECHANICAL SLEEVE SEALS

- A. Description: Modular design with interlocking rubber links shaped to continuously fill annular space between pipe and sleeve. Include connecting bolts and pressure plates.
- B. Manufacturers: Thunderline/Link-Seal; Calpico, Inc.; MetraFlex Co.

2.7 ELASTOMERIC JOINT SEALANTS

- A. Sealant: Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated. Per ASTM C 920 like Dow Corning 995 GE Silicones, Tremco Spectrum 1 or equal.
- B. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26°F (minus 32°C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance. Verify compatibility with Elastomeric Joint Sealant Manufacturer prior to use.
- C. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- D. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.

2.8 PIPE IDENTIFICATION

- A. Banding and labeling shall consist of the following:
 - 1. Color-coded band to conform to color code hereinafter specified.

- a. For pipe diameter of 6" or less (including insulation):

<u>PIPE DIA.</u>	<u>SIZE OF LETTERS</u>	<u>LENGTH OF COLOR FIELD</u> (Use only if banding)
3/4" – 1 3/8"	1/2"	8"
1 1/2" – 2 3/8"	3/4"	8"
2 1/2" – 6"	1 1/4"	12"

- 1) Manufacturer: Seton Setmark "SNA" Marker. Graphic Products or approved equal.

- b. For pipe diameter of 6" or greater (including insulation):

PIPE DIA.	SIZE OF LETTERS	LENGTH OF COLOR FIELD (Use only if banding)
6" – 7 7/8"	1 1/4"	12"
8" – 10"	2 1/2"	24"
Over 10"	3 1/2"	32"

- 1) Manufacturer: Seton Setmark "STR" Marker, Graphic Products or approved equal.

2.9 PLASTIC LAMINATE SIGNS FOR EQUIPMENT IDENTIFICATION

- A. ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore.
 1. Engraved with engraver's standard letter style, of sizes and with wording to match equipment identification.
 2. Punch for mechanical fastening.
 3. Thickness: 1/8 inch (3.2mm) , unless otherwise indicated.
 4. Fasteners: Self-tapping stainless-steel screws or contact-type permanent adhesive.
 5. Nomenclature: Name and plan number as shown on Equipment Schedules and on Drawings or as directed by the Owner.
 6. Size: Approximate 2 1/2 by 4 inches (65 by 100mm) for control devices, dampers, and valves; and 4 1/2 by 6 inches (115 by 150 mm) for equipment.

2.10 GROUT

- A. Non-shrink, Nonmetallic Grout: ASTM C 1107, Grade B.
 1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
 3. Packaging: Premixed and factory packaged.

2.11 CEILING AND WALL ACCESS PANELS

- A. Plastered Wall or Ceiling: 24" x 24" unless otherwise noted. Constructed to receive plaster to match adjacent finish. Milcor Style **with cylinder lock**.

2.12 THERMOSTATS AND SENSORS

- A. Refer to individual equipment specifications and temperature controls specifications for device specifications.

PART 3 - EXECUTION

3.1 PRESSURE AND TEMPERATURE TEST PLUGS (PETE'S PLUGS)

- A. Install Pete's Plugs at each and every piece of hydronic equipment including coils, heat exchangers and pumps and install where shown on Drawings.
- B. Install Pete's Plugs in 1/4" plugged bosses at pump suction and pump discharge flanges.
- C. Always install Pete's Plugs on equipment side of balance valves to measure true differential pressure across equipment, and not across balance valve.

3.2 ESCUTCHEONS

- A. Escutcheons: Manufactured wall, ceiling and floor plates; deep-pattern of type required to conceal protruding fittings and sleeves.
 - 1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
 - 2. OD: Completely cover opening and sleeve.
- B. Cast Brass: One piece, with set screw.
 - 1. Finish: Rough brass.
 - 2. Finish: Polished chrome-plate.
- C. Install pipe escutcheons for exposed pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:
 - 1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish. Use split-casting escutcheons if required, for existing piping.
 - 2. Un-insulated Piping Wall Escutcheons: Cast brass or stamped steel, with chrome-plated finish and set screw.
 - 3. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.

3.3 SLEEVES / PENETRATIONS

- A. Sleeves are not required for core drilled holes through poured in place concrete walls.
- B. Install sleeves for pipes and ducts passing through masonry walls, fire rated gypsum-board partitions, gypsum-board partitions with dry wall on both wall faces, and concrete floor slabs.
- C. Sleeve length to be a minimum of 1" longer on each side of wall penetration.
- D. Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast iron sleeve fittings below floor slab as required to secure clamping ring.
- E. Build sleeves into new walls and slabs as work progresses.

- F. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - 1. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS (DN150).
 - 2. Steel, Sheet-Metal Ductwork Sleeves: For ducts 6 inch and larger, penetrating gypsum-board partitions.
 - 3. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
- G. Where sleeves are to be installed in existing floor or masonry wall, seal space between sleeve and wall with non-shrink grout.
- H. Above Grade wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants.
- I. Below Grade Exterior-Wall Penetrations and Floors of Mechanical Spaces: Seal penetrations using mechanical sleeve seals. Size penetration for 1-inch annular clear space between pipe and opening for installing mechanical sleeve seals.
 - 1. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.
- J. Fire-Barrier Penetrations:
 - 1. Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe and duct penetrations. Seal penetrations with fire sealants and caulks.
 - 2. This assembly must maintain a watertight seal between floor or wall and pipe when used on exterior walls, or floors of wet areas. Also use mechanical link seals in these cases.
 - 3. Use intumescent sealant for applications where combustible penetrants are involved (i.e., insulated or plastic pipe).
 - 4. Install in all penetrations where required by code.
- K. Sealant Application
 - 1. Install sealants around all piping and duct penetrations.
 - 2. Comply with sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
 - 3. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of sealants as applicable to materials, applications, and conditions indicated.
 - 4. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
 - 5. Install sealant backings of type indicated to support sealants during applications and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - a. Do not leave gaps between ends of sealant backings.
 - b. Do not stretch, twist, puncture, or tear sealant backings.
 - 6. Install sealants by proven techniques to comply with the following and at the same time backings are installed:

- a. Place sealants so they directly contact and fully wet joint substrates.
- b. Completely fill recess between pipe and opening.
- c. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- d. Remove excess sealants from surfaces adjacent to joint.
- e. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of product in which joints occur.

3.4 PIPE IDENTIFICATION

- A. Install Pipe Identification on each system. Include pipe service as abbreviated on Drawings i.e. CHWS, CHWR, etc. and arrows showing normal direction of flow.
 1. Locate pipe identification as follows:
 - a. Exposed piping in unfinished spaces, machine rooms, and accessible maintenance spaces, such as shafts, tunnels, plenums, above lay-in ceilings and exterior non-concealed locations.
 - b. Near each branch, excluding short takeoffs for fixtures and terminal units. Mark each pipe at branch, if flow pattern or service is not obvious.
 - c. Adjacent to penetrations where pipes pass through walls, floors, ceilings, or enter non-accessible enclosures.
 - d. At access doors, manholes and similar access points that permit view of concealed piping.
 - e. At all major equipment and other points of origination and termination.
 - f. Spaced at maximum of 50-foot (15 m) intervals along each run. Reduce intervals to 25 feet (7.5 m) in congested areas of piping and equipment and in equipment rooms.

3.5 EQUIPMENT IDENTIFICATION

- A. Install engraved plastic-laminate sign on each scheduled piece of mechanical equipment.
 1. Lettering Size: Minimum 1/4 inch (6.4 mm) high lettering for name of unit if viewing distance is less than 24 inches (610 mm), 1/2 inch (12.7 mm) high lettering for distances up to 72 inches (1800 mm) and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principle lettering.
 2. Text of Signs: Provide specific name of unit as identified on Equipment Schedule on Drawings or as directed by the Owner. Inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
 3. Locate identifying devices as necessary for unobstructed view in finished construction.
 4. Where equipment is located above lay-in ceiling, affix a 1" adhesive label on ceiling grid system below equipment with equipment tag identification. Verify description requirements with Owner/Engineer. Where equipment is located above inaccessible ceilings, affix label or engraved plastic laminate sign securely to or near access panel.

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit and place miscellaneous metal supports accurately in location, alignment and elevation to support and anchor mechanical materials and equipment.

- B. Field Welding: Comply with AWS D1.1, "Structural Welding Code – Steel".

3.7 GROUTING

- A. Install nonmetallic, non-shrink grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's written instructions.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout. To ensure complete grout base, with no voids, pack grout from one side until grout is forced out of opposite side of base.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases to provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout according to manufacturer's written instructions.

3.8 THERMOSTATS AND SENSORS

- A. Unless specifically noted otherwise, install all wall-mounted thermostats and sensors required for respective equipment with 48" A.F.F. to top of device box. Closely coordinate rough-in locations with all trades.

END OF SECTION 20 00 50

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SECTION 20 00 60 – COMMON PIPE, VALVES, FITTINGS AND HANGERS FOR FIRE SUPPRESSION, PLUMBING AND HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This section specifies piping, valves and fittings including piping support for all systems. These systems include the following:
 - 1. System Piping Schedule #1
Heating Water
 - 2. System Piping Schedule #14
Sanitary Inside Building
Vent Inside Building
Storm Gravity Inside Building
 - 3. System Piping Schedule #17
Domestic Hot Water Aboveground
Domestic Cold Water Aboveground
 - 4. System Piping Schedule #19
Fire Protection
- B. All specialty valves for specific systems are listed in specification sections for those systems. Specialty valves for specific systems can be found in the following sections:
 - 1. Plumbing Specialty Valves – 22 00 00 “Plumbing”
 - 2. Fire Protection Specialty Valves – 21 00 00 “Fire Protection”
 - 3. Refrigeration Specialty Valves – 23 00 00
 - 4. Hydronic Specialty Valves – 23 00 00 “Heat Transfer”
 - 5. Control Valves – 23 00 00 “Temperature Controls”
- C. Related sections include the following:
 - 1. 20 00 10 Common Work Results for Fire Suppression, Plumbing and HVAC
 - 2. 20 00 50 Common Materials and Methods for Fire Suppression, Plumbing and HVAC
 - 3. 20 01 80 Common Insulation for Plumbing and HVAC
 - 4. 21 00 00 Fire Suppression
 - 5. Division 22 Plumbing
 - 6. Division 23 Mechanical

1.3 SUBMITTAL

- A. Submit product data for valves and fittings used in each system.
- B. Submittal data to be in compliance with Section 20 00 10.
- C. Product data shall include pressure and temperature classifications, model numbers, material types, actuators, trim, valve handle extensions and all pertinent data as required for complete evaluation by Engineer.
- D. Maintenance data for valves shall include adjusting, servicing, disassembly, exploded view with part numbers and repair instructions.
- E. Piping submittals are not required. However, piping to meet all specifications.

1.4 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.
- B. MSS Compliance: Comply with the various MSS Standard Practice documents referenced.
- C. All grooved joint couplings, fittings, valves and specialties shall be products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
- D. Welded and Soldered Pipe
 - 1. Pipe welding shall comply with provisions of latest revision of applicable code, whether ASME Boiler & Pressure Vessel Code, ASTM Code for Pressure Piping, or such state or local requirements as may supersede code mentioned above.
 - 2. A copy of his welding procedure specification together with proof of its qualification as outlined and required by most recent issue of code having jurisdiction.
 - 3. Submit Operator's qualification record in conformance with provisions of code having jurisdiction, showing that operator was under proven procedure specifications submitted by Contractor.
 - 4. Standard procedure specifications and operators qualified by National Certified Pipe Welding Bureau shall be considered as conforming to requirements of these specifications.
 - 5. Welders to have ASME test papers not more than 5 years old.
 - 6. Each manufacturer or Contractor shall be responsible for quality of welding done by his organization and shall repair or replace work not in accordance with these specifications.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set globe and gate valves closed to prevent rattling.
 - 4. Set ball and plug valves open to minimize exposure of functional surfaces.
 - 5. Set butterfly valves closed or slightly open.
 - 6. Set butterfly valves closed or slightly open.

- B. Use the following precautions during storage:
1. Maintain valve end protection.
 2. Store indoors and maintain valve temperature higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
 3. Stack piping above grade and covered.
- C. Use a sling to handle large valves. Rig to avoid damage to exposed parts. Do not use handwheels and stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 PIPE MATERIAL DESIGNATIONS

- A. Refer to System Schedules in Execution portion of this Section for designation of pipe types to be used for each piping system. When more than one piping type is designated, contractor may choose which type is installed.
- B. Piping Designations
1. CP-2 Steel:
 - a. 3/4" to 2" ASTM A53, Type S (seamless) or Type F (furnace-butt welded) Grade A Black steel (galvanized if so noted). U.S. Steel; Laclede; Republic; Youngstown, Jones & Laughlin.
 - b. 2-1/2" to 12" ASTM A53, Type E (electric resistance welded) Grade A Black steel (galvanized if so noted).
 - c. 14" to 20" ASTM A53, Type E (electric resistance welded) Grade B or Type S (seamless), (galvanized if so noted). U.S. Steel; Laclede; Republic; Youngstown; Jones & Laughlin.
 2. CP-8 Copper: ASTM B75, B88, B251 and B447; ASA H23.1-1947 seamless copper tubing, hard temper (soft copper if so noted). Type K or L. (as noted) Chase; Bridgeport, Anaconda; Scovill.
 3. CP-20 Ductile Iron Mechanical Joint: AWWA C151 with Mechanical Joint Bell and plain spigot end, cast iron pipe, centrifugally cast with asphaltum coating. Class as noted in schedule. Pipe to be marked and carry nominal weights and dimensions as required by state and local codes. As manufactured by James B. Clow & Sons; American Cast Iron Pipe; Alabama Pipe; U.S. Pipe & Foundry.
 4. CP-33 PVC DWV Drainage Pipe: ASTM D2665, Polyvinylchloride pipe solid-wall, waste, and vent. Schedule as noted.
 5. CP-40 Cast Iron (HUB) Bell and Spigot: ASTM A74, extra heavy bell and spigot cast iron soil pipe centrifugally metal or sand spun cast with asphaltum coating. American Brass & Iron; Tyler; Charlotte. Pipe and fittings shall be labeled with the trademark of the Cast Iron Soil Pipe Institute.
 6. CP-41 Soil Pipe: Cast Iron no hub ASTM A888, CISPI 301. No hub cast iron soil pipe centrifugally metal or sand spun cast with asphaltum coating. American Brass & Iron;

Tyler; Charlotte. Pipe and fittings shall be labeled with the trademark of the Cast Iron Soil Pipe Institute.

7. CP-80 Prefabricated and pre-insulated jacketed pipe for below-grade installation. HDPE carrier pipe with polyurethane foam insulation and HDPE jacket. SDR-11/150 psi pressure rating. Butt-fusion welded, 2.0 to 3.0 pounds per cubic foot insulation density and k-factor of 0.16, conforming to ASTM C-591, nominal 2-inch thickness. All pre-insulated pipe, fittings, insulating materials, and technical support shall be provided by the pre-insulated piping system manufacturer. Fittings to be factory pre-insulated, straight pipe field joint kits by manufacturer. As manufactured by Thermacor. Contact Mike Harris, Harris and Associates, Joliet IL, 815-485-6464.

2.2 PIPE FITTING DESIGNATIONS

- A. Refer to System Schedules in Execution portion of this Section for designation of fitting types to be used for each piping system. Fittings to be of the same strength of piping in each respective piping system. When more than one type is designated, contractor may choose which type is installed.
- B. Fitting Designations:
 1. CF-1 Malleable Iron: ASME B16.3. 300# (or as noted) black band malleable iron threaded fitting (galvanized if so noted). Grinnell; Flagg; Kuhns; Illinois Malleable, Stockham.
 2. CF-2 Cast Iron: ASME B16.4; 250# (or as noted) black cast iron threaded fitting (galvanized if so noted). Grinnell; Kuhns, Illinois Malleable; Stockham.
 3. CF-4 Flanged: 125# (or as noted) black cast iron, flanged fitting (galvanized if so noted). Grinnell; Kuhns; Stockham; Illinois Malleable.
 4. CF-5 Wrought Steel fittings: ASTM, B16.9, B16.11, B16.28. Steel butt welding fitting. All elbows shall be long radius, unless otherwise noted. Tube Turns; Midwest; Taylor Forge; Ladish; NIBCO; Grinnell; Weld Bend; Babcock Wilcox.
 5. CF-6 Grooved Mechanical-Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47 (ASTM A 47M), Grade 32510 malleable iron; ASTM A 53, Type F, E, or S, Grade B fabricated steel; or ASTM A 106, Grade B steel fittings with grooves or shoulders designed to accept grooved end couplings. All fittings shall be long radius unless otherwise specified. UL listed, FM approved for fire service. Victaulic; Anvil; Gruvlok.
 6. CF-8 Wrought Copper: ASME B16.22. Wrought copper solder joint fitting as manufactured by Flagg; Mueller; Chase, NIBCO; Anaconda; American Brass.
 7. CF-20 Mechanical Joint: AWWA C111 ductile or grey-iron, standard pattern, same class as noted for pipe. Alabama Pipe, U.S. Pipe & Foundry.
 8. CF-33 PVC Drainage Fittings: ASTM D2665, socket type, made to ASTM D 3311 drain waste and vent patterns.
 9. CF-40 (HUB) Bell and Spigot: Cast iron bell and spigot Type fitting DWV configuration, extra heavy duty. American Brass & Iron; Tyler; Charlotte.

10. CF-41 (NO-HUB) Mechanical Joint: Cast iron no hub type fitting - DWV configuration. American Brass & Iron; Tyler; Charlotte.

2.3 PIPE JOINT DESIGNATIONS

- A. Refer to System Schedules in Execution portion of this Section for designations of joint types to be used for each piping system. When more than one type is designated, contractor may choose which type is installed.
- B. Piping Joint Designations:
 1. CJ-1 Threaded: threads shall conform to ASME B1.20.1, ASTM B16.3, B16.4, B16.12. Remove all burrs. Ream pipe ends to full bore and remove all chips. Use pipe compound on male ends only. Approved pipe compounds: Blue Seal; Key Tite.
 2. CJ-5 Welded Pipe: standard specification provision for fabrication and erection of piping systems as recommended by National Certified Pipe Welding Bureau. All welding of pipe, regardless of condition of is to be installed as follows:
 - a. Pipe welding shall comply with provisions of latest revision of applicable code, whether ASME Boiler & Pressure Vessel Code, ASTM Code for Pressure Piping, or such state or local requirements as may supersede code mentioned above.
 - b. A copy of his welding procedure specification together with proof of its qualification as outlined and required by most recent issue of code having jurisdiction.
 - c. Submit Operator's qualification record in conformance with provisions of code having jurisdiction, showing that operator was under proven procedure specifications submitted by Contractor.
 - d. Standard procedure specifications and operators qualified by National Certified Pipe Welding Bureau shall be considered as conforming to requirements of these specifications.
 - e. Welders to have ASME test papers not more than 5 years old.
 - f. Each manufacturer or Contractor shall be responsible for quality of welding done by his organization and shall repair or replace work not in accordance with these specifications.
 1. CJ-6: grooved mechanical-joint couplings: Two ductile or iron housing segments and synthetic rubber EPDM (+250°F) gasket of central cavity pressure-response design; with ASTM A449/ASTM A183 nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings; Installation-Ready rigid coupling, or equal by Victaulic, Gruvlok, or engineer approved equal. UL classified in accordance with ANSI / NSF-61 for potable water service and shall meet the low-lead requirements of NSF-372. Torque of fittings, if required, shall be in accordance with the manufacturer's latest recommendations and each coupling shall be tagged or marked with the specific value of torque attained to confirm joint rigidity and proper installation, when applicable.
 2. CJ-8: 95% tin, 4.85% copper, 0.15% selenium. Premium Contractor Grade solder. 410°F Minimum working temperature; 7130 PSI Tensile Strength, ASTM B32. Like Taramet Sterling, Taracorp.IMACO, Winston-Salem, NC. Cut ends of tubing square with wheel type cutter, ream to remove burrs, wipe clean on inside, apply paste type solder flux on external surface. Apply solder (no lead allowed).
 3. CJ-20 Mechanical Joint: AWWA C 111 ductile - or grey - iron glands, rubber gasket and steel bolts. Reinforce joint at hydrants, fittings or valves with heavy wrought iron clamps

and wrought iron rods in accordance with standard details of National Board of Fire Underwriters. Apply heavy coat of bituminous solution to assembly.

4. CJ-33 PVC/CPVC
 - a. Solvent Cement: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1) Comply with ASTM F 402 for safe-handling practice of cleaners, primers and solvent cements.
 - 2) ABS piping: ASTM D 2235 and ASTM D 2661.
 - 3) CPVC Piping: ASTM D 2846 and ASTM F-493.
 - 4) PVC Pressure Piping: ASTM D 2672.
 - 5) PVC Nonpressure Piping: ASTM D 2665.
 - 6) PVC to ABS Nonpressure Transition Fittings: Procedure and solvent cement according to ASTM D 3138.
 - b. Heat Welding: ASTM D 2657
 - c. Threads: Use only where noted on schedules. Install as outlined for steel pipe but only to be used on Schedule 80 or 120 pipe. Use strap wrench for tightening.
5. CJ-40 (HUB) Bell & Spigot: Gasket-ASTM C 564, Rubber. American Brass & Iron; Tyler; Charlotte.
6. CJ-41 (No HUB) Coupling: Stainless steel couplings CISPI 310 with ASTM A 167, Type 301 or ASTM A 666 Type 301 Stainless steel corrugated shield; stainless steel bands and sleeve. American Brass & Iron; Tyler; Charlotte.
7. CJ-44 Flanged Joints:
 - a. Cast-Iron Flanges and Flanged Fittings: ASME B16.21, Classes 25, 125 and 250; raised ground face, and bolt holes spot faced. Including bolts, nuts and gaskets.
 - b. Flange bolts and nuts: ASME B18.2, Carbon Steel unless otherwise indicated.
8. CJ-45 Mechanical Grooved Pipe Couplings: Style 107/ W07 rigid couplings, Style 177/ W77 standard couplings. Installation and pipe grooving shall be in accordance with the manufacturer's instructions. Coupling shall be suitable for working pressure and temperature of service. Coupling shall be approved by authorities having jurisdiction. Unions and flanges for servicing and disconnect are not required in installations with grooved mechanical joint couplings. The couplings shall serve as disconnect points.
 - a. Standard Mechanical Couplings: Manufactured in two segments of cast ductile iron, conforming to ASTM A-536, Grade 65-45-12. Gaskets shall be pressure-responsive synthetic rubber, grade to suit the intended service, conforming to ASTM D-2000. Mechanical Coupling bolts shall be zinc plated (ASTM B-633) heat treated carbon steel track head conforming to ASTM A-449 and ASTM A-183. Couplings shall comply with ASTM F1476 – Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.
 - b. Rigid Type: Coupling housings with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with ANSI B31.1, B31.9, with Victaulic Style 107H/107N (Quick-Vic™) or GruvLok SlideLok, Installation ready rigid coupling for direct stab installation without field disassembly. Gasket shall be Grade "EHP" EPDM designed for operating temperatures from -30 deg F (-34 deg C) to +250 deg F (+120 deg C).

- c. Flexible Type: Use in locations where vibration attenuation and stress relief are required. Flexible couplings may be used in lieu of flexible connectors at equipment connections. Three couplings, for each connector, shall be placed in close proximity to the vibration source. Victaulic Style 177 (Quick-Vic™) or GruvLok, Installation ready or Style 77 flexible coupling.
- d. Victaulic AGS Mechanical Couplings, 14 inch (DN350) through 60 inch (DN1500): Couplings shall consist of two ASTM A-536 ductile iron housing segments with lead-in chamfer on housing key and a wide-width elastomer pressure responsive gasket. Victaulic Style W07 AGS Rigid and Style W77 AGS Flexible Coupling.

2.4 TRANSITION FITTINGS

- A. Plastic-to-Metal Transition Fittings: CPVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
 - 1. Manufacturers:
 - a. Eslon Thermoplastics.
- B. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimension; one end with threaded brass insert, and one solvent-cement-joint end.
 - 1. Manufacturers:
 - a. Thomson Plastics, Inc.
- C. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC and PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.
 - 1. Manufacturers:
 - a. NIBCO, Inc.
 - b. NIBCO, Inc.; Chemtrol Div.

2.5 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
 - 1. Manufacturers:
 - a. Capitol Manufacturing Co.
 - b. Central Plastics Company/
 - c. Eclipse, Inc.
 - d. Epco Sales, Inc.
 - e. Hart Industries, International, Inc.

- f. Watts Industries, Inc.; Water Products Div.
 - g. Zurn Industries, Inc.; Wilkins Div.
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300- psig minimum working pressure as required to suit system pressures.
 - 1. Manufacturers:
 - a. Capitol Manufacturing Co.
 - b. Central Plastics Company
 - c. Epco Sales, Inc.
 - d. Watts Industries, Inc.; Water Products Div.
- E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 - 1. Manufacturers:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Central Plastics Company
 - d. Pipeline Seal and Insulator, Inc.
 - 2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.
- F. Dielectric Couplings: Galvanized-steel coupling with inert and non-corrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
 - 1. Manufacturers:
 - a. Calpico, Inc.
 - b. Lochinvar Corp.
- G. Dielectric Nipples: Electroplated steel nipple with inert and non-corrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.
 - 1. Manufacturers:
 - a. Perfection Corp.
 - b. Precision Plumbing Products, Inc.
 - c. Sioux Chief Manufacturing Co., Inc.
 - d. Victaulic Co. of America

2.6 UNIONS AND FLANGED CONNECTIONS

- A. 150-pound malleable iron with ground joint and brass to iron seats. Crane 1280.
- B. 125-pound wrought copper or cast brass union with solder joint fittings. Crane 633.
- C. 150-pound forged steel flanges with welding neck. Crane 568.

- D. 150-pound bronze flanges with tube stop. Mueller F900.

2.7 VALVE DESIGNATIONS

- A. Refer to System Schedules in Execution portion of this Section for designation of valve types to be used for each piping system.
- B. All valves shall be compatible with the type of piping material installed in the system.

PART 2 - PRODUCTS (Continued)

VALVE SCHEDULES

1	Refer to System Schedules in Execution portion of this Section for designation of valve types to be used for each piping system.		
2	VALVE DESIGNATION	CV-4	
3	TYPE	Globe	
4	MAXIMUM WORKING		
4.1	Pressure - PSIG	125	
4.2	Temperature - °F	Sat. Stm.	
5	SIZE LIMITS - Inches	1/2 - 2 1/2	
6	DESCRIPTION		
6.1	Body	Bronze	
6.2	Trim	Bronze	
6.3	Disc/plug	Renewable Composite	
6.4	Bonnet	Screw-in	
6.5	Stem	Rising-Silicon Bronze	
6.6	Seat	Integral	
6.7	Agency Compliance	MSS SP-80	
	APPROVED PRODUCTS	Soldered	Threaded
7.1	Nibco	S211	T211
7.2	Crane	1310	1
8	NOTES		
8.1	Provide manufacturer's standard stem packing for service intended.		
8.2	Valves with rising stems suitable for repacking under pressure.		

PART 2 - PRODUCTS (Continued)

VALVE SCHEDULES

1	Refer to System Schedules in Execution portion of this Section for designation of valve types to be used for each piping system.		
2	VALVE DESIGNATION	CV-5	CV-6
3	TYPE	Globe	Angle
4	MAXIMUM WORKING		
4.1	Pressure - PSIG	125	125
4.2	Temperature - °F	Sat. Stm.	Sat. Stm.
5	SIZE LIMITS - Inches	3 - 12	3 - 12
6	DESCRIPTION		
6.1	Body	Iron ASTM A126	Iron
6.2	Trim	Bronze	ASTM B-584
6.3	Disc/plug	Renewable Composite	Renewable Composite
6.4	Bonnet	Bolted	Bolted
6.5	Stem	OS&Y	OS&Y
6.6	Seat	Renewable Rings	Renewable Rings, ASTM B584
6.7	Agency Compliance	MSS SP-85	MSS SP-85
7	APPROVED PRODUCTS		
7.1	Nibco	F-718-B	F-818-B
7.2	Crane	351	353
7.3	Jenkins	613CJ	615CJ
8	NOTES		
8.1	Provide manufacturer's standard stem packing for service intended.		
8.2	Valves with rising stems suitable for repacking under pressure.		

PART 2 - PRODUCTS (Continued)

VALVE SCHEDULES

1	Refer to System Schedules in Execution portion of this Section for designation of valve types to be used for each piping system.			
2	VALVE DESIGNATION	CV-7	CV-8	
3	TYPE	Horizontal Swing Check	Horizontal Swing Check	
4	MAXIMUM WORKING			
4.1	Pressure - PSIG	125	125	
4.2	Temperature - °F	Sat. Stm.	Sat. Stm.	
5	SIZE LIMITS - Inches	0 - 3	2 1/2 - 12	
6	DESCRIPTION			
6.1	Body	Bronze ASTM-B62	Iron ASTM A-126	
6.2	Trim	Bronze	Bronze	
6.3	Disc/plug	Bronze	Renewable Bronze	
6.4	Bonnet	Screw-in	ASTM B-584	
6.5	Seat	Integral	Renewable Rings	
6.6	Agency Compliance	MSS SP-80	MSS SP-71 TYPE I	
7	APPROVED PRODUCTS	Soldered	Threaded	Threaded Flanged
7.1	Crane	1342	37	372 373
7.2	Nibco	S41BB	T-413B	T-918-B F-918-B
7.3	Jenkins	762A		
7.4	Victaulic	Series 716		Series 779

PART 2 - PRODUCTS (Continued)

VALVE SCHEDULES

1	Refer to System Schedules in Execution portion of this Section for designation of valve types to be used for each piping system.	
2	VALVE DESIGNATION	CV-9
3	TYPE	Non-Slam Wafer Check
4	MAXIMUM WORKING	
4.1	Pressure - PSIG	150 (WOG)
4.2	Temperature - °F	100
5	SIZE LIMITS - Inches	2 - 12
6	DESCRIPTION	
6.1	Body	Semi-Steel, ASTM A-126
6.2	Trim	Bronze ASTM B-62
6.3	Disc/plug	Center Guided
6.4	Bonnet	
6.5	Seat	Renewable Rings
6.6	Agency Compliance	
7	APPROVED PRODUCTS	
7.1	Crane	1400
7.2	Lunkenheimer	-
7.3	Nibco	W910
7.4	Mueller	91 AP, 92 AP
7.5	Victaulic	Series 779

PART 2 - PRODUCTS (Continued)

VALVE SCHEDULES

1	Refer to System Schedules in Execution portion of this Section for designation of valve types to be used for each piping system.	
2	VALVE DESIGNATION	CV-15
3	TYPE	Globe Non-Slam Check
4	MAXIMUM WORKING	
4.1	Pressure - PSIG	125
4.2	Temperature - °F	200
5	SIZE LIMITS - Inches	4 - 12
6	DESCRIPTION	
6.1	Body	Cast Iron
6.2	Trim	Bronze
6.3	Disc/plug	Center Guided
6.4	Bonnet	
6.5	Seat	Bronze
7	APPROVED PRODUCTS	
7.1	Crane	
7.2	Lunkenheimer	
7.3	Jenkins	
7.4	Nibco	F-910
7.5	Victaulic	
	Mueller	105M-AP
7.6	Centerline	
8	NOTES	
8.1	Use lift check valves only when noted on Drawings.	
8.2	Use viton seat on CV-15 for temperatures above 250°F.	

PART 2 - PRODUCTS (Continued)

VALVE SCHEDULES

1	Refer to System Schedules in Execution portion of this Section for designation of valve types to be used for each piping system.	
2	CLASS NO.	CV-20
3	TYPE	Ball - Full Port
4	MAXIMUM WORKING	
4.1	Pressure - PSIG	600
4.2	Temperature - °F	Sat. Stm.
5	SIZE LIMITS - Inches	1/2 – 2 1/2"
6	DESCRIPTION	
6.1	Body/End Piece	2-Piece Construction - ASTM B 584 Bronze Body Alloy 844 Forging Brass ASTM B-124 Alloy 377
6.2	Ball	Chromeplated Brass Conventional Port
6.3	Stem	Bronze or Brass
6.3.1		Provide with Stem Extension on insulated pipes
6.4	Seats/Seals	Teflon
6.5	Agency Compliance	MSS SP-110
7	APPROVED PRODUCTS	
7.1	Nibco	T-585-70
7.2	Crane/Capri	9202
7.3	Conbraco Industries, Inc.	70-100
7.4	Apollo Series	
7.5	Milwaukee Valve	
8	NOTES	
8.1	Soldered valves are not allowed.	
8.2	Provide metal valve stem extension or valve manufacturer's insulated metal extension handle system on all valves installed in insulated systems and specified to be insulated. Plastic valve stem extensions are not acceptable.	
8.3	Provide lead-free valves for all domestic water applications.	

PART 2 - PRODUCTS (Continued)

VALVE SCHEDULES

- 1 Refer to System Schedules in Execution portion of this Section for designation of valve types to be used for each piping system.
- 2 CLASS NO. CV-23
- 3 TYPE Butterfly
- 4 MAXIMUM WORKING
 - 4.1 Pressure - PSIG 300
 - 4.2 Temperature - °F 200
- 5 SIZE LIMITS - Inches 3 – 6 (see note below)
- 6 DESCRIPTION
 - 6.1 Body/End Piece Duct. Iron ASTM A-126 Threaded Lug for dead end service
 - 6.2 Disc AL. Bronze ASTM B-148 Alloy 954/955; Coated Ductile Iron
 - 6.3 Stem 416 Stainless steel ASTM A-582
Collar bushings upper and lower bushing
Stem shall be offset from the disc centerline to provide complete 360-degree circumferential seating.
 - 6.4 Seats Pressure Responsive EPDM
 - 6.5 Agency Compliance MSS SP-67
- 7 OPERATOR
 - 7.1 **Self-locking worm gear type actuator with adjustable stops and disc position indicator.**
 - 7.2 **Provide with chain wheel where noted on Drawings.**
- 8 APPROVED PRODUCTS
 - 8.1 Nibco LD 2000-3
 - 8.2 Crane 14-TL
 - 8.3 Apollo 6L-31
 - 8.4 Lunkenheimer FIG. 4735
 - 8.5 Stockham LD-711-BS3-E
 - 8.6 Victaulic VIC300 Series
 - 8.7 Bray Series 31
- 9 NOTES
 - 9.1 Do not use butterfly valves on pipes size 2 1/2" and smaller.

PART 2 - PRODUCTS (Continued)

VALVE SCHEDULES

- 1 Refer to System Schedules in Execution portion of this Section for designation of valve types to be used for each piping system.
- 2 CLASS NO. CV-24
- 3 TYPE Butterfly
- 4 MAXIMUM WORKING
 - 4.1 Pressure - PSIG 150
 - 4.2 Temperature - °F 200
- 5 SIZE LIMITS - Inches 8 - 12
- 6 DESCRIPTION
 - 6.1 Body/End Piece Duct. Iron ASTM A-536 Threaded Lug for dead end service
 - 6.2 Disc AL. Bronze ASTM B-148 Alloy 954/955; Coated Ductile Iron
 - 6.3 Stem 416 Stainless steel ASTM A-582
Collar bushings upper and lower bushing
 - 6.4 Seats EPDM Rubber
 - 6.5 Agency Compliance MSS SP-67
- 7 OPERATOR
 - 7.1 Self-locking worm gear type actuator with adjustable stops and disc position indicator.
- 7.2 Provide with chain wheel where noted on Drawings.**
- 8 APPROVED PRODUCTS
 - 8.1 Nibco LD 2000-5
 - 8.2 Crane 14-TL
 - 8.3 Apollo 6L-31
 - 8.4 Lunkenheimer FIG. 4735
 - 8.5 Stockham LD-711-B53-E
 - 8.6 Victaulic 300 Series
 - 8.7 Bray Series 31

PART 2 - PRODUCTS (Continued)

VALVE SCHEDULES

- 1 Refer to System Schedules in Execution portion of this Section for designation of valve types to be used for each piping system.
- 2 CLASS NO. CV-25
- 3 TYPE Butterfly
- 4 MAXIMUM WORKING
 - 4.1 Pressure - PSIG 150
 - 4.2 Temperature - °F 200
- 5 SIZE LIMITS - Inches 14 - 24
- 6 DESCRIPTION
 - 6.1 Body/End Piece Duct. Iron ASTM A-126 CL.B
 - 6.2 Disc AL. Bronze ASTM B-148 Alloy 954; Coated Ductile Iron
 - 6.3 Stem 302 Stainless steel A151-302
 - 6.4 Seat/Backing Ring EPDM/Fiberite
- 7 OPERATOR
 - 7.1 Self-locking work gear type actuator with adjustable stops and disc position indicator.
- 7.2 Provide with chain wheel where noted on Drawings.**
- 8 APPROVED PRODUCTS
 - 8.1 Victaulic Series 709
 - 8.2 Crane Series 21/23
 - 8.3 Apollo LD 141
 - 8.4 Stockham LD 721
 - 8.5 Nibco LD 10005
 - 8.6 Bray Series 31

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install pipe, valves and fittings for each system as designated in the System Schedules on the following pages.
- B. Reference Products, Part 2 of this Section for specifications and manufacturers of pipes, valves and fittings designated to be installed in System Schedules.

PART 3 - EXECUTION (Continued)

**SYSTEM PIPING SCHEDULE 1
HEATING WATER**

- 1 Install pipe, valves and fittings as designated in this Schedule for this System.
- 2 NOMINAL SIZE RANGE
 - 2.1 Minimal Diameter 1/2" 2 1/2" 10"
 - 2.2 Maximum Diameter 2" 8" 20"
- 3 DESIGN
 - 3.1 Working Pressure PSIG 160 160 160
 - 3.2 Working Temperature °F 250 250 250
- 4 PIPING MATERIAL DESIGNATIONS
 - 4.1 Soft "K" Copper (See Notes) CP-8 - -
 - 4.2 Hard "L" Copper CP-8 CP-8 -
 - 4.3 Sch. 40 Bl. St. (See Notes) Not Allowed CP-2 CP-2
- 5 FITTING DESIGNATIONS
 - 5.1 Cold Press Not Allowed Not Allowed -
 - 5.2 Wrought CF-8- CF-8- -
 - 5.3 Cast Iron Threaded CF-2 - -
 - 5.4 Flanged Not Allowed CF-4 CF-4
 - 5.5 Butt Welded Not Allowed CF-5 CF-5
 - 5.6 Grooved Not Allowed CF-6 CF-6
- 6 JOINT DESIGNATIONS
 - 6.1 Cold Press Not Allowed Not Allowed -
 - 6.2 Solder CJ-8 CJ-8 -
 - 6.3 Threaded CJ-1 - -
 - 6.4 Welded Not Allowed CJ-5 CJ-5
 - 6.5 Flanged 125# Not Allowed CJ-44 CJ-44
 - 6.6 Grooved Not Allowed CJ-45 CJ-45
- 7 VALVE DESIGNATIONS
 - 7.1 Ball CV-20 CV-20 -
 - 7.2 Butterfly - CV-23, 24 CV-24, 25
 - 7.3 Globe CV-4 CV-4, 5 CV-5
 - 7.4 Wafer Check - CV-9 CV-9
 - 7.5 Globe Check - CV-15 CV-15
- 8 NOTES
 - 8.1 Pipe installed below grade shall be continuous soft copper. No piping joints allowed below grade. All pipes above grade shall be straight lengths.
 - 8.2 Buried piping shall be CP-80, no exceptions. See Section 3, Underground Piping for installation requirements.
 - 8.3 Use Schedule 30 black steel pipe on all sizes 12" and over.
 - 8.4 Use 1/2" pipe only if shown on Drawings.

8.5 Mechanical T-bolted branch outlets not approved.

PART 3 - EXECUTION (Continued)

SYSTEM PIPING SCHEDULE 14
SANITARY, VENT AND STORM GRAVITY-INSIDE BUILDING

- 1 Install pipe, valves and fittings as designated in this Schedule for this System.
- 2 ABOVE GRADE
 - 2.1 SANITARY & STORM PIPE DESIGNATIONS

			FITTING DESIGNATIONS		JOINT DESIGNATIONS	
2.1.1	1 1/2" and Larger					
2.1.1.1	Cast Iron No Hub	CP-41	No Hub	CF-41	Coupling	CJ-41
2.1.1.2	Sch. 40 DWV PVC	CP-33	PVC	CF-33	Solvent	CJ-33
 - 2.2 VENT PIPE DESIGNATIONS

2.2.1	1 1/2" and Larger					
2.2.1.1	Cast Iron No Hub	CP-41	No Hub	CF-41	Coupling	CJ-41
2.2.1.3	Sch. 40 DWV PVC	CP-33	PVC	CF-33	Solvent	CJ-33
- 3 BELOW FLOOR
 - 3.1 SANITARY, STORM AND VENT
 - 3.1.1 2" and Larger

3.1.1.1	Cast Iron Hub	CP-40	Hub	CF-40	Gasket	CJ-40
3.1.1.2	Sch. 40 DWV PVC	CP-33	PVC	CF-33	Solvent	CJ-33
- 4 NOTES
 - 4.1 PVC piping installed above ceilings and within all plenum types shall be insulated. Reference Insulation Section 20 01 80.
 - 4.2 All waste pipe for kitchens shall be cast iron under entire footprint of the kitchen.

PART 3 - EXECUTION (Continued)

SYSTEM PIPING SCHEDULE 17
DOMESTIC HOT & COLD WATER
ABOVE GROUND

- 1 Install pipe, valves and fittings as designated in this Schedule for this System.
- 2 NOMINAL SIZE RANGE
 - 2.1 Minimum Diameter 1/2" 4"
 - 2.2 Maximum Diameter 3" 8"
- 3 DESIGN
 - 3.1 Working Pressure PSIG 125 125
 - 3.2 Working Temperature °F 250 250
- 4 PIPING DESIGNATIONS
 - 4.1 Hard "L" Copper CP-8 CP-8
- 5 FITTING DESIGNATIONS
 - 5.1 Cold Press Not Allowed Not Allowed
 - 5.2 Wrought CF-8 -
 - 5.3 Grooved Mech. - CF-6
- 6 JOINT DESIGNATIONS
 - 6.1 Cold Press Not Allowed Not Allowed
 - 6.2 Solder CJ-8 -
 - 6.3 Grooved - CJ-6
- 7 VALVES
 - 7.1 Ball CV-20
 - 7.2 Angle - CV-6
 - 7.3 Globe CV-4, 5 CV-5
 - 7.4 Check Horizontal Swing CV-7, 8 CV-8
 - 7.5 Butterfly - CV-23, 24
- 8 NOTES
 - 8.1 Install ball valves for balancing services.
 - 8.2 Use flange joint on 3" and larger pipe when connection to equipment.
 - 8.3 Saddle type fittings are prohibited.
 - 8.4 See Division 22 "Plumbing" for special valves.
 - 8.5 Mechanical T-bolted branch outlets not approved.

PART 3 - EXECUTION (Continued)

**SYSTEM PIPING SCHEDULE 19
FIRE PROTECTION**

1	Install pipe, valves and fittings as designated in this Schedule for this System			
2	LOCATION LIMITES	BELOW GROUND	ABOVE GROUND	
3	NOMINAL SIZE RANGE			
3.1	Minimum Diameter	4"	1"	2 1/2"
3.2	Maximum Diameter	12"	2"	8"
4	DESIGN			
4.1	Working Pressure PSIG	175	175	175
4.2	Working Temperature °F	WOG	WOG	WOG
5	PIPING DESIGNATIONS			
5.1	Ductile Iron	CP-20	-	-
5.2	Sch. 40 Bl. St.	-	CP-2	-
5.3	Sch. 10 Bl. St.	-	-	CP-2
6	FITTING DESIGNATIONS			
6.1	Ductile Iron Mech. Joint	CF-20	-	-
6.2	Class 125 Cast Iron	-	CF-2	-
6.3	Class 150 Malleable Iron	-	CF-1	-
6.4	Steel Grooved	-	-	CF-6
7	JOINT DESIGNATIONS			
7.1	Mechanical Joint	CJ-20	-	-
7.2	Threaded	-	CJ-1	-
7.3	Mech. Grooved	-	-	CJ-6
8	NOTES			
8.1	Valves are specified in Fire Protection Section 21 10 00.			
8.2	Provide manufacturer's standard gasket for service intended on mechanical joint pipe.			
8.3	Provide thrust blocks, tie-rods on fittings below grade as required by NFPA #24, Chapter 8.			
8.4	The minimum burial depth of exterior fire protection systems shall be 5'-0".			
8.5	Saddle type fittings are prohibited.			
8.6	Mechanical T-bolted branch outlets not approved.			

3.2 PIPE SUPPORT

A. Pipe Support

1. Furnish and install supports, guides, anchors and swaybraces required for proper installation and support of pipelines except supports noted to be furnished by others.
2. Pipe suspension shall prevent excessive stress and excessive variation in supporting force. Fabrication and installation of supports for pipelines shall not constrain piping to cause excess transfer of load from supports to piping or from support to support when expansion or contraction occurs. Supports shall be capable of taking entire piping load imposed by expansion or contraction.
3. Where pipe vibration transmits objectionable vibration to building structure or attached equipment, hangers shall be supplemented by spring cushions or an energy absorbing means in the supports themselves, or through the addition of flexible piping connectors or other auxiliary equipment.
4. Piping system where flexibility is not desired shall be supported by rigid hangers.
5. See Section 20 00 10, "Attaching to Building Construction" for attaching pipe support to structure.

B. Vertical Pipe Risers

1. Support vertical runs under 15' long with hanger adjacent to elbows.
2. Support vertical runs over 15' with steel riser clamps. Weld clamps to pipe and support on building structure. Space clamps at every floor with maximum spacing of 28'.

C. Hanger Rods

1. Support horizontal pipe with hot rolled steel rod manufactured in accordance with ASTM A107. Space hanger rods to eliminate pipe sagging. Space hangers as listed below. Place hangers within 12" of each horizontal elbow.
2. Steel and Copper Hanger Spacing

<u>PIPE SIZE (NPS)</u>	<u>ROD SIZE (DIAMETER)</u>	<u>MAXIMUM HANGER SPACING</u>
1/2" thru 1-1/4"	3/8"	6'0"
1-1/2" and 3"	1/2"	10'0"
4" and 5"	5/8"	10'0"
6"	3/4"	10'0"
8" thru 12"	7/8"	15'0"
14" thru 18"	Two 7/8"	15'0"
20" thru 24"	Two 1"	15'0"

3. PVC Pipe Support Spacing

<u>PIPE SIZE (NPS)</u>	<u>ROD SIZE (DIAMETER)</u>	<u>MAXIMUM HANGER SPACING</u>
1/2" thru 1"	3/8"	3'0"
1-1/4" thru 3"	3/8"	4'0"
4" thru 5"	1/2"	4'0"
6"	1/2"	4'0"

4. Piping with caulked joints to be supported at each joint.
- D. Pipe Hangers (Pipe Suspended from Above)
1. For Hot Lines or Combination Hot and Cold Lines
 - a. 2" and smaller iron or steel pipe: adjustable steel clevis hangers. Elcen 12; Grinnell 260; Fee & Mason 239; Crawford 11.
 - b. 2" and smaller copper pipe: adjustable copper pipe ring. Elcen 394; Grinnell 97CP; Fee & Mason 365; Crawford.
 - c. 2-1/2" thru 12" iron, steel and copper pipe: adjustable steel clevis hangers. Elcen 12; Grinnell 260; Fee & Mason 239; Crawford 11.
 - d. 2-1/2" thru 12" iron, steel and copper pipe: adjustable swivel pipe roll (one hanger rod). Elcen 14; Grinnell 174; Fee & Mason 272; Crawford 129.
 - e. 14" thru 24" o.d. iron or steel pipe: single pipe roll with adjustable sockets (two hanger rods). Elcen 15; Grinnell 171; Fee & Mason 170; Crawford 15.
 2. For Cold Lines
 - a. All sizes iron or steel pipe: Elcen 12; Grinnell 260; Fee & Mason 239; Crawford 11.
 - b. All sizes copper pipe: adjustable copper-plated ring. Elcen 394; Grinnell 97CP; Fee & Mason 365; Crawford.
 3. All hangers used on lines requiring insulation and vapor barrier shall have hangers oversized to allow insulation to pass thru hanger. Install insulation cradles or wood blocks the same thickness as insulation so insulation will not be crushed. Insulation cradles or wood blocks shall be designed for this specific use.
- E. Pipe Carriers (Pipe Supported from Below on Racks, Piers, Stands or Trapeze Support)
1. For Hot Lines or Combination Hot and Cold Lines
 - a. 3" and smaller Pipe: roller chair with steel U bar support. Elcen 16; Grinnell 176; Fee & Mason 168; Crawford 130.
 - b. 4" and larger Pipe: adjustable pipe roll stand with base plate. Elcen 20; Grinnell 274; Fee & Mason 161; Crawford 19.
 2. For Cold Lines: all pipe sizes supported on steel pipe chair designed to contain pipe movement in direction perpendicular to pipe run but allow some movement in direction of pipe run.
 3. All hangers used on lines requiring insulation and vapor barrier shall have hangers oversized to allow insulation to pass thru hanger. Install insulation cradles or wood blocks the same thickness as insulation so insulation will not be crushed. Insulation cradles or wood blocks shall be designed for this specific use.
- F. For sprinkler piping support refer to NFPA#13 (3-10 hangers).
- G. Supports for sprinkler piping to be in conformance with NFPA 13, if modified by this section.
- H. For piping hanger rod attachment to building, see Section 20 00 10 "Attaching to Building Construction."

3.3 UNDERGROUND PIPING Reference - Excavation and Backfilling

- A. See Excavation and Backfilling Section 20 00 50.
- B. Pre-Insulated Piping Installation Requirements: Piping shall be installed at burial depth noted on the plans, and in accordance with the piping manufacturer's requirements. Provide manufacturer's field technician for installation, unloading, field joint instruction, and testing. Service pipe shall be hydrostatically tested as noted in Section 3, Testing Piping. Joints shall be insulated/jacketed per manufacturer's requirements, using manufacturer's materials.

3.4 ESCUTCHEONS

- A. See Escutcheons, Section 20 00 50.

3.5 INSTALLATION OF VALVES

- A. Locate valves accessibly and arrange to permit easy removal of fixtures and equipment they serve.
- B. Unless otherwise noted, all valves shall be full size of lines in which they are placed.
- C. Install all piping and shut-off valves full pipe size as shown on Drawings. Reduce at control valves to control valve size.
- D. Valves mounted in horizontal lines shall not have their stems and bonnets pointed below horizontal position unless indicated on Drawings.
- E. Provide valves with 3/4" garden hose adaptor for draining low points, boilers, chillers, coils, etc. with cap and chain. Use ball valves for systems which operate below 120°F. Use gate (Crane 431) or globe valves for systems which operate above 121°F.
- F. Mount all globe valves to close against flow pressure. Flow should be against bottom of plug.
- G. Remove bonnets and trim from all valves before soldering, brazing or welding in piping system. Protect seating surfaces during installation. Clean valve parts thoroughly before reassembling. Install bonnet with valve in open position. Follow manufacturer's written instructions to protect valves from overheating during installation.
- H. Install all valves with discs or plugs in open position. Close only when assured that sealing parts are free from foreign material. Weld scale or similar foreign materials found embedded in sealing surfaces will require installation of new trim or complete valve.
- I. **If grooved piping system is used, then only grooved end valves shall be used. It is not acceptable to use grooved to flanged adapters to install flanged valves.**
- J. Install valves as required by control contractor.

3.6 INSTALLATION OF PIPING

- A. Offset piping to avoid interference with other work to increase head room under piping.

- B. Contractor may, at his option, use pipe bending equipment to form full lengths of pipe to proper configuration indicated on Drawings.
- C. Remove raised face from flanges that are to match cast iron flat face patterns.
- D. Coat studs, nuts, flange faces and metallic gaskets with material similar to molybdenum disulphide before assembly.
- E. Pipe sizes refer to nominal inside pipe diameter except on copper refrigeration lines and steel and wrought iron pipe 14" and larger.
- F. Bonney Weldolet Forge Branch Outlet Fittings may be used where steel with welding fittings are specified in lieu of branch outlet tees, provided branch tee is 2 sizes smaller than main. Nipples welded into mains not acceptable.
- G. Use galvanized fittings and unions with galvanized pipe.
- H. Caulk clearance space in floor sleeves with plastic compound or fire stop material as required.
- I. Caulk exterior wall sleeves with thiokol.
- J. Install chromeplated pipe escutcheons on bare exposed pipe at wall, floor and ceiling penetrations. Reference 20 00 50 Escutcheons.
- K. Use dielectric couplings when joining dissimilar piping materials.
- L. Piping shall not pass over electrical apparatus. If conflict is shown on Drawings, notify Engineer prior to installing pipe.
- M. Refer to General Requirements for installation of sleeves, escutcheons, cutting and fitting and attaching to building construction.
- N. Refer to Insulation Section 20 01 80 for insulation data. PVC piping installed above ceilings and within all plenum types shall be insulated.
- O. Conceal all pipes where provisions have been made for this purpose.
- P. In case of conflict on Drawings as to pipe size, the larger pipe size shall be installed.
- Q. Joints shall be approved type, gas and watertight for system pressure.
- R. All pipes shall be cut square, reamed, chamfered and free of all burrs and obstructions. Pipe ends shall have full-bore openings and not be undercut.
- S. Piping not serving elevator equipment rooms shall not pass through elevator equipment rooms. If conflict is shown on drawings, notify Engineer prior to installing pipe.
- T. Install wells, thread-o-lets and T's as required by control contractor.
- U. Copper pipe shall not come in direct contact with mortar or grout. Where copper pipes are exposed to mortar or grout, pipes shall be wrapped with duct tape. This typically happens when pipes pass through masonry walls.

- V. All pipes to equipment and isolation valves shall be full pipe size as shown on Drawings regardless of equipment connection size. Use reducers at equipment to reduce to equipment size.
- W. Grooved product must be installed per manufacturer's written instructions, which may or may not include extreme lubricant, torque wrench and specified torque ratings. Manufacturer's representative must provide on-site training to field personnel on installation of product.
- X. No pulled "T" drilling of copper piping for branch takeoff's allowed.
- Y. Condensate piping shall be installed with slope of not less than 1/8" per foot.
- Z. **If grooved piping system is used, it is not acceptable to use mechanical-T bolted branch outlet fittings.**

3.7 PIPE CLEANING

- A. Swab to remove dirt or scale.
- B. Flush water system until water runs clear.
- C. Operate steam systems until condensate runs clear.
- D. Clean all strainers and traps.

3.8 TESTING PIPING

- A. Test all piping at 1 1/2 times operating pressure.
- B. Test all concealed work before covering with earth, insulation or furring.
- C. Notify Engineer not less than 24 hours in advance of all tests.
- D. Furnish all fuel and necessary equipment required for tests.
- E. Promptly repair all leaks and reapply tests.
- F. Install blind flanges or plugs in order to make tests.
- G. See Specification Divisions 22 and 23 for additional pressure testing requirements.

3.9 STERILIZATION OF DOMESTIC WATER SYSTEM

- A. Flush system thoroughly until water runs clear.
- B. Entire system shall be filled with a water/chlorine solution containing 50 parts per million of chlorine. The system or part thereof shall be valved off and allowed to stand for 24 hours; or the system or part thereof shall be filled with a water/chlorine solution containing at least 200 parts per million of chlorine and allowed to stand for three hours.

- C. Following the allowed standing time, the system shall be flushed with clean potable water until chlorine does not remain in the water coming from the system.
- D. After the above requirements are satisfied, submit samples to local Board of Health for approval.
- E. Sterilization shall be redone until approval from the State Board of Health is obtained.

3.10 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook", using lead-free solder alloy complying with ASTM C 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook", "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 - 3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 - 4. PVC Non-pressure Piping: Join according to ASTM D 2855.
- J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- K. Plastic Non-pressure Piping Gasketed Joints: Join according to ASTM D 3212.

- L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
 - 1. Plain-End Pipe and Fittings: Use butt fusion.
 - 2. Plain-End Pipe and Socket Fittings: Use socket fusion.
- M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.
- N. Cold Press – Not Allowed

3.11 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2-1/2 and smaller, adjacent to each threaded valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 - 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
 - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.
 - 5. "Pulled Tee's" in copper piping are not allowed.

3.12 GROOVED PIPING

- A. Grooved joints shall be installed in accordance with the manufacturer's latest published installation instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks. Gaskets shall be molded and produced by the coupling manufacturer, and shall be verified as suitable for the intended service. A factory-trained field representative (direct employee) of the mechanical joint manufacture shall provide on-site training for contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. The factory-trained representative shall periodically review the product installation and ensure best practices are being followed. Contractor shall remove and replace any improperly installed products. A distributor's representative is not considered qualified to conduct the training.
- B. For applicable projects, the grooved coupling manufacturer shall provide inspection services and/or certify the installing contractor for the installation of their product. The manufacturer's factory trained representative shall provide certification training for the installing contractor's field personnel in the use of grooving tools, application of groove, and product installation. The training program shall be designed, developed, administered and evaluated in accordance to the ANSI/IACET Standard for Continuing Education and Training. (IACET-International Association for Continuing Education and Training)

END OF SECTION 20 00 60

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SECTION 20 01 80 – COMMON INSULATION FOR PLUMBING AND HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This section includes field applied insulation and jacket materials for all systems. These systems include:
 - 1. System Insulation Schedule 1:
Heating Water Pipe
 - 2. System Insulation Schedule 3:
Domestic Cold Water Pipe
Domestic Hot Water Pipe
Sanitary Waste & Vent
 - 3. System Insulation Schedule 9:
Heating and Air Conditioning:
Supply Air Ductwork
- B. Any equipment that is to be factory insulated is specified with respective equipment.
- C. All PVC piping installed in a ceiling plenum shall be insulated to provide a flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
- D. Any piece of equipment, pipe, or duct, installed in this contract, which is typically insulated to prevent condensation, shall be insulated unless specifically noted otherwise.
- E. Internally lined sheet metal is specified in Metal Ducts, Section 23 31 13.
- F. Related sections include all applicable Mechanical Sections.

1.3 SUBMITTALS

- A. Submit product data for insulation, jacket materials and fittings used in each system as required in Section 20 00 10, "Shop Drawings".
- B. Product data shall include thermal conductivity, thickness, jacket material, insulation material, sealing compounds, flame-spread and smoke-developed ratings for each type of product to be used.
- C. Submit test reports of independent testing agency showing conformance with flame-spread and smoke-developed ratings.

1.4 QUALITY ASSURANCE

- A. Insulation Contractor shall have completed a minimum of two (2) projects of similar scope. Upon request, the Insulation Contractor shall provide a list of similar projects and references to the Engineer. The engineer may wish to inspect work previously installed by the Insulation Contractor.
- B. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
- C. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. All insulation to be shipped to site in unopened containers as packaged by Insulation Manufacturers.
- B. All containers shall state contents within.
- C. Store in clean dry area properly protected from weather and physical damage.
- D. Open only containers required to be opened as construction progresses.

1.6 COORDINATION

- A. Coordinate size and location of supports, hangers and insulation shields.
- B. Coordinate hanger sizes and piping penetrations for pipes requiring insulation, wood blocking and saddles with piping installer.

1.7 SCHEDULING

- A. Schedule insulation application after pipe testing and heat trace has been installed.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Refer to Insulation Material Schedules in Execution portion of this Section for Insulation types to be used for each system. When more than one is shown, contractor may choose which type is to be installed.
- B. Fiberglass Insulation
 - 1. Glass fiber bonded with a thermosetting resin with thermal conductivity of .27 or less @ 75°F. Designed for use to 650°F.

- a. Preformed Pipe Insulation with Jacket: 3 lb/ft³, ASTM C547, Type 1, Class 1 with factory applied all-purpose, vapor-retarder ASJ jacket, 0.02 perm max water vapor permeance. Designed for use to 850°F max.
 - b. Board Insulation: 3 lb/ft³, ASTM C 612, Type IB, without facing and with FSK jacket manufactured from kraft paper, reinforcing scrim, aluminum foil and vinyl film. Verify jacketing with Engineer prior to insulating exposed ductwork with board insulation within finished spaces. Design for use to 450°F max.
 - c. Blanket Insulation: 3/4 lb/ft³, ASTM C 553, Type II, without facing and with FSK manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film. Designed for use to 250°F max.
 2. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:
 - a. Class 1, Grade A for bonding glass cloth and tape to un-faced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to un-faced glass-fiber insulation.
 - b. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.
 3. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.
 4. Mineral-Fiber Insulating Cements: Comply with ASTM C 195.
 5. Expanded or Exfoliated Vermiculite Insulating Cements: Comply with ASTM C 196.
 6. Mineral-Fiber, hydraulic-setting insulating and finishing cement: Comply with ASTM C 449/C 449M.
 7. Manufacturers:
 - a. CertainTeed Manson
 - b. Knauf Insulation.
 - c. Owens-Corning Fiberglas Corp.
 - d. Schuller International, Inc.
 - e. Johns Manville
- C. Flexible Elastomeric Insulation
1. Closed cellular or expanded rubber material of high insulating efficiency (K of .25 or better @ 75°F) and designed for use with temperatures from -40°F to 210°F. Odorless, self-extinguishing and vapor resistant in compliance with ASTM E-84, 25/50 flame smoke rating. Approved for use in return air plenums.
 - a. Preformed pipe insulation: ASTM C 534, Type I.
 - b. Sheet insulation: ASTM C 534, Type II.
 2. Adhesive: As recommended by Insulation Material Manufacturer.
 3. Ultraviolet – Protective Coating: As recommended by Insulation Manufacturer.
 4. Manufacturers:
 - a. Armacell AP
 - b. K-Flex
 - c. Aeroflex
- D. Duct Liner: See Section 23 31 13.

2.2 ADHESIVES

- A. Adhesives or mastics used in the application or manufacture of insulating materials shall be fire retardant with UL flame rating not exceeding 25 and smoke developed rating not exceeding 50 (on dry film) when tested in accordance with ASTM E 84. All adhesives specifically designed for respective application as noted by insulation manufacturer.

2.3 JACKETS

- A. PVC Jacket
 - 1. High-impact
 - a. Fittings – Gloss White, preformed, 30 Mill, PVC jacket designed for use with and provided by same manufacturer of insulation. Fiberglass insert wrapped around fitting and covered by PVC preformed jacket piping insulation system.
 - b. Sheet – Gloss White, preformed, pre-cut and curled 20 mil PVC jacket designed for use with and provided by same manufacturer of piping insulation system. Ultraviolet-resistant suitable for outdoor service and temperature range 0 – 150°F. Jacket to be completely sealed with solvent weld for vapor proof barrier where noted in schedule.
- B. Foil, Scrim and Kraft-Paper (FSK) Jacket
 - 1. Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil. Maximum of .02 perms moisture vapor transmission, ASTM C 921, Type I, Max 25/50 flame smoke rating.
- C. All-Service Jacket (ASJ)
 - 1. White, kraft-paper fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type 1.

2.4 ACCESSORIES AND ATTACHMENTS

- A. Glass Cloth and Tape
 - 1. Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, pre-sized a minimum of 8 oz./sq. yd. (270 g/sq. m). Tape Width: 4 inches (100 mm).
- B. Bands
 - 1. 3/4 inch (19 mm) wide, in one of the following materials compatible with jacket:
 - a. Stainless Steel: ASTM A 666, Type 304; 0.020 inch (0.5 mm) thick.
 - b. Aluminum: 0.007 inch (0.18 mm) thick.
- C. Wire

1. 0.080-inch (2.0 mm), nickel-copper alloy; 0.062-inch (1.6 mm), soft-annealed, stainless steel; or 0.062-inch (1.6 mm), soft-annealed, galvanized steel.

D. Welded-Attached Anchor Pins and Washers

1. Copper-coated steel pin for capacitor-discharge welding and galvanized speed washer. Pin length sufficient for insulation thickness indicated.
 - a. Welded Pin Holding Capacity: 100 lb. (45 kg) for direct pull perpendicular to the attached surface.

E. Adhesive-Attached Anchor Pins and Speed Washers

1. Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.
 - a. Adhesive: Recommended by the anchor pin manufacturer as appropriate for surface temperature of ducts, plenums, and breechings; and to achieve a holding capacity of 100 lb. (45 kg) for direct pull perpendicular to the adhered surface.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install Insulation for each system as designated in the Insulation Material Schedules on the following pages.
- B. When more than one type of insulation system is specified, contractor may choose which type is installed.
- C. Reference Products, Part 2 of this Section for specifications and manufacturers of insulation materials designated to be installed in Insulation Material Schedules.

3.1 EXECUTION (Continued)

SYSTEM INSULATION SCHEDULE 1: HEATING WATER PIPE

1	Install insulation materials as designated in this schedule for system(s) listed.								
2	LOCATION			INSIDE			OUTSIDE		
3	INSULATION								
3.1	Pipe			Fiberglass-Preformed with Jacket			Fiberglass-Preformed with Jacket		
3.2	Fitting			Fiberglass Blanket			Fiberglass Blanket		
4	INSULATION THICKNESS								
4.1	Pipe Size			≤2"	2 ½ ", 3"	≥4"	≤2"	2 ½ ", 3"	≥4"
4.2	Insulation Thickness			1"	1 ½ "	2 ½ "	1"	1 ½ "	2 ½ "
5	JACKETS								
5.1	Pipe			ASJ Integral to Insulation			Stainless Steel		
5.2	Fittings			Preformed PVC (See Note 6.3)			Preformed Stainless Steel		
5.3	Vapor-Retardant			No					
6	NOTES								
6.1	On VAV Boxes with heating coils, wrap ends of coils, exposed to space adjacent to coils with blanket type insulation. Secure with tape for vapor retarder surface.								

3.0 EXECUTION (Continued)

SYSTEM INSULATION SCHEDULE 3:

DOMESTIC COLD WATER PIPE
DOMESTIC HOT WATER PIPE
SANITARY WASTE & VENT

1	Install insulation materials as designated in this schedule for system(s) listed.		
2	LOCATION	INSIDE	OUTSIDE
3	INSULATION		
3.1	Pipe	Fiberglass-Preformed with Jacket	
3.2	Fitting	Fiberglass Blanket	
4	INSULATION THICKNESS		
4.1	Pipe Size	All	
4.2	Thickness	1"	
5	JACKETS		
5.1	Pipe	ASJ Integral to Insulation	
5.2	Fittings	Preformed PVC	
5.3	Vapor-Retardant	Yes	
6	NOTES		
6.1	Application of insulation on sanitary waste pipe shall be as follows:		
6.1.1	Piping installed above ground floor.		
6.1.2	Serving discharge from cooling coils or electric water coolers.		
6.1.3	Piping installed in return air plenum.		
6.1.4	Where insulation is required, install along pipe lengths connecting fixture to waste stack/main building drain only.		
6.2	All PVC piping in return air plenums shall be insulated per this schedule.		

3.1 EXECUTION (Continued)

SYSTEM INSULATION SCHEDULE 9: HEATING AND AIR CONDITIONING: SUPPLY AIR DUCTWORK

1	Install insulation materials as designated in this schedule for system.				
2	LOCATION	INSIDE	INSIDE	INSIDE	EXTERIOR
3	INSULATION MATERIAL	Flexible Fiber-glass	Rigid Fiberglass	Flexible Elastomeric	Rigid Fiberglass
4	INSULATION THICKNESS	1 1/2"	1 1/2"	3/4"	2"
5	JACKETS	FSK	FSK	FSK	Multi-Layer Weather-proof
5.1	Vapor-Retardant	Yes	Yes	Yes	Yes
6	NOTES				
6.1	Use rigid or flexible elastomeric insulation in mechanical rooms. All other areas may be flexible fiberglass.				
6.2	Where smaller diameter round ductwork is to be insulated and then painted, utilize pre-formed pipe insulation of required thickness with paintable all-service jacket (ASJ).				
6.3	Where ductwork is to be painted, install 3 lb/ft ³ rigid insulation with paintable all-service jacket (ASJ).				
6.4	Insulate ends of reheat coils including VAV box reheat coils in all applications where heating coils are in air conditioning supply ductwork. Install vapor barrier over insulation and seal watertight to adjacent insulation vapor barrier.				
6.5	Externally insulate supply air slot diffuser plenums with flexible fiberglass.				
6.6	External insulation to have a 1" crown on top to shed water.				
6.7	Where supply and return air branch ducts containing volume dampers are covered using duct wrap, expose volume damper actuator through duct wrap and "spot" paint the duct wrap around the actuator a bright and contrasting color for ease in visually locating the actuator while standing on the floor below the duct.				

3.2 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.4 GENERAL APPLICATION REQUIREMENTS

- A. All insulation that is to be painted shall have all-service jacket (ASJ) unless noted otherwise.
- B. Apply insulation only after pipes, ducts and equipment have been tested and cleaned.
- C. Protect furniture, equipment, ducts, pipes, etc. with tarpaulins. Keep premises clean.
- D. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the entire length.
- E. Refer to schedules at the beginning of this Section for insulation materials and thickness, jackets, and fittings required for each system. Unless otherwise indicated, insulation shall be the same type throughout the same service.
- F. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- G. Where insulation is applied on ducts, pipes and equipment which are against columns, walls or other equipment without adequate space for insulation, finish off insulation in workmanlike manner to meet approval of Engineer.
- H. Apply multiple layers of insulation with longitudinal and end seams staggered.
- I. Seal joints, seams and ends of insulation with vapor-retardant mastic on insulation with a compound recommended by the insulation material manufacturer on systems indicated to receive a vapor retardant.
- J. Keep insulation materials dry during application and finishing.
- K. Insulation shall be applied by craftsmen who are qualified to install insulation.
- L. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

- M. Apply insulation with the least number of joints practical.
- N. Apply insulation over fittings and specialties, with continuous thermal and vapor-retardant integrity, on systems noted to have vapor-retardant jacket.
- O. Provide removable sections of insulation or insulation boxes at all points where access is required for servicing of equipment on systems not requiring vapor-retardant jacket.
- P. Exposed is defined to mean visible from working zones of finished building. Concealed signifies opposite. Pipes and ducts above ceilings and in crawl tunnels are considered to be concealed. Finished rooms are defined as office, workrooms, instruction, storeroom areas, equipment rooms, walking tunnels, etc.
- Q. Aluminum jackets shall be installed in high traffic areas subject to damage.
- R. On systems not requiring vapor-retardant, neatly bevel insulation at all flanges, access cover plates, etc. so that bolts may be removed without disturbing insulation.
- S. All hangers used on lines requiring insulation and vapor barrier shall have hangers oversized and insulation cradles to allow insulation to pass thru hanger.
- T. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.
- U. Whenever Insulation Jacket is noted as Vapor Retardant: Overlap insulation facing at seams a minimum of one inch and secure with pressure-sensitive tape or adhesive as recommended by Manufacturer.
- V. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.
- W. Seal penetrations with vapor-retardant mastic.
- X. Apply insulation for exterior applications tightly joined to interior insulation ends.
- Y. Seal insulation to roof flashing with vapor-retardant mastic.
- Z. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions.
- AA. Insulation Terminations: For insulation application where vapor retardants are indicated, taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retardant.
- BB. Do not insulate over equipment name plate data.
- CC. Seal all punctures in vapor retardant jacket with vapor-barrier adhesive on cooling piping and air conditioning ducts.
- DD. Apply adhesives and mastics at the manufacturer's recommended coverage rate.
- EE. Do not weld brackets, clips, or other attachment devices to item being insulated unless specifically noted to do so.

3.5 DUCTWORK AND EQUIPMENT INSULATION

A. Blanket Insulation Application

1. Apply insulation with integral jackets as follows:
 - a. Pull jacket tight and smooth.
 - b. Install anchor pins and speed washers to keep insulation from sagging when duct width exceeds 22".
 - c. Joints and Seams: Cover with tape and vapor retardant as recommended by insulation material manufacturer to maintain vapor seal.
 - d. Vapor-Retardant Mastics: Where vapor retardants are indicated, apply mastic on seams and joints and at ends adjacent to duct flanges and fittings.
2. Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire-rated wall and partition penetrations. Maintain vapor-retardant barrier.
3. Floor Penetrations: Terminate insulation at underside of floor assembly and at floor support at top of floor. Provide vapor-retardant mastic on insulation indicated to receive vapor-retardant.

B. Board and Block Insulation Application

1. Blankets, Board, and Block Applications: Secure insulation with adhesive and anchor pins with speed washers.
 - a. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of surfaces to be insulated.
 - b. Groove and score insulation materials to fit as closely as possible to the surfaces, including contours. Bevel insulation edges for cylindrical surfaces for tight joint. Stagger end joints.
 - c. Protect exposed corners with secured corner angles.
 - d. Install adhesive-attached or self-adhesive anchor pins and speed washers on sides and bottoms of surfaces to be insulated as follows:
 - 1) Do not weld anchor pins to ASME-labeled pressure vessels.
 - 2) 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c. in both directions.
 - 3) Do not over-compress insulation during installation.
 - 4) Cut and miter insulation segments to fit curved sided and dome heads of tanks and vessels.
2. Impale insulation over anchor pins and attach speed washers.
3. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. Secure each layer of insulation with stainless-steel bands.
5. Stagger joints between insulation layers at least 3 inches (75 mm).
6. Apply insulation in removable segments on access doors and other elements that require removal for service.
7. Bevel and seal insulation ends around access panels, manholes, hand holes, ASME stamps, and nameplates.
8. Apply vapor-retardant mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retardant.

C. Flexible Elastomeric Thermal Insulation Applications:

1. Apply insulation over entire surface to be insulated according to the manufacturer's written instructions.
2. Apply 100 percent coverage of adhesive to surface with manufacturer's recommended adhesive.
3. Seal longitudinal seams and end joints for Vapor Retardant installation.

3.6 FIELD-APPLIED JACKET APPLICATION

- A. Apply glass-cloth jacket, where indicated, directly over bare insulation or insulation with factory-applied jackets.
1. Apply jacket smooth and tight to surface with 2-inch (50-mm) overlap at seams and joints.
 2. Embed glass cloth between two 0.062-inch- (1.6-mm-) thick coats of jacket manufacturer's recommended adhesive.
 3. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.

3.7 PIPING APPLICATION REQUIREMENTS

- A. Apply insulation with integral jackets as follows:
1. Pull jacket tight and smooth.
 2. Circumferential Joints: Cover with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip and spaced 4 inches (100mm) o.c.
 3. Longitudinal Seams: Overlap jacket seams at least 1-1/2 inches (40 mm). Apply insulation with longitudinal seams at bottom pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches (100 mm) o.c.
 - a. Exception: Do not staple longitudinal laps on insulation having a vapor retardant.
 4. Vapor-Retardant Mastics: Where vapor retardants are indicated, apply mastic on seams and joints and at ends adjacent to flanges, unions, valves, and fittings.
 5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor-retardant mastic.
- B. Apply insulation to fittings and elbows as follows:
1. Apply pre-molded insulation sections of the same material as straight segments of pipe insulation where scheduled. Secure according to manufacturer's written instructions.
 2. Apply mitered sections of pipe insulation, or glass-fiber blanket insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.
 3. Apply jacket material overlapping seams at least 1 inch (25 mm) at each end. Secure with manufacturer's recommended adhesive, attachments and accessories. Seal seams with tape. Use vapor-retardant mastic on insulation indicated to receive vapor-retardant.
- C. Apply insulation to valves and specialties as follows:
1. Apply pre-molded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
 2. When pre-molded insulation sections are not available, apply glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation

- without disturbing insulation. For strainers, arrange insulation for access to strainer basket without disturbing insulation.
3. Use preformed standard PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape. Also, seal seams with vapor-retardant mastic on insulation indicated to receive vapor-retardant.
 4. On piping 3" and smaller, not requiring vapor-retardant, fittings may be insulated with insulating cement equal in thickness to adjoining pipe insulation and troweled to smooth even finish. Do not insulate heating water pipe valves or unions.
 5. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.
- D. Floor Penetrations: Apply insulation continuously through floor assembly. Seal insulation with vapor-retardant mastic where floor supports penetrate vapor-retardant.
- E. Exterior Wall Penetrations: For penetrations of below-grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal terminations with vapor-retardant mastic.
- F. Hangers and Anchors: All hangers used on lines requiring insulation shall have hangers oversized and insulation support shield to allow insulation to pass continuously thru hanger.
1. Install insert materials on all piping 1 1/2" and larger. Apply insulation to tightly joint the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by the insulation material manufacturer.
 2. Fabricate inserts of heavy density insulating material suitable for temperature. Insulation inserts shall not be less than the following lengths:

1 1/2" to 2 1/2" pipe size	10" long
3" to 6" pipe size	12" long
8" to 10" pipe size	16" long
12" and over	22" long
 3. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect the jacket from tear or puncture by the hanger, support, and shield.
- G. Apply insulation to flanges as follows:
1. Apply preformed pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
 4. Apply jacket material with manufacturer's recommended adhesive, overlapping seams at least 2 inches (50 mm), and seal joints with vapor-retardant mastic.

END OF SECTION 20 01 80

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SECTION 211000 – WATER-BASED FIRE-SUPPRESSION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following fire-suppression piping inside the building:
 - 1. Wet-pipe sprinkler systems.
- B. See Division 10 Sections "Fire Extinguisher Cabinets" and "Fire Extinguishers" for cabinets and fire extinguishers.
- C. See Division 21 Section "Electric-Drive, Centrifugal Fire Pumps" for fire pumps, pressure-maintenance pumps, and pump controllers.
- D. See Division 28 Section "Fire Detection and Alarm" for alarm devices not specified in this Section.

1.2 SYSTEM DESCRIPTIONS

- A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device.

1.3 GENERAL

- A. Provide all material, labor, engineering and operations for the installation of complete and operable fire suppression system as shown on the Drawings and as specified herein.
- B. Provide all equipment and materials including pipes, valves, fittings, sprinkler heads, fire department connections, backflow preventer, pipe supports, specialties and accessories necessary for a complete and approved fire suppression system.
- C. This Contractor shall be completely responsible for the design, layout, submittals, installation, testing, certification and acceptance of the fire suppression system by the Indiana Department of Homeland Security Division for Fire and Building Safety.

1.4 PERFORMANCE REQUIREMENTS

- A. Standard Piping System Component Working Pressure: Listed for at least 175 psig.
- B. Fire-suppression sprinkler system design shall be approved by authorities having jurisdiction.
 - 1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
 - 2. Sprinkler Occupancy Hazard Classifications:
 - a. Auditoriums: Ordinary Hazard, Group 1.
 - b. Building Service Areas: Ordinary Hazard, Group 1.

- c. Classrooms: Light Hazard.
 - d. Corridors: Light Hazard.
 - e. Display Cases: Light Hazard.
 - f. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
 - g. General Storage Areas: Ordinary Hazard, Group 1.
 - h. Janitors: Ordinary Hazard, Group 1.
 - i. Laundries: Ordinary Hazard, Group 1.
 - j. Libraries, Except Stack Areas: Light Hazard.
 - k. Library Stack Areas: Ordinary Hazard, Group 2.
 - l. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
 - m. Office and Public Areas: Light Hazard.
 - n. Residential Living Areas: Light Hazard.
 - o. Restaurant Service Areas: Ordinary Hazard, Group 1.
 - p. Restrooms: Light Hazard.
 - q. Stages/Stagecraft: Ordinary Hazard, Group 2.
 - r. Stairs: Light Hazard.
3. Minimum Density for Automatic-Sprinkler Piping Design:
- a. Light-Hazard Occupancy: 0.10 gpm/sq. ft. over 1500 sq. ft.
 - b. Ordinary-Hazard, Group 1 Occupancy: 0.20 gpm/sq. ft. over 2500 sq. ft.
 - c. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm/sq. ft. over 2500 sq. ft. (stage calculation should be over entire area of stage, up to max 2500 sq. ft.).
 - d. Remote area may NOT be reduced where listed quick response sprinklers are used.
4. Maximum Protection Area per Sprinkler:
- a. Light Hazard: 225 sq. ft.
 - b. Ordinary Hazard: 130 sq. ft.
 - c. Other Areas: According to NFPA 13 recommendations, unless otherwise indicated.
 - d. When using extended coverage sprinkler heads, maximum protection area per sprinkler may be increased up to 400 sq. ft. in unobstructed light hazard and ordinary hazard locations and as allowable based on hydraulic calculations.
5. Total Combined Hose-Stream Demand Requirement: According to NFPA 13, unless otherwise indicated:
- a. Light-Hazard Occupancies: 100 gpm for 30 minutes.
 - b. Ordinary-Hazard Occupancies: 250 gpm for 60 to 90 minutes.
- C. Seismic Performance: Fire-suppression piping shall be capable of withstanding the effects of earthquake motions determined according to NFPA 13 and ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."
- 1.5 SUBMITTALS
- A. Product Data: For each product indicated.
- B. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations, if applicable, and as follows:
- 1. Areas to be sprinkled.

2. Type of hazards and hazard locations.
 3. Type and locations of valves, drains, and test pipes.
 4. Alarm devices.
 5. Riser diagrams.
 6. Fire department connections.
 7. Location and coordination of electrical connections.
 8. Coordination with other trades.
 9. Seismic restraints.
- C. Field test reports and certificates.
- D. Field quality-control test reports.
- E. Operation and maintenance data.
- F. **Submit shop drawings to Insurance Carrier first. Then, submit approved shop drawings to the Indiana Department of Homeland Security for approval. Submit shop drawings bearing stamp of Insurance Carrier and Department of Homeland Security to the Engineer for approval.**
- G. Shop Drawings must be created in a format compatible with AutoCad .dwg extension.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Installer's responsibilities include designing, fabricating, and installing fire-suppression systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test. Work shall be performed by a Sprinkler Contractor engaged in the fire suppression industry for a minimum of five (5) years.
- B. Equipment Qualifications
1. Each item of equipment shall be capable of performing its function over an extended period of time with a minimum of attention and maintenance. All equipment shall be constructed using new materials designed and built in accordance with the best practices of the industry.
 2. The equipment manufacturer shall have been engaged in the fire suppression industry for a minimum of five (5) years.
 3. All equipment and components shall bear UL and FM label or marking and shall be FM approved for fire service.
- C. NFPA Standards: Fire-suppression-system equipment, specialties, accessories, installation, and testing shall comply with the following:
1. FM, "Factory Mutual Approval Guide".
 2. UL, "Underwriters Laboratory Fire Protection Equipment Directory.
 3. Local Fire Department requirements.
 4. Local, city, state, or any other requirements of the Authority Having Jurisdiction.
 5. NFPA 13, "Installation of Sprinkler Systems"; 2010 version.
 6. NFPA 13R, "Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height"; 2010 version.
 7. NFPA 14, "Installation of Standpipe, Private Hydrant, and Hose Systems"; 2000 version.

8. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances"; 1995 version.

1.7 EXTRA MATERIALS

- A. For Projects requiring more than thirty (30) sprinkler heads, provide 10% extra sprinkler heads and head wrench.
- B. For Projects requiring three (3) or more flow and/or tamper switches, provide 10% (or a minimum of 1) extra for each device.
- C. Provide fifty (50) spare concealed sprinkler head cover plates for the Owner's future use.

1.8 IMPAIRING THE FIRE PROTECTION SYSTEM

- A. Coordinate with Owner all existing fire protection systems.
- B. Use the FM Global Red Tag Regulations.
- C. Plan and coordinate work to minimize the period of time which the system is impaired.
- D. In general, reactivate system at the end of each workday, under the supervision of Facilities Management. System may be left impaired overnight only if explicitly authorized by Owner.

PART 2 - PRODUCTS

2.1 SPRINKLER SPECIALTY FITTINGS

- A. Sprinkler specialty fittings shall be UL listed or FMG approved, with 175-psig minimum working-pressure rating, and made of materials compatible with piping.
- B. Outlet Specialty Fittings:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International, Inc.
 - b. Central Sprinkler Corp.
 - c. National Fittings, Inc.
 - d. Star Pipe Products; Star Fittings Div.
 - e. Victaulic Co. of America.
 - f. Ward Manufacturing.
 2. Mechanical-T and -Cross Fittings: UL 213, ductile-iron housing with gaskets, bolts and nuts, and threaded, locking-lug, or grooved outlets.
 - a. Saddle Type fittings are prohibited.
- C. Drop-Nipple Fittings: UL 1474, adjustable with threaded inlet and outlet, and seals.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CECA, LLC.
 - b. Merit.

2.2 LISTED FIRE-PROTECTION VALVES

- A. Valves shall be UL listed or FMG approved, with 175-psig minimum pressure rating.
- B. Butterfly Valves: UL 1091.
 1. NPS 2 and Smaller: Bronze body with threaded ends.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Global Safety Products, Inc.
 - 2) Milwaukee Valve Company.
 2. NPS 2-1/2 and Larger: Bronze, cast-iron, or ductile-iron body; wafer type or with grooved ends.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Central Sprinkler Corp.
 - 2) McWane, Inc.; Kennedy Valve Div.
 - 3) Mueller Company.
 - 4) NIBCO.
 - 5) Victaulic Co. of America.
- C. Check Valves NPS 2 and Larger: UL 312, swing type, cast-iron body with flanged or grooved ends.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Central Sprinkler Corp.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Crane Co.; Crane Valve Group; Jenkins Valves.
 - d. Grinnell Fire Protection.
 - e. Hammond Valve.
 - f. McWane, Inc.; Kennedy Valve Div.
 - g. Mueller Company.
 - h. NIBCO.
 - i. Potter-Roemer; Fire Protection Div.
 - j. Reliable Automatic Sprinkler Co., Inc.
 - k. Star Sprinkler Inc.
 - l. Stockham.
 - m. Victaulic Co. of America.
 - n. Watts Industries, Inc.; Water Products Div.

D. Gate Valves: UL 262, OS&Y type.

1. NPS 2 and Smaller: Bronze body with threaded ends.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Crane Co.; Crane Valve Group; Crane Valves.
 - 2) Hammond Valve.
 - 3) NIBCO.
2. NPS 2-1/2 and Larger: Cast-iron body with flanged ends.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Crane Co.; Crane Valve Group; Crane Valves.
 - 2) Crane Co.; Crane Valve Group; Jenkins Valves.
 - 3) Hammond Valve.
 - 4) Milwaukee Valve Company.
 - 5) Mueller Company.
 - 6) NIBCO.

E. Indicating Valves: UL 1091, with integral indicating device and ends matching connecting piping.

1. Indicator: Electrical, 115-V ac, pre-wired, single-circuit, supervisory switch.
2. NPS 2 and Smaller: Ball or butterfly valve with bronze body and threaded ends.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Milwaukee Valve Company.
 - 2) NIBCO.
 - 3) Victaulic Co. of America.
3. NPS 2-1/2 and Larger: Butterfly valve with cast- or ductile-iron body; wafer type or with flanged or grooved ends.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Central Sprinkler Corp.
 - 2) Grinnell Fire Protection.
 - 3) McWane, Inc.; Kennedy Valve Div.
 - 4) Milwaukee Valve Company.
 - 5) NIBCO.
 - 6) Victaulic Co. of America.

2.3 UNLISTED GENERAL-DUTY VALVES

- A. Check Valves NPS 2 and Smaller: MSS SP-80, Type 4, Class 125 minimum, swing type with bronze body, nonmetallic disc, and threaded ends.

- B. Gate Valves NPS 2 and Smaller: MSS SP-80, Type 2, Class 125 minimum, with bronze body, solid wedge, and threaded ends.
- C. Globe Valves NPS 2 and Smaller: MSS SP-80, Type 2, Class 125 minimum, with bronze body, nonmetallic disc, and threaded ends.

2.4 AIR VENT

- A. Automatic Air Vent:
 - 1. Description: Automatic air vent that automatically vents trapped air without human intervention.
 - 2. Standard: UL listed or FM Global approved for wet-pipe fire sprinkler systems.
 - 3. Vents oxygen continuously from system.
 - 4. Float valve to prevent water discharge.
 - 5. Minimum Water Working Pressure Rating: 175 psig.

2.5 SPRINKLERS

- A. Sprinklers shall be UL listed or FMG approved, with 175-psig minimum pressure rating.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Reliable Automatic Sprinkler Co., Inc.
 - 2. Tyco International.
 - 3. Victaulic Co. of America.
 - 4. Viking Corp.
- C. Automatic Sprinklers: With heat-responsive element complying with the following:
 - 1. UL 199, for nonresidential applications.
 - 2. UL 1626, for residential applications.
 - 3. UL 1767, for early-suppression, fast-response applications.
- D. Sprinkler Types and Categories:
 - 1. Nominal 1/2-inch orifice for standard flow sprinkler head.
 - 2. Nominal 17/32-inch orifice extended coverage sprinkler head.
 - 3. "Ordinary" temperature classification rating, unless otherwise indicated or required by application.
- E. Sprinkler types, features, and options as follows:
 - 1. Concealed ceiling sprinklers, including cover plate.
 - 2. Pendent sprinklers.
 - 3. Quick-response sprinklers.
 - 4. Recessed sprinklers, including escutcheon.
 - 5. Sidewall sprinklers.
 - 6. Upright sprinklers.
 - 7. Dry sidewall sprinklers.
 - 8. Dry pendent sprinklers.

- F. Sprinkler Finishes: Chrome plated, bronze, painted, custom-color painted where indicated on Drawings.
- G. Special Coatings: Wax, lead, and corrosion-resistant paint.
- H. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, sidewall, and recessed-type sprinklers are specified with sprinklers.
 - 1. Ceiling Mounting: Chrome-plated steel, 2-piece, with 1-inch vertical adjustment.
 - 2. Sidewall Mounting: Chrome-plated steel, one piece, flat.
- I. Sprinkler Guards: Wire-cage type when head is installed below 7'-6" or in areas subject to physical damage, including fastening device for attaching to sprinkler.
- J. Flexible Sprinkler Hose Fittings:
 - 1. Standard: UL 1474.
 - 2. Type: Flexible hose for connection to sprinkler, and with manufacturer furnished bracket for connection to ceiling grid.
 - 3. Pressure Rating: 175-psig minimum.
 - 4. Size: Same as connected piping, for sprinkler.

PART 3 - EXECUTION

3.1 GENERAL

- A. Inspect preceding work. Verify all dimensions before proceeding with work and coordinate all work and placement of components with other trades.
- B. Be responsible for all measurements, fitting and assembly of all work. Prefabrication is done at the Contractor's risk.
- C. Installation
 - 1. Drawings indicate general intent and location. Piping shall be installed in the most direct and straight manner as possible. All lines shall be run high enough to permit relocation of lights without moving ceiling grid.
 - 2. Coordinate exact pipe locations with Drawings and other trades before design approval and fabrication of piping. This Contractor shall be responsible for any redesign and fabrication required to fit system into allowable space.
 - 3. Sprinkler piping that passes through a non-sprinkled area shall be adequately protected as required by NFPA 13.
 - 4. Do not route any piping over electrical panels, transformers, or other equipment requiring a clear space above per NEC and NFPA Codes.
 - 5. All piping in finished areas shall be concealed unless shown otherwise on the Drawings.
 - 6. All vertical lines shall be plumb and horizontal lines shall run parallel to building construction.
 - 7. Install horizontal piping to slope to low points so that entire system may be emptied to facilitate testing.
 - 8. Pipe drains to terminate outside the building wherever possible. Location of drains to the building exterior shall be as shown on Drawings or as approved by the Owner.

9. Pipe and fittings shall be inspected for soundness and cleaned of all dirt and other foreign matter prior to be installed. All damaged pipe and fittings will be rejected.
10. Protect open pipe ends whenever work is suspended during construction to prevent foreign material from entering.
11. Chrome plated or other polished finished components shall be installed with care so that marring does not occur to the finish.

D. Zoning

1. Sprinkler system shall be zoned on a floor-by-floor basis. In addition, systems protecting special hazards shall be zoned separately.
2. Refer to Drawings for sprinkler zone locations.

E. Pipe Supports

1. All piping shall be supported from the structure above with UL approved hangers. Sizing, spacing, and installation shall be in accordance with NFPA 13 except as otherwise shown on the Drawings or specified herein. Comply with other sections of this specification relating to Basic Mechanical Materials and Methods for basic pipe installation.
2. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 250 lb.

F. Sprinkler Heads

1. Sprinkler heads shall be installed per manufacturer's recommendations. Heads shall be installed to satisfy all code requirements for head spacing and as herein specified.
2. Finishes shall be protected against scratches, dents and discoloration. Defective items will not be acceptable.

G. Wet Sprinkler System

1. Fire sprinklers shall be provided for the entire building except as follows:
 - a. Do not install sprinkler piping or heads in elevator shafts or elevator equipment rooms.
 - b. Do not install sprinkler heads in transformer vaults.
2. Air Vent:
 - a. Provide at least one air vent in each wet pipe sprinkler system in accordance with NFPA 13 requirements. Connect vent into top of fire sprinkler piping. Where trapped portion of pipe exists, provide air vent for each location.
 - b. Provide dielectric union for dissimilar metals, ball or globe valve, and strainer upstream of automatic air vent.

H. Instructions

1. When required approvals of this work have been obtained, and at time designated by the Owner, demonstrate to the Owner's personnel the operation and maintenance of the systems.

3.2 PIPING INSTALLATION

- A. Refer to Division 20 Section "Pipe, Valves, Fittings, and Hangers for Fire Suppression, Plumbing, and HVAC" for basic piping installation.
- B. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
 - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
- C. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- D. Install unions adjacent to each valve in pipes NPS 2 and smaller. Unions are not required on flanged devices or in piping installations using grooved joints.
- E. Install flanges or flange adapters on valves, apparatus, and equipment having NPS 2-1/2 and larger connections.
- F. Install sprinkler piping with drains for complete system drainage.
- G. Do not install sprinkler piping directly below roof relief vents, wall intake louvers or anywhere where piping will be subjected to ambient conditions which will result in freezing of sprinkler piping.
- H. Hangers and Supports: Comply with NFPA 13 for hanger materials.
 - 1. Install sprinkler system piping according to NFPA 13.
- I. Earthquake Protection: Install piping according to NFPA 13 to protect from earthquake damage.
- J. Fill wet-pipe sprinkler system piping with water.

3.3 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Listed Fire-Protection Valves: UL listed and FMG approved for applications where required by NFPA 13 and NFPA 14.
 - a. Shutoff Duty: Use butterfly or gate valves.
 - 2. Unlisted General-Duty Valves: For applications where UL-listed and FMG-approved valves are not required by NFPA 13 and NFPA 14.
 - a. Shutoff Duty: Use butterfly or gate valves.
 - b. Throttling Duty: Use globe valves.

3.4 VALVE INSTALLATION

- A. Install listed fire-protection valves, unlisted general-duty valves, specialty valves and trim, controls, and specialties according to NFPA 13 and NFPA 14 and authorities having jurisdiction.

3.5 SPRINKLER APPLICATIONS

- A. Drawings indicate sprinkler types to be used. Where specific types are not indicated, use the following sprinkler types:
 - 1. Rooms without Ceilings: Upright sprinklers.
 - 2. Rooms with Suspended Ceilings: Concealed sprinklers.
 - 3. Wall Mounting: Sidewall sprinklers.
 - 4. Sprinkler Finishes:
 - a. Upright Sprinklers: Rough bronze; wax coated where exposed to acids, chemicals, or other corrosive fumes.
 - b. Recessed Pendent, and Sidewall Sprinklers: Factory painted white, with white escutcheon.
 - c. Concealed Sprinklers: Rough brass, with factory-painted cover plate. Finish shall be specified by architect.

3.6 SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of both dimensions of acoustical ceiling panels and tiles.
- B. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing. Use dry-type sprinklers with water supply from heated space.

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Connect water-supply piping to fire-suppression piping.
- D. Connect piping to specialty valves, hose valves, specialties, fire department connections, and accessories.
- E. Electrical Connections: Power wiring is specified in Division 26.
- F. Connect alarm devices to fire alarm.
- G. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- H. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.8 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
 - 3. Flush, test, and inspect standpipe systems according to NFPA 14, "System Acceptance" Chapter.
 - 4. Coordinate with fire alarm tests. Operate as required.
 - 5. Verify that equipment hose threads are same as local fire department equipment.
- B. Report test results promptly and in writing to Architect and authorities having jurisdiction.
- C. Sterilization
 - 1. Contractor shall sterilize all piping upstream of fire protection backflow preventer.
 - a. Flush system thoroughly until water runs clear.
 - b. Entire system shall be filled with a water/chlorine solution containing 50 parts per million of chlorine. The system or part thereof shall be valved off and allowed to stand for 24 hours; or the system or part thereof shall be filled with a water/chlorine solution containing at least 200 parts per million of chlorine and allowed to stand for three hours.
 - c. Following the allowed standing time, the system shall be flushed with clean potable water until chlorine does not remain in the water coming from the system.
 - d. After the above requirements are satisfied, submit samples to Indiana State Board of Health for approval.
 - e. Sterilization shall be redone until approval from the State Board of Health is obtained. Include copies of the approval in the Operations and Maintenance Manuals.
- D. Testing
 - 1. Testing to comply with NFPA 13 Standard.
 - 2. Test all piping hydrostatically at not less than 200 psi for 2 hours without loss of pressure.
 - 3. Retest piping that initially fails after corrective actions have been made.
 - 4. All tests shall be made in the presence of the Owner's Representative or as directed by the Engineer. Allow for at least 24-hour notice of all tests.
 - 5. Complete and sign "Contractor's Material and Test Certificates". Make arrangements and pay for all costs for all inspections by the authority having jurisdiction and obtain approval of the installation. Include copies of the certificates in the Operations and Maintenance Manuals.

END OF SECTION 211000

SECTION 22 11 19 – DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following domestic water piping specialties:
 - 1. Balancing valves.

1.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.
- C. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. NSF Compliance:
 - 1. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 BALANCING VALVES

- A. Memory-Stop Balancing Valves:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Bell & Gossett Circuit Setter Plus or a comparable product by one of the following:
 - a. Conbraco Industries, Inc.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Hammond Valve.
 - d. Milwaukee Valve Company.
 - e. NIBCO INC.
 - f. Red-White Valve Corp.
 - 2. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.

3. Pressure Rating: 400-psig minimum CWP.
4. Size: Equal to pipe-size.
5. Body: Copper alloy with 1/4-inch NPT tapped drain/purge port.
6. Port: Standard or full port.
7. Ball: Chrome-plated brass.
8. Seats and Seals: Replaceable.
9. End Connections: Solder joint or threaded.
10. Handle: Vinyl-covered steel with memory-setting device. Nameplate to be calibrated to assure specific setting.
11. Operation: Valve to have differential pressure read-out ports across seat area and memory stop feature to allow it to be closed for service and then reopened to set point without disturbing balance position.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Division 20 Section "Pipe, Valves, Fittings, and Hangers for Fire Suppression, Plumbing, and HVAC" for piping joining materials, joint construction, and basic installation requirements.
- B. Install balancing valves in locations where they can easily be adjusted.
- C. Piping installation requirements are specified in other Division 20 Sections. Drawings indicate general arrangement of piping and specialties.

3.2 FIELD QUALITY CONTROL

- A. Test domestic water piping specialties under pressure. Refer to Division 20 Section "Pipe, Valves, Fittings, and Hangers for Fire Suppression, Plumbing, and HVAC" for pressure test requirements.
- B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.3 ADJUSTING

- A. Set field-adjustable flow of balancing valves. Refer to Circuit Setter Schedule on Drawings for flow rates.

END OF SECTION 22 11 19

SECTION 22 13 19 – SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. **This Section includes** the following sanitary drainage piping specialties:
1. Cleanouts.
 2. Miscellaneous sanitary drainage piping specialties.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for grease interceptors.

1.3 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 CLEANOUTS

- A. Cleanouts for Vinyl Tile Floor:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Jay R. Smith 4141S or a comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. MIFAB, Inc.
 - c. Tyler Pipe; Wade Div.
 - d. Watts Drainage Products Inc.
 - e. Zurn Plumbing Products Group; Specification Drainage Operation.
 2. Standard: ASME A112.36.2M.
 3. Size: Same as connected branch.
 4. Body or Ferrule: Cast iron
 5. Outlet Connection: Spigot.
 6. Closure: Bronze plug with straight threads and gasket.
 7. Adjustable Housing Material: Cast iron with threads.
 8. Frame and Cover Material and Finish: Nickel-bronze with 1/8-inch tile recess.
 9. Frame and Cover Shape: Round.
 10. Top Loading Classification: Light duty.

2.2 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains:

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
2. Size: Same as connected waste piping.

B. Deep-Seal Traps:

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.
 - a. NPS 2: 4-inch minimum water seal.
 - b. NPS 2-1/2 and Larger: 5-inch minimum water seal.

C. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

D. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Division 20 Section "Pipe, Valves, Fittings, and Hangers for Fire Suppression, Plumbing, and HVAC" for piping joining materials, joint construction, and basic installation requirements.
- B. Install backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.
- C. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 2. Locate at each change in direction of piping greater than 45 degrees.

3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
 4. Locate at base of each vertical soil and waste stack.
- D. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- E. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- F. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
1. Position floor drains for easy access and maintenance.
 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
 - a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- G. Assemble open drain fittings and install with top of hub 2 inches above floor.
- H. Install deep-seal traps on floor drains and other waste outlets, if indicated.
- I. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- J. Install vent caps on each vent pipe passing through roof.
- K. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 20 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

3.3 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 13 19

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SECTION 22 40 00 – PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Faucets.
2. Toilet seats.
3. Protective shielding guards.
4. Disposers.
5. Water Closets
6. Lavatories.
7. Bathtubs.
8. Sinks.
9. Ice maker boxes.
10. Clothes washer boxes.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.
- C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- D. NSF Standard: Comply with the latest adopted version of NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- E. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.
- F. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
1. Plastic Shower Enclosures: ANSI Z124.2.

2. Slip-Resistant Bathing Surfaces: ASTM F 462.
 3. Solid-Surface-Material Lavatories and Sinks: ANSI/ICPA SS-1.
 4. Stainless-Steel Sinks: ASME A112.19.3.
 5. Vitreous-China Fixtures: ASME A112.19.2M.
 6. Water-Closet, Flushometer Tank Trim: ASSE 1037.
- G. Comply with the following applicable standards and other requirements specified for lavatory/sink faucets:
1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
 2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
 3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
 4. Faucets: ASME A112.18.1.
 5. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
 6. NSF Potable-Water Materials: NSF 61.
- H. Comply with the following applicable standards and other requirements specified for bathtub/shower faucets:
1. Backflow Protection Devices for Hand-Held Showers: ASME A112.18.3M.
 2. Combination, Pressure-Equalizing and Thermostatic-Control Antiscald Faucets: ASSE 1016.
 3. Faucets: ASME A112.18.1.
 4. Hand-Held Showers: ASSE 1014.
 5. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
 6. Manual-Control Antiscald Faucets: ASTM F 444.
 7. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
 8. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
 9. Thermostatic-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
- I. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
1. Atmospheric Vacuum Breakers: ASSE 1001.
 2. Brass and Copper Supplies: ASME A112.18.1.
 3. Brass Waste Fittings: ASME A112.18.2.
 4. Manual-Operation Flushometers: ASSE 1037.
 5. Plastic Tubular Fittings: ASTM F 409.
 6. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.
 7. Supply Fittings: ASME A112.18.1.
- J. Comply with the following applicable standards and other requirements specified for miscellaneous components:
1. Disposers: ASSE 1008 and UL 430.
 2. Flexible Water Connectors: ASME A112.18.6.
 3. Grab Bars: ASTM F 446.
 4. Hose-Coupling Threads: ASME B1.20.7.
 5. Off-Floor Fixture Supports: ASME A112.6.1M.
 6. Pipe Threads: ASME B1.20.1.
 7. Plastic Toilet Seats: ANSI Z124.5.
 8. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 TANK TYPE WATER CLOSETS

A. Water Closets; WC-1 (Inoperable):

1. Basis-of-Design Product: Subject to compliance with requirements, provide American Standard "Champion PRO" 211CA.104, or a comparable by the following:
 - a. Kohler Co.
 - b. Sloan.
 - c. Zurn Plumbing Products Group.
2. Description: Floor-mounting, bottom-outlet, vitreous-china fixture.
 - a. Style: 4" piston-action flushometer tank.
 - b. Bowl Type: Elongated with siphon-jet design.
 - c. Trapway: Fully-glazed 2-3/8" trapway.
 - d. Trim: Chrome plated metal trip lever.
 - e. Accessories: Color matched bowl caps.
 - f. Height: 15" to rim.
 - g. Color: White.

2.2 TOILET SEATS

A. Toilet Seats; WC-1 (Inoperable):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bemis Manufacturing Company.
 - b. Church Seats.
 - c. Olsonite Corp.
2. Description: Toilet seat for water-closet-type fixture.
 - a. Material: Molded, solid plastic.
 - b. Configuration: Closed front with cover.
 - c. Size: Elongated.
 - d. Hinge Type: Stainless steel, self-sustaining check hinge.
 - e. Class: Extra heavy-duty, commercial.
 - f. Color: White.

2.3 LAVATORIES

A. Lavatories; L-1, L-2 :

1. Basis-of-Design Product: Integral solid surface sink (by others)
2. Description: Solid surface sink integral to countertop.
3. Subject to compliance with requirements, provide trim products by one of the following:

- a. McGuire Manufacturing Company.
- b. Engineered Brass Company.
- c. Keeney Manufacturing Company.

4. Lavatory Trim

- a. Supplies: Chrome-plated copper with 1/2" NPT x 3/8" OD loose key stops.
- b. Drain: Grid with ADA compliant offset waste.
- c. Drain Piping: NPS 1-1/4 chrome-plated cast-brass P-trap with cleanout; NPS 1-1/4 17-gauge tubular brass waste to wall; and wall escutcheon.

2.4 LAVATORY FAUCETS

A. Lavatory Faucets; L-1, L-2 :

- 1. Basis-of-Design Product: Subject to compliance with requirements, provide Kohler "Coralais" K-15243-4RA, or a comparable by the following:
 - a. American Standard.
 - b. Zurn Plumbing Products Group; Commercial Brass Operation.
- 2. Description: Manual-control mixing valve. Coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.
 - a. Body Material: Commercial, solid brass.
 - b. Finish: Polished chrome plate.
 - c. Maximum Flow Rate: 0.5 gpm.
 - d. Mixing Valve: Two-handle.
 - e. Centers: 4-inch.
 - f. Mounting: Deck, exposed.
 - g. Handle(s): Lever with color coded index button.
 - h. Inlet(s): NPS 1/2 male shank.
 - i. Spout Outlet: Aerator.
 - j. Operation: Quarter-turn ceramic, manual.

2.5 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers; L-2 :

- 1. Basis-of-Design Product: Subject to compliance with requirements, provide Truebro 103 E-Z or a comparable product by one of the following:
 - a. Insul-Tect Products Co.; a Subsidiary of MVG Molded Products.
 - b. Plumberex Specialty Products Inc.
- 2. Description: Manufactured plastic wraps for covering plumbing fixture hot and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.
 - a. Material: Molded vinyl.
 - b. Nominal Thickness: 1/8" constant wall.
 - c. UV Protection: Required.

- d. Fasteners: Internal, reusable fasteners.
- e. Color: White.

2.6 BATHTUBS

A. Bathtubs, BT-1 (Inoperable):

1. Basis-of-Design Product: Subject to compliance with requirements, provide American Standard "Princeton" 2390.202 ICH, or a comparable by the following:
 - a. Kohler Co.
 - b. Zurn Plumbing Products Group.
2. Description: Composite porcelain/enameled, formed steel fixture.
 - a. Bathing Surface: Acid resistant porcelain finish, full slip resistant coverage.
 - b. Size: 60 by 30 by 14 inches with integral apron.
 - c. Color: White.
 - d. Drain: End drain outlet, lift-and-turn stopper, integral overflow, chrome-plated exposed parts.
 - e. Accessories (furnished by manufacturer):
 - 1) Stainless steel curtain rod
 - 2) Weighted anti-microbial shower curtain
 - 3) Integral overflow and drain assembly

2.7 COMBINATION TUB/SHOWER FAUCETS

A. Bathtub/Shower Faucets; BT-1 (Inoperable):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Symmons "Origins" S-9606-X-PLR-B, or a comparable by the following:
 - a. Leonard Valve Co.
 - b. Powers; a Watts Industries Co.
2. Description: Single-handle pressure-balance valve with fixed shower head, hand shower, tub spout, and dual outlet diverter. Coordinate faucet inlets with supplies.
 - a. Body Material: Cast bronze with bronze and stainless-steel balancing assembly, metal lever handle.
 - b. Finish: Polished chrome plate.
 - c. Diverter Valve: Integral with handle.
 - d. Bathtub Spout: Metallic, chrome-plated.
 - e. Construction: Concealed mount, stainless steel balancing piston with renewable seats, adjustable hi-limit stop, integral service stops.
 - f. Shower Head Type: Ball joint and head, 4" arm with escutcheon.
 - g. Shower Head Material: Non-metallic with chrome-plated finish.
 - h. Spray Pattern: Adjustable.

2.8 KITCHEN SINKS

A. Kitchenette Sinks; SK-1:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Elkay ELUH311810LDBG or a comparable product by one of the following:
 - a. Just Manufacturing Company.
 - b. Franke Group.
 - c. Acorn.
2. Description: Dual-bowl, under-mounting, stainless-steel kitchen type sink.
 - a. Overall Dimensions: 34-3/4 by 18-1/2 by 10 inches.
 - b. Metal Thickness: 18-gauge type 302 (18-8) stainless steel.
 - c. Bowl Dimensions: 13-1/2 by 16 by 8 inches (left). 13-1/2 by 16 by 10 inches (right).
 - d. Drain: 3-1/2-inch stainless steel crumb cup; Elkay LK35.
 - 1) Location: Rear center of bowl.
3. Subject to compliance with requirements, provide trim products by one of the following:
 - a. McGuire Manufacturing Company.
 - b. Engineered Brass Company.
 - c. Keeney Manufacturing Company.
4. Sink Trim
 - a. Supplies: Chrome-plated copper with 1/2" NPT x 3/8" OD loose key stops.
 - b. Drain Piping: NPS 1-1/2 chrome-plated cast-brass P-trap with cleanout; NPS 1-1/2 17-gauge tubular brass waste to wall; and wall escutcheon.

2.9 KITCHEN SINK FAUCETS

A. Kitchen Sink Faucets; SK-1:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Elkay LKHA1041 or a comparable product by one of the following:
 - a. Chicago Faucet
 - b. T & S Brass and Bronze Works, Inc.
 - c. Zurn Plumbing Products Group; Commercial Brass Operation.
 - d. Krowne Inc.
2. Description: Kitchen faucet with pull down spray. Coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.
 - a. Body Material: Commercial, solid brass.
 - b. Finish: Polished chrome plate.
 - c. Maximum Flow Rate: 1.5 gpm.
 - d. Mixing Valve: Single control
 - e. Centers: Single Hole.
 - f. Mounting: Deck, exposed.

- g. Handle: Lever.
- h. Inlet(s): NPS 3/8" tubing, with NPS 1/2" male adaptor.
- i. Spout Type: 10-1/8" swing, solid brass.
- j. Spout Outlet: Aerator, Pull down spray
- k. Operation: Ceramic, manual.
- l. Deck Plate: 8" c-c trim cover plate.
- m. Vegetable spray: Required.

2.10 DISPOSERS

A. Disposers, GD-1 :

1. Basis-of-Design Product: Subject to compliance with requirements, provide In-Sink-Erator Badger 5 Plus or a comparable product by one of the following:
 - a. American Standard Companies, Inc.
 - b. KitchenAid.
 - c. Maytag Co.
2. Description: Batch-feed household, food-waste disposer. Include reset button; wall switch; plastic chamber with jam-resistant, stainless-steel lugs; NPS 1-1/2 outlet; quick-mounting, stainless-steel sink flange; antisplash guard; and combination cover/stopper.
 - a. Model: Sound-insulated chamber.
 - b. Motor: 115-V ac, 1725 rpm, 5/8 hp with overload protection.
 - c. Accessories: 3-prong plug-in cord.

2.11 ICE MAKER BOXES

A. Ice Maker Boxes; IMB-1 :

1. Basis-of-Design Product: Subject to compliance with requirements, provide Guy Gray MIB1HAAB or a comparable product by one of the following:
 - a. Acorn Engineering Company.
 - b. IPS Corporation.
2. Description: Recessed wall-mounting water supply box.
 - a. Overall dimension: 4-3/4 by 4-1/8 by 3-1/2 inches.
 - b. Metal Thickness: 20 gauge cold rolled steel.
 - c. Supplies: 1/2" sweat inlet.
 - d. Valve: Integral hammer arrester quarter turn, 1/4" O.D. outlet.
 - e. Finish: White powder coat.

2.12 CLOTHES WASHER BOXES

A. Washer Boxes; WB-1 :

1. Basis-of-Design Product: Subject to compliance with requirements, provide Guy Gray 82158 or a comparable product by one of the following:

- a. Acorn Engineering Company.
 - b. Oatey.
2. Description: Recessed wall-mounting water supply box.
- a. Overall dimension: 8-1/4 by 5-5/8 by 3-1/2 inches.
 - b. Metal Thickness: 20 gauge cold rolled steel.
 - c. Supplies: 1/2" sweat inlet.
 - d. Valve: Integral hammer arrester quarter turn, 1/2" O.D. outlet.
 - e. Drain: 2" slipnut drain kit.
 - f. Finish: White powder coat.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.
 - 1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
 - 2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
- C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.
- D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.
- E. Install wall-mounting fixtures with tubular waste piping attached to supports.
- F. Install fixtures level and plumb according to roughing-in drawings.
- G. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation. All exposed supply piping shall be chrome-plated copper.
- H. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
- I. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.
- J. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.
- K. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.
- L. Install toilet seats on water closets.

- M. Install traps on fixture outlets.
 - 1. Exception: Omit trap on fixtures with integral traps.
 - 2. Exception: Omit trap on indirect wastes, unless otherwise indicated.
- N. Install disposer in outlet of each sink indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.
- O. Connect drain outlet hose from dishwasher to drain connection on disposer.
- P. Install escutcheons at piping wall and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 20 Section "Common Work Materials and Methods for Fire Suppression, Plumbing, and HVAC."
- Q. Set bathtub in leveling bed of cement grout. Grout is specified in Division 20 Section "Common Work Materials and Methods for Fire Suppression, Plumbing, and HVAC."
- R. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 20 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

- A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.
- B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.
- E. Install fresh batteries in sensor-operated mechanisms.

3.4 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 22 40 00

SECTION 23 05 93 – TESTING AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Work Specified Elsewhere
 - 1. Control Systems Equipment: Section 23 09 00

1.2 SUMMARY

- A. This Section includes testing, adjusting and balancing of HVAC Systems to produce design objectives, including the following:
 - 1. Adjusting fans and ducts to deliver or exhaust design air flow.
 - 2. Adjusting terminal units, diffusers, registers and grilles to supply, return or exhaust design air flow.
 - 3. Adjusting diffusers, registers and grilles to minimize drafts.
 - 4. Adjusting all zones for design supply and return air flow.
 - 5. Balancing of heating water system to achieve design flow characteristics.
 - 6. Balancing of domestic hot water return loop.
 - 7. Adjusting VAV terminal box controllers to design cfm. (Heating and Cooling).
 - 8. Sheet metal shop drawing review prior to ductwork installation, review the Sheet Metal Contractor's duct fabrication drawings and mark any additional balancing dampers, etc. that are required for proper balancing of the systems. This Contractor shall receive two copies from the Sheet Metal Contractor and shall return one copy to Sheet Metal Contractor.

1.3 SUBMITTALS

- A. Bidding Documents
 - 1. If so requested on the bid form Submit name of the Test and Balance Agency to Architect/Engineer as a subcontractor on the Materials and Subcontractors Listing.
 - 2. If the Contractor fails to submit name of selected Test and Balance Agency, the Architect/Engineer will select the agency of his choice and Contractor must then issue purchase order for this work as directed.
- B. Certificate: Selected and approved agency shall submit certificate immediately upon receipt of test and balance contract.
- C. Data Sheets
 - 1. Submit typewritten data sheets on each item of testing equipment to be used.
 - 2. Include name of device, manufacturer's name, model number, latest date of calibration and correction factors.

D. Report Forms

1. Submit 30, 60, 90 percent site visit reports on installation of HVAC systems.
2. Forms shall be 8-1/2" x 11", with blanks for listing of the required test ratings and for certification of report.
3. Submit preliminary pencil copies of reports as A/E determines.

E. Final Report

1. Upon completion, all information shall be neatly typed, PDF'd, and electronically submitted to the Architect/Engineer with accompanying schematic diagrams of systems tested.
2. All test reports shall be submitted with project name and Balancing Contractor's name printed thereon.
3. A copy of the report shall be incorporated into the O&M manual for the project as a dedicated section.

1.4 QUALITY ASSURANCE

A. Test and Balance Agency

1. Obtain the services of an independent Test and Balance Agency that specializes in, and whose business is limited to, the testing and balancing of air conditioning systems.
2. The agency selected shall be fully certified by the NEBB and shall have at least one member of the agency qualified as a certified test and balance Engineer who has been issued this certification by the National Examining Board.
3. All work shall be done under the direct supervision of a full-time member of the organization.
4. All final reports shall be signed and sealed by the certified test and balance Engineer.
5. Approved Test and Balance Contractors:
 - a. Mechanical Systems Balancing
 - b. Total Balance
 - c. Fluid Dynamics
 - d. Gibson Services.
 - e. Midwest Balance
 - f. Synergy Test and Balance
 - g. Bledsoe Test and Balance
 - h. Technical Systems Group – Terre Haute
6. Agency Contract: Award the contract to the approved Balance Contractor in sufficient time to allow the Test and Balance Contractor to schedule this work in cooperation with other trades involved and comply with the completion date.

B. Instruments

1. The minimum instrumentation for testing, adjusting and balancing shall be the "NEBB Approved Minimum Field Instrumentation."
2. Instruments used for testing and balancing must have been calibrated within a period of six months and checked for accuracy prior to start of work.
3. Instruments must be maintained and carried in such manner to protect them from excessive vibration and moisture conditions.
4. Approval: all products and instrumentation used shall be subject to approval of the Engineer.

- C. Procedure - Methodology: testing and balancing shall be performed in complete accordance with NEBB National Standards for Field Measurements and Instrumentation.
- D. Conditions: System Operation - heating, ventilating, and air conditioning equipment including filters, shall be completely installed and in continuous operation as required to accomplish the adjusting and balance work specified. Test and Balance Agency shall give a Check List to the Mechanical and/or Sheet Metal Contractors which, when completed, and returned, will ensure the systems are ready to be balanced. A/E shall receive a copy of check list from Mechanical and Sheet Metal Contractors when completed.

1.5 COORDINATION

- A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, Commissioning Agent (if applicable) and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.
- B. Notice: Provide seven (7) days' advance notice for each test. Include scheduled test date and times.
- C. Perform testing, adjusting, and balancing after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.
- D. Measurements – Readjustments
 - 1. Should corrective measures caused by faulty installation require retesting, adjusting and balancing, such work shall be at no additional expense.
 - 2. Corrective measures other than the above shall be made only as directed by the Architect/Engineer. Such work shall be at no additional expense.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Air Systems - prior to system testing and balancing
 - 1. Verify that the appropriate contractor has:
 - a. Checked all systems and placed them into a fully operational status.
 - b. Installed clean filters within the equipment. Do not continue testing of unit until clean filters have been provided.
 - c. Checked temperature and system controls for proper operation.
 - d. Checked fan rotation for proper operation.
- B. Water Systems - prior to system testing and balancing
 - 1. A complete air balance must be accomplished before beginning the water system test and balance.
 - 2. Verify that the Mechanical Contractor has:

- a. Removed and cleaned all strainers.
- b. Treated and cleaned water in system.
- c. Check air vents at high points of the system for proper operation.

3.2 SYSTEM BALANCE

A. Air Systems - Perform the following minimum tests and balance:

1. Test and record system static pressure, suction and discharge.
2. Adjust all main supply and return air ducts to proper design CFM.
3. Adjust all zones to proper design CFM, supply and return.
4. Test and adjust each diffuser, grille and register to within $\pm 10\%$ of design requirements.
5. Each grille, diffuser and register shall be identified as to location and area. Size, type, flow factor and manufacturer of diffusers, grilles, registers and all tested equipment shall be identified and listed.
6. Readings and tests of diffusers, grilles and registers shall include required FPM velocity and test resultant velocity, required CFM and test resultant CFM after adjustments.
7. The Balance Contractor shall list all controls requiring adjustment by Temperature Control Contractor and assist Control Contractor with required settings.
8. All diffusers, grilles and registers shall be adjusted to minimize drafts in all areas.
9. Read and adjust the minimum and maximum settings on all variable air volume (VAV) boxes. On dual minimum applications, set and confirm both minimums.

B. Water Systems - Perform the following minimum water system test and balance:

1. Adjust water flow through equipment.
2. Check water temperatures at inlet side of coils. Note rise or drop of temperatures from source.
3. Proceed to balance each water coil.
4. Upon completion of flow readings and adjustments at coils, mark all settings and record data.
5. After adjustments to coils are made, recheck settings at the pumps and readjust if required.
6. Install pressure gauges in gauge fittings provided on coil, read pressure drop through coil at set flow rate for full cooling and on full heating. Set pressure drop across bypass valve to match coil full flow pressure drop.
7. Install zone balance valve and size the control valve to the coil it serves.

C. Record Data

1. Air Systems - record the following minimum data:
 - a. CFM delivered or exhausted at each diffuser, register, or grille.
2. Water Systems - record the following minimum data at each heating element:
 - a. Pressure drop across each coil
 - b. Water balance device readings and/or settings.

D. Equipment Cards

1. Install at each piece of equipment a "check out" card showing all significant operating temperatures, pressures, amperes, voltages, brake horsepower, etc. Check out cards

shall be standard 5" x 8" index cards enclosed in vinafilm card folders securely attached to equipment or wall in immediate area.

- E. Owner's Instructions: Balancing Contractor shall arrange with the Owner at a time for the instruction of the Owner's personnel as to the proper operation and maintenance of the equipment.

3.3 ADDITIONAL TEST

- A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods
 - 1. If initial testing, adjusting, and balancing procedures were not performed during near-peak summer and winter conditions, perform additional inspections, testing, and adjusting during near-peak summer and winter conditions, if so requested by Owner/Engineer.

END OF SECTION 23 05 93

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SECTION 23 09 93 – SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. VAV Boxes with Hydronic Heat.
- B. Miscellaneous Controls

1.2 RELATED SECTIONS

- A. Section 23 05 93 – Testing and Balancing.
- B. Section 23 09 00 – Instrumentation and Control for HVAC.

1.3 WORK INCLUDED BY SEQUENCE DESCRIPTION

- 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. Furnish all control devices and components, whether specified or not, to accomplish the described sequences.

1.4 GENERAL

- A. The software will enable user to automatically program lead-lag operation of all common types of equipment. Common types of equipment include chillers, cooling towers, pumps, boilers, etc.
- B. Every setpoint indicated in these Specifications shall be user adjustable.
- C. All equipment indexed by outside air temperature shall be indexed through one single temperature sensor.
- D. In the event of a power failure, everything shall automatically reset/restart. All equipment shall be staged on.
- E. There shall be no memory loss or reprogramming required upon loss of power.
- F. General references are made to global commands. Global commands shall be set up to communicate to all common equipment, as specified, without having to address each and every piece of equipment individually.
- G. Graphics shall include a format that can fit on one screen which allows easy occupied and unoccupied scheduling as well as changing major system parameters.
- H. All fan systems with motorized dampers shall be interlocked through end switches. Fan shall not start until dampers are fully open.

- I. BAS System shall utilize optimum start/stop for building warm-up and cool-down prior to occupancy.
- J. This DDC control system will be designed to reside on the owner's LAN with connection to the owner's WAN. The owner will be able to access and control this system from anywhere on the WAN using a standard internet browser such as Internet Explorer.
- K. This system shall reside on the school system Wide Area Network (WAN) through an Ethernet connection.
- L. The DDC system shall make only one connection to the owner's LAN in this facility. Any LAN needed between proposed supervisory panels proposed for this system shall run in parallel to the owner's LAN and shall be completely installed and maintained by the TCC. This single connection to the owner's LAN shall be made in the building's IT room.
- M. Temperature Control Contractor shall insure that no low voltage wiring is exposed to high voltage wiring within starters, control cabinets, etc. Insulation rating on control wiring must match high voltage wiring rating (above 300 volts) within starters or devices such as start/stop relays and current sensors must be mounted in companion enclosures. Follow guidelines in Div. 26 and or the NEC, whichever is most strict.
- N. All interface relays must be of two-piece construction consisting of a plug-in relay and a base. Single piece relays commonly known as 'relay in a box' (RIBs) are not acceptable. Maintenance personnel shall be able to change out the relay by plugging a new relay in the base. Relays requiring breaking of wiring connections for maintenance purposes are not permitted.
- O. Line voltage (48 volts and above) shall be kept separated from low voltage within the control panel. Line voltage terminals shall be covered or protected in such a way that accidental contact with line voltage is prevented.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION – SEQUENCE OF CONTROLS

3.1 OCCUPIED/UNOCCUPIED

- A. Global Commands
 - 1. Unoccupied – 11:00 P.M. to 6:00 A.M.
 - a. Motion Sensor and push button are disabled. This "No Energy" zone: All fan coils off, VAV's air valves closed, etc. when space temperature is within unoccupied temperature limits.
 - b. Control systems are energized only when zone calls for cooling and heating.
 - 2. Standby/Occupied 1 – 6:00 A.M. to 3:00 P.M.
 - a. Enables push buttons and space mounted motion sensors to index terminal devices from standby to occupied mode and indexes AHU units to enable ventilation. When

motion sensor detects motion, space remains in occupied mode for 120 minutes (adjustable).

- b. Control systems are energized only when zone calls for cooling and heating.

3. Occupied 2

- a. Disables space mounted motion sensors. Only push buttons will index terminal units to occupied mode. Ventilation to stay off. When button is pushed space maintains occupied temperature for 120 minutes (adjustable).

3.2 TERMINAL UNITS

A. VAV with Hydronic Heat

1. VAV Minimums

- a. Global command to index VAV air valves to the following minimums based on ambient temperature.
 - 1) At ambient temperature of < 50°F all VAV boxes shall have minimum CFM set to 70% of VAV design CFM.
 - 2) At ambient temperature > 50°F all VAV boxes shall have a minimum CFM set to 35% of VAV design CFM
- b. When unoccupied temperature is within the temperature range as noted in "Temperature Setpoints", the air valve shall remain at 10%.
- c. If space temperature increases above temperature range, the VAV valve shall modulate open.
- d. If space temperature falls below temperature range, the VAV valve to modulate to minimum CFM as described above and TC heating valve shall modulate open to satisfy space temperature.

2. Unoccupied

- a. Air valves shall modulate to a minimum setting of 10% of design CFM.

END OF SECTION 23 09 93

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SECTION 23 21 13 – HYDRONIC PIPING SYSTEMS

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes hydronic piping specialties for the following systems:
 - 1. Heating Water Systems.
- B. Hydronic systems specialties – this section includes the following:
 - 1. Valve – Balance Valve.
 - 2. Valve – Automatic Flow Control.
 - 3. Valve – Pressure Relief – Water Systems.
- C. Piping: See Section 20 00 60 “Common Pipe, Valves, Fittings and Hangers for Fire Suppression, Plumbing and HVAC” for Hydronic Piping, Fittings and Valves.

1.2 SUBMITTALS

- A. Product Data: For each type of the following:
 - 1. Valves. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves. Submit complete valve schedule with indicated specific equipment designation of coil, connection sizes, flows, components, and pressure drops on a single schedule.
 - 2. Air control devices.
 - 3. Hydronic specialties. Include flow and pressure drop curves based on manufacturer's testing.
- B. Field quality-control test reports.
- C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.1 AIR VENTS

- A. Furnish and install vents where shown and at each high trapped point in closed water systems, each coil, unit heater, piece of radiation and where otherwise required to properly expel air from systems. Pipe air vent outlet to floor drain, drip pan, open-site drain, etc.
- B. Main and Riser Vents: vents for venting mains, branches and risers to have heavy-duty cast-iron body, seamless copper float and stainless steel or bronze trim.
- C. Branch and Equipment Vents: (Coils, Unit Heaters, Cooling Units, etc.)
 - 1. Vents to have drawn brass body with nickel trim and tapped at top for 1/4" drain connection.
- D. Radiation Vents: vents used for venting radiation to be fiber disc type.
- E. Manual Vents: pipe air chamber with 1/4" brass pet cock.
- F. Manufacturers:
 - 1. Armstrong
 - 2. Bell & Gossett
 - 3. Spirax/Sarco
 - 4. Taco
 - 5. Nexus

2.2 STRAINER – Y-TYPE

- A. Furnish and install where indicated on Drawings. Strainers to be full line size.
- B. Strainer body working pressure to be suitable for working pressure of system, but not less than pressure listed below. Screen size to be size listed below.

Strainer Size	Screen Size	Pressure Rating
2" and Smaller	10 MESH (1/16")	250 PSIG
2 ¼ to 4"	10 MESH (1/16")	125 PSIG
5" and Larger	7 MESH (1/8")	125 PSIG

- C. Strainer connections to be threaded for screwed piping, flanged for welded piping. All sizes 2 ½" and above to be Flanged connection.
- D. Strainers to have full tapping size valved blowdown with brass cap. Blowdown tappings above 1" may be 1" size. Valve to be quick opening full port ball valve.
- E. Manufacturers:
 - 1. Hoffman
 - 2. Armstrong
 - 3. Crane
 - 4. Mueller
 - 5. Sarco

6. Victaulic
7. Nibco
8. IMI Flow Design
9. Nexus

2.3 VALVE – AUTOMATIC MAKE-UP FOR CLOSED LOOP

- A. Furnish and install where shown or required for each closed water circulating system automatic feed or makeup valves.
- B. Valves to be spring-loaded pressure-reducing type having bronze body and monel or stainless-steel trim. Valves for use in cold water systems to have rubber diaphragm with composition shutoff disc. Valves for hot water systems to have monel metal diaphragm with stainless steel shutoff disc.
- C. Feed valves suitable for entering pressures from 40 to 80 psig and to have a reduced pressure spring range from 8 to 25 psig. Valves to have built-in strainer and check.
- D. Valves to be adjusted, after installation, to maintain a minimum of 10 psig at highest and most remote point of system.
- E. Manufacturers:
 1. Armstrong
 2. Taco
 3. Bell & Gossett
 4. Watts

2.4 VALVE – BALANCE VALVE

- A. Furnish and install where shown on drawings and in accordance to manufacturers installation instructions.
- B. Valves 1" and smaller to be ¼ turn lever with full throttling range and tight shut-off. Valve internals similar to globe or ball valve type construction.
- C. Valves 1 1/4" and larger to be multi-turn hand-wheel with full throttling range and tight shut-off. Valve internals similar to globe valve type construction.
- D. Positive shut-off with tamper proof memory stop for ease of returning to the balance set point without readjusting.
- E. Valves shall maintain flow rates within +/-3% regardless of system pressure fluctuations. Water valves shall be sized by the manufacturer to produce the required flow at or equal to a pressure loss of not more than 3 psi. Nominal body rating shall not be less than 150 psig. However, the valve body and packing selected shall be designed and rated for the maximum system operating pressure and temperature at the point of installation. Each valve shall be equipped with proper packing to assure that there will be no leakage.
- F. Valves 2" and smaller to have bronze or copper alloy body; 2 1/2" and larger to be cast iron.

- G. Two 1/4" NPT metering ports with check valves and gasketed caps located on both sides of valve seat for precise flow measurement. Caps shall be of brass construction. Plastic caps are not acceptable.
- H. Valve rated for 250 psi working pressure and 250°F working temperature.
- I. Valves 2" and smaller to have threaded ends; 2 1/2" and larger to be flanged or grooved ends.
- J. Submit complete valve schedule with indicated specific equipment designation of coil, connection sizes, flows, components, and pressure drops on a single schedule.
- K. Manufacturers:
 - 1. 1/2" to 1"
 - a. Pro Hydronic CBV (lever)
 - b. Griswold Quickset Series (lever)
 - c. Bell & Gossett MV (lever)
 - d. Nexus UltraXB (1/4 turn)
 - e. IMI Flow Design UA (lever)

2.5 VALVE – AUTOMATIC FLOW CONTROL

- A. Automatic Flow Limiter
 - 1. Factory calibrated pressure compensating type valve. Valve shall maintain flow rates within +/-5% regardless of system pressure fluctuations.
 - 2. Cartridges easily removable from valve body with disturbing existing piping.
 - 3. Pressure independent design.
 - 4. Cartridges to be made of stainless-steel construction.
 - 5. Flow rate shall be preset and not field adjustable without replacement of cartridge.
 - 6. No brass or plastic components permitted.
- B. Valves
 - 1. Valves shall be equipped with nipples and quick disconnect valves for connection of flow measuring instrumentation. Caps shall be of brass construction. Plastic caps are not acceptable.
 - 2. Full port ball valve with blow-out proof stem. Internal diameter of the ball shall be equivalent to the pipe size. Reduced port ball valves are not acceptable.
- C. Wye-Strainers
 - 1. Strainers shall have 20 mesh rating. Minimum 8:1 ratio of total area vs internal pipe diameter.
 - 2. Stainless Steel Construction
 - 3. Strainer body shall incorporate a full-port isolation ball valve. Reduced port valves are not acceptable.
- D. Submit complete valve schedule with indicated specific equipment designation of coil, connection sizes, flows, components, and pressure drops on a single schedule.

- E. Manufacturers:
 - 1. Flow Design
 - 2. Victaulic
 - 3. Nibco
 - 4. Nexus
 - 5. Pro Hydronic
 - 6. Griswold
 - 7. Bell Gossett
 - 8. Hays
 - 9. IMI Flow Design

2.6 VALVE – PRESSURE RELIEF – WATER SYSTEMS

- A. Furnish and install where shown or required for each closed water circulating system automatic relief valve.
- B. Valves tested and rated by ASME in btu/hr to relieve full gross heat output of system and to bear ASME stamp.
- C. Valves to be spring-loaded type with bronze body, stainless steel trim, brass seat and composition disc. Valves to relieve at 20 psig above setting of its companion system fill valve. Run discharge line from relief valve to nearest floor drain.
- D. Manufacturers:
 - 1. Watts
 - 2. McDonnell
 - 3. Kunkle
 - 4. Spirax/Sarco

PART 3 - EXECUTION

3.1 VALVE APPLICATIONS

- A. Install shutoff-duty valves at each branch connection to supply mains, and at supply connection to each piece of equipment.
- B. Install balance valves at each piece of equipment as noted on drawings.

3.2 PIPING INSTALLATIONS

- A. Install piping of type as indicated in Section 20 00 60.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- M. Install drains, consisting of a tee fitting, NPS 3/4 (DN 20) ball valve, and short NPS 3/4 (DN 20) threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
- N. Install piping at a uniform grade of 0.2 percent upward in direction of flow.
- O. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the top of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.
- P. Install valves according to Section 20 00 60.
- Q. Install unions in piping, NPS 2 (DN 50) and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
- R. Install flanges in piping, NPS 2-1/2 (DN 65) and larger, at final connections of equipment and elsewhere as indicated.
- S. Install strainers on inlet side of each piece of all hydronic equipment(i.e. coils, control valves, chillers, boilers, etc.), pressure-reducing valve, solenoid valves, pumps, and elsewhere, as indicated or required by manufacturer of equipment. Install NPS 3/4 (DN 20) nipple and ball valve in blowdown connection of strainers NPS 2 (DN 50) and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2 (DN 50).
- T. Identify piping as specified in Section 20 00 50.
- U. Install air vents at all high points in system and where piping connects to equipment.

3.3 HANGERS AND SUPPORTS

- A. See Section 20 00 60 for hanger installation.
- B. See Section 20 00 10 for hanging attachment to building construction.

3.4 HYDRONIC SPECIALTIES INSTALLATION

- A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

3.5 TERMINAL EQUIPMENT CONNECTIONS

- A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.
- B. Install control valves in accessible locations close to connected equipment. All control valves, strainers, shutoff and balance valves shall be within arm's reach from ladder that is set up to service terminal unit controller. Installing valves beyond arm's reach is not acceptable unless approved by Engineer.
- C. Install ports for pressure gages and thermometers at coil inlet and outlet connections as detailed on drawings.
- D. Install supply to the manufacturers listed connection designed for supply. Do not always assume supply connects to the bottom of the equipment connection.

3.6 FIELD QUALITY CONTROL

- A. Prepare hydronic piping according to ASME B31.9 and as follows:
 - 1. Leave joints, including welds, un-insulated and exposed for examination during test.
 - 2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
 - 3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
 - 4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
 - 5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
- B. Perform the following tests on hydronic piping:
 - 1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
 - 2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
 - 3. Isolate expansion tanks and determine that hydronic system is full of water.
 - 4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any

- vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
 6. Prepare written report of testing.
- C. Perform the following before operating the system:
1. Open manual valves fully.
 2. Inspect pumps for proper rotation.
 3. Set makeup pressure-reducing valves for required system pressure.
 4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
 5. Set temperature controls so all coils are calling for full flow.
 6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
 7. Verify lubrication of motors and bearings.

END OF SECTION 23 21 13

SECTION 23 31 13 – METAL DUCTS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular ducts and fittings.
2. Duct Liner.
3. Round ducts and fittings.
4. Sheet metal materials.
5. Sealants and gaskets.
6. Hangers and supports.

B. Related Sections:

1. Division 23 Section "Testing and Balancing" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated.

1. Static-Pressure Classes:

- a. Supply Ducts (Upstream from Air Terminal Units): 4-inch wg.
- b. Supply Ducts (Downstream from Air Terminal Units): 1-inch wg.
- c. Return Ducts (Negative Pressure): 2-inch wg.

2. Leakage Class:

- a. Round Flat Oval Supply-Air Duct: 3 cfm/100 sq. ft. at 1-inch wg.
- b. Rectangular Supply-Air Duct: 6 cfm/100 sq. ft. at 1-inch wg.
- c. Flexible Supply-Air Duct: 6 cfm/100 sq. ft. at 1-inch wg.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.
13. The construction documents are not fabrication drawings and are not intended to show all offsets as required for proper ductwork installation. Contractor to field verify all existing conditions and prepare fabrication drawings based on existing conditions. All additional offsets shall be included in bid price.
14. Submit 2 copies of sheet metal fabrication drawings to Testing and Balancing Contractor for his review prior to submitting to engineer.

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.

D. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.

PART 2 - PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- E. Exposed ductwork in finished areas shall have "paint-grip" finish. Ductwork will be field painted.

2.2 DUCT LINER

- A. Where noted on Drawings, this Contractor shall insulate inside of duct with liner.
- B. All exposed leading edges and transverse joints shall be neatly butted without gaps. All edges shall be factory coated. All field cut edges shall be coated with approved coating/sealant. Manville Superseal Permacote or equal.
- C. Nominal insulation thickness to be 1"
- D. Insulation density shall be 1 ½ #/cu. ft.
- E. Insulation shall have an air stream surface with an acrylic coating and a biocidal component, which satisfies the requirements of ASTM C1071 – "Standard Specification for Thermal and Acoustical Insulation (Glass Fiber, Duct Liner Material)." The material must not support the growth of mold and fungi when tested in accordance with ASTM C665. NBFU approved. All components of duct liner insulation must not exceed 25 flame or 50 smoke developed ratings.
- F. Manufacturers:
 - 1. Knauf Performance+ Rigid Duct Liner
 - 2. Johns Manville Linacoustic R-300 Rigid Duct Liner
 - 3. Owens Corning QuietR Duct Liner Board
 - 4. Approved equal.

2.3 ROUND DUCTS AND FITTINGS

- A. See Floor Plans for dual wall duct requirements.
- B. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Linx Industries.
 - b. McGill AirFlow LLC.
 - c. SEMCO Incorporated.
 - d. Sheet Metal Connectors, Inc.
 - e. Spiral Manufacturing Co., Inc.
 - f. United Sheet Metal.
 - g. LaPine
 - h. Eastern Sheet Metal
 - i. JTD Spiral Inc.
- C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure showing, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
- D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure showing, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- E. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure showing, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- F. Dual-walled ductwork shall have "paint-grip" finish. Ductwork will be field painted.

2.4 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60.

2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.5 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System:
 1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
 2. Tape Width: 4 inches.
 3. Sealant: Modified styrene acrylic.
 4. Water resistant.
 5. Mold and mildew resistant.
 6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 7. Service: Indoor and outdoor.
 8. Service Temperature: Minus 40 to plus 200 deg F.
 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
- C. Water-Based Joint and Seam Sealant:
 1. Application Method: Brush on.
 2. Solids Content: Minimum 65 percent.
 3. Shore A Hardness: Minimum 20.
 4. Water resistant.
 5. Mold and mildew resistant.
 6. VOC: Maximum 75 g/L (less water).
 7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 8. Service: Indoor or outdoor.
 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- D. Flanged Joint Sealant: Comply with ASTM C 920.
 1. General: Single-component, acid-curing, silicone, elastomeric.
 2. Type: S.
 3. Grade: NS.
 4. Class: 25.
 5. Use: O.
- E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.6 HANGERS AND SUPPORTS

- A. Hanger Rods for Non-corrosive Environments: Cadmium-plated steel rods and nuts. Clean/degrease for painting where applicable.
- B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure Showing 5-1, "Rectangular Duct Hangers Minimum Size," and Figure showing 5-2, "Minimum Hanger Sizes for Round Duct."
- C. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- D. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- E. Trapeze and Riser Supports: Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
- F. See 20 00 10 Common Work Results for Fire Suppression, Plumbing and HVAC for attachment to existing structure.

2.7 DUCT SCHEDULE

- A. Fabricate supply, and return with galvanized sheet steel unless noted otherwise on drawings or within specifications.
- B. Intermediate Reinforcement:
 1. Galvanized-Steel Ducts: Galvanized steel.
- C. Elbow Configuration:
 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure showing, "Rectangular Elbows."
 - a. Velocity 1000 fpm or Lower:
 - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 4 without vanes.
 - b. Velocity 1000 to 1500 fpm:

- 1) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure showing, "Vanes and Vane Runners," and Figure showing, "Vane Support in Elbows."
- c. Velocity 1500 fpm or Higher:
 - 1) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure showing, "Vanes and Vane Runners," and Figure showing, "Vane Support in Elbows."
2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure showing, "Round Duct Elbows."
 - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table showing, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - 2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
 - 3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
 - b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches and Larger in Diameter: Welded.
- D. Branch Configuration:
 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connections."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Rectangular Main to Round Branch: 45-degree entry. No spin-in type fittings allowed.
 - b. Round Main to Round Branch: 45-degree entry.
- E. Escutcheons:
 1. For all duct penetrations thru walls into finished areas duct shall have neat shop fabricated picture frame escutcheon on finished side of wall.
 - a. This applies to both round and square duct work.
 - b. Externally insulated ducts to have escutcheon oversized by thickness of insulation.
 - c. Ducts without insulation to have escutcheon tight to exterior of duct.
 - d. Escutcheon to be fastened to wall and not duct.
 - e. Escutcheon to be of quality finish and paintable.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. **Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.**
- B. Contractor shall remove all labels and stickers from inside of ductwork prior to installation.
- C. Install dual wall insulated duct in exposed areas as noted on Drawings.
- D. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- E. Install round ducts at maximum practical lengths.
- F. Install ducts with fewest possible joints.
- G. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- H. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- I. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- J. Install ducts with a clearance that will allow for insulation thickness.
- K. Route ducts so that they do not pass through transformer vaults, electrical equipment rooms, stairwell enclosures and elevator equipment rooms.
- L. Where ducts pass through non-fire-rated interior partitions and exterior walls, cover the opening between the partition and duct or duct insulation with sheet metal flanges (picture frames) of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- M. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with "Intermediate Level" standards as identified in SMACNA's "Duct Cleanliness for New Construction Guidelines." All ducts and air openings on equipment shall be covered and protected throughout construction until ready for use.

3.2 SEAM AND JOINT SEALING

- A. Seal duct seams and joints for duct static-pressure and leakage classes specified in "Performance Requirements" Article, according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 1-1, "Standard Duct Sealing Requirements," unless otherwise indicated.
- B. Seal Classes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table showing 1-1, "Standard Duct Sealing Requirements."

3.3 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter for, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 2. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 - 3. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
 - 4. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table showing 5-1, "Rectangular Duct Hangers Minimum Size," and Table showing 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports. Clean/degrease where painting is to occur.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum interval of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- G. Install stiffener's, turning vanes, and/or air straighteners as required to stop objectionable duct oil canning, or fan surge to the satisfaction of the engineer.

3.4 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

END OF SECTION 23 31 13

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SECTION 23 33 00 – AIR DUCT ACCESSORIES

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Materials.
 - 2. Manual volume dampers.
 - 3. Flange connectors.
 - 4. Turning vanes.
 - 5. Duct-mounted access doors.
 - 6. Flexible connectors.
 - 7. Flexible ducts.
 - 8. Duct accessory hardware.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work on 1/4" = 1'-0" scale drawings.
 - 1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances, and method of field assembly into duct systems and other construction. Include the following:
 - a. Special fittings.
 - b. Manual volume damper installations.
 - c. Control damper installations.
 - 2. The construction documents are not fabrication drawings and are not intended to show all offsets as required for proper ductwork installation. Contractor to field verify all existing conditions and prepare fabrication drawings based on existing conditions. All additional offsets shall be included in bid price.
- C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90.
 - 2. Exposed-Surface Finish: Mill phosphatized.
- C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- D. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.
- E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Balance Inc.; a division of Mestek, Inc.
 - b. American Warming and Ventilating; a division of Mestek, Inc.
 - c. Flexmaster U.S.A., Inc.
 - d. McGill AirFlow LLC.
 - e. METALAIRE, Inc.
 - f. Nailor Industries Inc.
 - g. Ruskin Company.
 - h. Greenheck.
 - i. Vent Products Company, Inc.
 - j. United Enertech
 - k. Pottorff
 - l. NCA Mfg.
 - 2. Suitable for horizontal or vertical applications.
 - 3. Frames:
 - a. Hat-shaped, galvanized-steel channels, 16 ga. minimum thickness.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.

4. Blades:
 - a. Multiple (min. 16 ga) or Single blade (min. 20 ga)
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized steel
 5. Blade Axles: Galvanized steel.
 - a. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 6. Tie Bars and Brackets: Galvanized steel.
- B. Jackshaft:
1. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
 2. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.
- C. Damper Hardware:
1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 1/4-inch hexagon locking nut.
 2. Include center hole to suit damper operating-rod size.
 3. Include standoff bracket for insulated duct mounting.

2.3 FLANGE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ductmate Industries, Inc.
 2. Nexus PDQ; Division of Shilco Holdings Inc.
 3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
 4. Duro Dyne Inc.
- B. Description: roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- C. Material: Galvanized steel.
- D. Gauge and Shape: Match connecting ductwork.

2.4 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ductmate Industries, Inc.
 2. Duro Dyne Inc.

3. METALAIRE, Inc.
 4. SEMCO Incorporated.
 5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
- C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."
- D. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.5 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. American Warming and Ventilating; a division of Mestek, Inc.
 2. Cesco Products; a division of Mestek, Inc.
 3. Ductmate Industries, Inc.
 4. Flexmaster U.S.A., Inc.
 5. Greenheck Fan Corporation.
 6. McGill AirFlow LLC.
 7. Nailor Industries Inc.
 8. Buensod Stacey Type F.
 9. Ventfabrics, Inc.
 10. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
 11. Pottorff
- B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."
1. Door:
 - a. Double wall, rectangular.
 - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
 - c. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
 - d. Fabricate doors airtight and suitable for duct pressure class.
 2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
 3. Number of Hinges and Locks:
 - a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
 - b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
 - c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches with outside and inside handles.
 - d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

2.6 FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Wiremold Type 86-C.
 - 2. Aircon-Duct.
 - 3. Flexmaster U.S.A., Inc.
 - 4. McGill AirFlow LLC.
 - 5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.
 - 1. Pressure Rating: 4-inch wg positive and 1-inch wg negative.
 - 2. Maximum Air Velocity: 4000 fpm.
 - 3. Temperature Range: Minus 20 to plus 175 deg F.
- C. Flexible Duct Connectors:
 - 1. Clamps and Sheetmetal Screws: Nylon strap in sizes 3 through 18 inches with 3 sheetmetal screws to prevent blow-off of duct, to suit duct size.
 - 2. Non-Clamp Connectors: Adhesive plus sheet metal screws.

2.7 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel ducts and aluminum accessories in aluminum ducts.
- C. Install backdraft and/or control isolation dampers at outlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Install volume dampers at all locations as required for balancing whether shown or not. Dampers specified on backs of grilles shall not be used for balancing unless approved by Engineer.

1. Install steel volume dampers in steel ducts.
 2. Install aluminum volume dampers in aluminum ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire, smoke, combination fire and smoke and ceiling radiation dampers according to UL listing.
- H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
1. On both sides of duct coils.
 2. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors; and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
 3. At changes of direction of kitchen hood exhaust ducts.
 4. Elsewhere as indicated.
- I. Install access doors with swing against duct static pressure.
- J. Access Door Sizes:
1. One-Hand or Inspection Access: 8 by 5 inches.
 2. Two-Hand Access: 12 by 6 inches.
 3. Head and Hand Access: 18 by 10 inches.
 4. Head and Shoulders Access: 21 by 14 inches.
 5. Body Access: 25 by 14 inches.
 6. Body plus Ladder Access: 25 by 17 inches.
- K. Label access doors according to Section 20 00 50.
- L. Install flexible canvas connectors to connect ducts to equipment.
- M. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- N. Connect terminal units to supply ducts with maximum 12-inch lengths of flexible duct rated at 10" static, strapped in place with 3 sheet metal screw stop keep straps from blowing off ducts. Do not use flexible ducts to change directions.
- O. Connect diffusers or light troffer boots to low-pressure ducts with maximum 36-inch lengths of flexible duct (rated at 4" static) strapped in place.
- P. Connect flexible ducts to metal ducts with draw bands plus sheet metal screws.
- Q. Install duct test holes where required for testing and balancing purposes.
- R. All dampers that penetrate building envelope shall be insulated dampers. This includes all exhaust, return and relief dampers.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 23 33 00

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SECTION 23 37 13 – DIFFUSERS, REGISTERS, GRILLES AND LOUVERS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes ceiling-, floor- and wall-mounted diffusers, registers, and grilles.
- B. This Section includes but is not limited to:
 - 1. Linear Slot Diffusers
- C. Related Sections include the following:
 - 1. Division 23 Section "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 SUBMITTALS

- A. Product Data: For each product indicated, include the following:
 - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
 - 2. Diffuser, Register, and Grille Schedule: Indicate Drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1 LINEAR SLOT DIFFUSERS

- A. Manufacturers:
 - 1. Price Industries SDS/R Series
 - 2. Titus ML Series
 - 3. Nailor Industries
 - 4. MetalAire
 - 5. Krueger
- B. Material – Frame: Extruded aluminum.

- C. Material – Pattern Controller and Tees: Extruded aluminum.
- D. Finish – Frame and Tees: Baked enamel, white.
- E. Finish – Pattern Controller: Baked enamel, black.
- F. Slot Width: As noted on Schedule.
- G. Number of Slots: As noted on Schedule.
- H. Length: As noted on Schedule or Drawings.
- I. Mounting: T-bar or surface-mount. Provide appropriate end configuration and frame for application. Reference Architectural drawings for ceiling type.
- J. Accessories:
 - 1. Steel plenum with factory installed external insulation.
 - 2. Alignment strips (when required).
 - 3. Cable operated butterfly damper adjustable from the face of the diffuser.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of panel if not of panel dimension. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 37 13

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SECTION 26 05 00 – COMMON WORK RESULTS FOR ELECTRICAL

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General, Supplementary, and Special Conditions apply to all electrical work.

1.02 DESCRIPTION OF WORK

- A. Section 260500 applies to all electrical materials, equipment, installations and services supplied under any portion of the work.
- B. All work must meet or exceed all Local, State and Federal Codes and ADA Guidelines.
- C. All Electrical Contractor or Electrical Sub-contractor work shall be performed by a licensed and bonded Electrical Contractor with at least five (5) years of successful installation experience on projects with electrical work similar to this project.
- D. The Electrical Contractor or Electrical Sub-contractor shall coordinate the Basic Requirements as applicable to any equipment, installations and services of an electrical nature.
- E. It is the intention of this Division of the Specifications and the accompanying drawings to describe and provide for the furnishing, installing, testing and placing in satisfactory and successful operation all equipment, materials, devices and necessary appurtenances to provide a complete electrical system.
- F. The Contract drawings indicate the extent and the general location and arrangement of equipment, conduit and wiring. The General Contractor and their Electrical Sub-contractor shall study the plans and details and shall coordinate with all other trades to prevent conflict and interference with other installations.
- G. The Electrical Contractor or the Electrical Sub-contractor is responsible for installation of a complete and operating electrical system in accordance with the intent of the Drawings and Specifications.
- H. Any minor changes in location of equipment and conduits from those shown on the plans shall be made without extra charge if so directed by the Owner prior to installation.
- I. All equipment shall be installed such that maintenance and service may be properly accomplished. If necessary, the Owner may at their option require the contractor to demonstrate the service on any piece of equipment to determine sufficient service space exists. If service space is not adequate, the equipment shall be relocated at no additional cost to the Owner so that sufficient service space is achieved.

1.03 PERMITS AND FEES

- A. This work shall include the procurement of and payment for all permits and fees for the performance of the electrical work.

1.04 SUBMITTALS

- A. The following items that shall be submitted for approval prior to ordering. Submit individually by the appropriate Specification Section number.
 - 1. Raceway (unless special raceway is specified a letter on Company letterhead stating the products to be used are in conformance with the Specifications is acceptable as a Submittal. Check with Engineer/Owner)
 - 2. Wire (unless special wire is specified a letter on Company letterhead stating the products to be used are in conformance with the Specifications is acceptable as a Submittal. Check with Engineer/Owner)
 - 3. Wiring Devices and Covers
 - 4. Lighting Fixtures
 - 5. Disconnect Switches
 - 6. Motor Starters
 - 7. Panelboards and Switchboards
 - 8. Fire Alarm
 - 9. Others as required by the related Division 26 Section.
- B. Submission of the above information shall be electronically in ISU approved PDF Format.

1.05 PROJECT CLOSEOUT

- A. On Electrical Prime Projects one set of all Project documents shall be submitted electronically in PDF Format on a USB Flash Drive. The following is a list, but not limited to, of required documentation to be included on the USB flash drive:
 - 1. Bid Form
 - 2. Award Letter and Contract for Construction
 - 3. Meeting minutes and supporting documentation.
 - 4. Reviewed submittals and reviewed shop drawings
 - 5. All Change documentation, e.g. ASI, RFI, CCD, RFP, CP, CO, etc.
 - 6. Pay Applications
 - 7. Installation instructions and schematic drawings
 - a. Complete parts list with manufacturer's model numbers.
 - b. Complete wiring diagrams showing all connections and internal wiring. Factory typical wiring diagrams are not acceptable.
 - 8. Operating and maintenance instructions.
 - 9. Warranty and guarantee information
 - 10. Substantial Completion documents to determine start of Warranty Period
- B. When individual Specification Sections call for close-out submission they may be combined on a master Project close-out USB flash drive with itemized files and sub-files for each Section.
- C. Additionally, submit one hard copy of the O&M's in a 3-ring binder and unfolded Record Drawings.

- D. Prior to release of final payment, Indiana State University must receive a complete set of record drawings in AutoCAD 2010 on a CD or DVD. The Design Engineer and the Indiana State University Department of Facilities Management engineering staff must approve these drawings.

1.06 COPPER REQUIREMENTS FOR ELECTRICAL EQUIPMENT

- A. All current-carrying components (phase, neutral and ground) of all electrical equipment shall be copper. No CUAL allowed without prior approval of Owner.
- B. Exceptions: molded case circuit breakers with in-built lugs and safety switches.

1.07 UNDERGROUND UTILITIES

- A. All underground utility lines shall be buried a minimum of 36" below finished grade.
- B. Place 3" of compacted red sand below all buried utility lines and cover with 12" of red sand.
- C. Remainder of the trench shall be back filled with new topsoil free of debris, compacted in 6" lifts to 98% standard proctor using the water jet method.
- D. Install the appropriate 6" wide marker tape a minimum of 12" above any buried utility line.

1.08 NEUTRAL RULES

- A. Neutral rules and requirements for multi-circuit branch raceway installations.
 - 1. A separate dedicated neutral shall be installed for every phase conductor in a multi-circuit 120-volt or 277-volt raceway.
 - 2. Neutrals shall be marked in such a way as to prevent the accidental crossing of neutrals at device locations.
 - 3. Neutrals in 120-volt applications shall be white, gray in 277-volt applications.
 - 4. This includes pre-wired raceway systems such as ISODUCT and systems furniture.
 - 5. No sharing of neutrals is allowed.
- B. Over sizing of neutral conductors shall not be allowed in lieu of the preceding rules and requirements.
- C. THESE RULES SUPERCEDE ANY OTHER NEUTRAL INSTRUCTIONS EITHER WRITTEN OR IMPLIED IN ANY OTHER SPECIFICATION SECTION OR SHOWN ON DRAWINGS.

1.09 RACEWAY SYSTEMS INSTALLATION SUMMARY

- A. Provide conduits, cable trays, surface raceways, boxes, fittings and supports to form a complete, coordinated, and continuously grounded raceway system.
- B. No more than three (3) single phase (120volt and 277volt) circuits shall be installed in a conduit raceway system.

1.10 RACEWAY REQUIREMENTS

- A. Conduits indoors in general areas shall be electrical metallic tubing (EMT) with steel set screw or compression fittings.
- B. Conduits indoors in hazardous areas, encased in concrete floorslabs or subjected to water, physical damage or abuse shall be galvanized rigid steel (GRS) or intermediate metal conduit (IMC) with cast or malleable iron threaded fittings and bushings.
- C. Conduits indoors for medium voltage distribution circuits or for fire pump feeders shall be galvanized rigid steel conduit with cast or malleable iron threaded fittings and bushings.
- D. Conduits outdoors shall be galvanized rigid steel or intermediate metal conduit with cast or malleable iron threaded fittings and bushings.

- E. Conduits encased in concrete underground shall be Type DB PVC for IT applications and Schedule 80 for MV applications both with matching fittings.
- F. Conduits direct buried underground shall be Schedule 40 PVC with matching fittings.
- G. Conduits in steam tunnels shall be galvanized rigid steel or intermediate metal conduit with cast or malleable iron threaded fittings and bushings. Exceptions to this requirement are tunnel segments inside building (i.e., mechanical rooms) where EMT may be used.
- H. Final connections to recessed lighting fixtures and under counter lights shall be 1/2" minimum flexible metallic conduit, manufactured wiring systems, or galvanized steel Type MC Cable all with steel fittings.
 - 1. Manufactured wiring systems shall
 - a. Only be used above accessible ceilings.
 - b. Shall not be used in walls or above permanent ceilings.
 - c. Shall contain a dedicated, separate, grounding conductor.
 - 2. Type MC cable conductors shall be color coded to match the building color-coding scheme. Type MC Cable shall be terminated with steel setscrew connectors that have integral insulating bushings. Self-locking, twist-in type fittings are not acceptable.
- I. Final connections to motors, transformers and equipment subject to vibration or removal for maintenance shall be 1/2" minimum liquid tight flexible metallic conduit with steel liquid tight fittings. Transformer connections may be non-liquid tight flexible metallic conduit in electrical rooms only.
- J. Connections to recessed power receptacles and light switches in areas with accessible ceilings:
 - 1. In new 'metal stud and gypsum board partitions (walls)' and in existing 'metal stud and gypsum board partitions (walls)', where the wall is not being otherwise opened up, the final connections may be made with type MC Cable. This MC Cable, shall:
 - a. Be run to a box immediately above the accessible ceiling, and the box size shall not exceed 4-11/16" square.
 - b. Conduit shall be used for the entire run, from this junction box, to the power source, load (lights), etc.
 - c. No more than three circuits may be run through any given junction box.
 - d. Individual conductors making up the MC cable shall be stranded copper, with separate grounding conductor, and steel corrugated armor. Individual conductors shall be color coded as required in section 16120.
 - e. The MC Cable is terminated using UL listed hardware intended for the cable and boxes being used, (and rated for commercial and industrial environments).
 - f. The MC Cable shall be secured in the wall cavity as required by NEC.
 - g. The MC Cable shall be as short as it is necessary to serve the need and meet the Code
- K. In areas with non-accessible ceilings devices shall be installed with standard conduit; run back in a continuous installation to a junction box located at an access point in the ceiling
- L. Connections to other recessed devices, (including communication outlet boxes, junction or pull boxes, etc) shall be with standard conduit of the type appropriate for the wall construction.

1.11 CABLE TRAY REQUIREMENTS

- A. Power and telecommunications cable trays shall be aluminum, ladder type, of the sizes shown on the drawings.
- B. Center spline telecommunications cable tray may only be used where shown.
- C. Changes in cable tray direction or elevation shall be made using standard fittings from the same manufacturer as the cable tray.

- D. Barriers shall be installed in cable trays where shown to separate circuits of different voltage levels.

1.12 SURFACE RACEWAY REQUIREMENTS

- A. When conduits in finished areas cannot be concealed in walls or above ceilings, surface raceways may be used where permitted. Boxes and fittings shall match and be from the same manufacturer as the raceways.
- B. Raceway shall be metal and white in color unless otherwise noted on the drawings.
- C. Contractor shall verify with the Owner if the use of metal surface raceway is acceptable.

1.13 BOX REQUIREMENTS

- A. Provide sheet steel outlet boxes, extensions, and plaster rings for EMT, flexible metal conduit, and MC cable.
- B. Provide cast or malleable iron outlet boxes and covers for galvanized rigid steel conduits, intermediate metal conduits, and liquidtight flexible metal conduits.
- C. Boxes shall be sized for all conductors and devices to be contained within. Box extensions shall not be used to correct for undersized boxes. A single extension may be used as follows only if all free conductors extend at least 3 inches outside of the extension opening.
 - 1. On boxes being flush mounted in masonry walls.
 - 2. On existing boxes in walls that are being furred out.
 - 3. On existing boxes for connecting to an existing circuit.
 - 4. On fire alarm, security and clock system boxes where required by the system manufacturer's instructions.
- D. Plaster rings shall not be considered box extensions, but their capacities may be included in box fill calculations.

1.14 SUPPORT REQUIREMENTS

- A. Mechanical Areas and Tunnels
 - 1. Surface mounted equipment shall be secured to steel channels.
 - 2. Surface mounted raceway 1½" and smaller and boxes maybe attached directly to surfaces.
 - 3. Multiple raceway runs maybe attached to
 - a. A trapeze system with approved straps
 - b. Trapeze shall be attached to the structure by steel channels and threaded rod.
 - 4. Vertical surface race way 1½" maybe attached by:
 - a. Below 8' by one or two hole straps
 - b. 8" and above with pipe hangers ("Minerallac style hangers")
 - 5. The channels and raceway shall be attached with toggle bolts to hollow tile, block or similar surfaces, and attached with screws or bolts and expansion shields to solid masonry or concrete.
- B. Finished Areas Above Suspended Ceilings
 - 1. Raceway and boxes maybe attached directly to surfaces with appropriate straps or hangers.
 - 2. Multiple raceway runs maybe attached to
 - a. A trapeze system with approved straps
 - b. Trapeze shall be attached to the structure by steel channels and threaded rod.
 - 3. The channels and raceway shall be attached with toggle bolts to hollow tile, block or similar surfaces, and attached with screws or bolts and expansion shields to solid masonry or concrete.
 - 4. Attachment of raceway to ceiling grid support wires or rods is not permitted.

C. Finished Areas Inside Walls

1. Raceway and boxes shall be attached to structural members with devices specifically designed for raceway/box attachment to the type of structural member used.

D. Finished Areas Exposed

1. Surface raceway shall be attached to finished surfaces utilizing the factory approved method of attachment.
2. Tape is not acceptable for attachment of non-metallic surface raceway.

PART 2 - PRODUCTS

2.01 CONDUITS

- A. Electrical metallic tubing shall be thin wall steel tubing, electro-galvanized or hot dipped galvanized inside and outside. Fittings and bushings shall be galvanized steel set screw type with two screws per connection for sizes over 2".
- B. Galvanized rigid steel conduit and intermediate metal conduit shall be hot dipped galvanized inside and outside, in 10' lengths and threaded on both ends. Fittings and bushings shall be cast or malleable iron, and hot dipped galvanized inside and outside.
- C. PVC conduit and fittings shall be Type DB for encasement in concrete for IT applications, Schedule 40 for direct burial, concealed and exposed work, and Schedule 80 in MV Duct Banks. Fittings shall be of the same type and from the same manufacturer as the conduit. PVC conduit shall be UL Labeled for 90 degrees C cables. Approved Manufacturers:
 1. Cantex
 2. Carlon
 3. National Pipe & Plastic.
- D. Flexible metallic conduit shall be galvanized steel or aluminum. Fittings shall be of steel with cadmium or galvanized finish. Fittings shall be machine screw clamp type, single or two-piece. Self-locking, twist-in type fittings are not acceptable.
- E. Liquid tight flexible metallic conduit shall consist of a flexible, galvanized steel core, a continuous copper ground strip and a polyvinyl chloride jacket. Fittings shall be steel liquid tight grounding type from the same manufacturer as the conduit.

2.02 CABLE TRAYS

- A. Ladder type cable tray shall be aluminum, of the width shown, with 4" rail height, 13/16" minimum rung width, and 9" maximum rung spacing. The tray with a 10' span shall be capable of sustaining a working load of 145 pounds per lineal foot with a load deflection of 1.0" when tested in accordance with NEMA VE1-3.01. Approved Manufactures:
 1. B-Line
 2. Chalfant
 3. Cope
 4. Globetray
 5. Husky
 6. Mono-Systems
 7. Square D
 8. Wiremold.
- B. Center spline cable tray shall be aluminum, of the width shown, with top mounted rungs, 3" load depth, 13/16" minimum rung width, and 9" maximum rung spacing. The tray with a 10' span shall be capable of sustaining a working load of 145 pounds per lineal foot with a load deflection of 1.0" when tested in accordance with NEMA VE1-3.01.

- C. Tray fittings including horizontal and vertical bends, tees, crosses, reducers, splice plates and expansion joints shall be from the same manufacturer and of the same product line as the tray. Bends, tees, crosses and reducers shall have a 13/16" minimum rung width, a 9" maximum rung spacing, and a 12" minimum bend radius.
- D. Tray fasteners shall be galvanized or zinc plated steel.

2.03 SURFACE RACEWAYS

- A. Where surface raceways are called for on the drawings, or when conduits in finished areas cannot be concealed in walls or above ceilings, surface raceways shall be used. Boxes and fittings shall match and be from the same manufacturer as the surface raceway.
- B. Surface raceways shall consist of a base and cover, sized for the number of conductors contained within, complete with all connectors, fittings, bushings, boxes, covers and mounting hardware.
- C. Raceways shall be 600 volt rated, and be in compliance with the applicable paragraphs of NEC Article 352.
- D. They shall be non-flammable, and UL labeled, under UL 5, or UL 5A (as applicable).
- E. The completed raceway system shall be vandal resistant.
- F. Shall accept receptacles, cover plates, telephone/data outlets and other standard wiring devices as specified elsewhere in these specifications.
- G. The coverplates used for wiring devices and telecommunication outlets shall be of the 'overlapping' type, and shall therefore cover the 'cut-end' of the raceway cover.
- H. The raceways shall have "scuff" resistant finish, and the raceways shall be paintable.
- I. All components of the raceway system exposed to view shall be of the same color and shade.
- J. Barriers shall be provided when necessary to separate conductors of different voltages, or services.
- K. Surface raceways shall be steel or plastic as noted below, and as noted on the drawings:
- L. Type Standards Manufacturers
 - 1. Metallic
 - a. Metallic raceways shall be of .040" thick (minimum) zinc plated or galvanized steel.
 - b. The acceptable levels of quality are, generically,
 - 1) Like "Wiremold V500 and V700" for smaller single channel raceway applications,
 - 2) Like "Wiremold V3000" for larger single channel raceway applications, and
 - 3) Like "Wiremold V4000" for larger multi-channel raceway applications.
 - c. Manufacturers include Wiremold, Hubbell, Thomas and Betts, or Mono-System.
 - 2. Plastic
 - a. Plastic raceways shall be of a material meeting all of the requirements of UL 5A, (including flammability, resistively structural strength, etc.).
 - b. The acceptable levels of quality are, generically,
 - 1) Panduit LD series, or Carlon Series 30 for smaller single channel raceway applications;
 - 2) Panduit Type T-70, or Carlon "Premiere", for larger single channel raceways, and smaller multi-channel raceways; and
 - 3) Panduit Twin 70 or Carlon "Prestige", for larger multi-channel raceway applications.
 - c. Manufacturers include Panduit, Carlon, Hubbell, Mono Systems, and Wiremold.
- M. Use vertical surface raceways from junction boxes above the ceiling, to the horizontal portion of the surface raceway. Locate vertical section as close to room corners (or 'vertical breaks' in mid wall) as is possible. Use of exposed vertical conduits is not acceptable.

2.04 BOXES

- A. Boxes for fixtures, outlets, switches, equipment connections and wire pulling shall be
 - 1. Cast or formed from carbon steel sheets of commercial grade steel not less than 14-gauge,
 - 2. One-piece construction, zinc, or cadmium plated,
 - 3. Tapped for mounting plates and covers as required.
- B. Pull and junction boxes shall be
 - 1. Fabricated from galvanized or painted code gauge cold rolled carbon steel sheets.
 - 2. Welded construction with flat removable covers fastened to the box with machine screws.
 - 3. Seams and joints shall be closed and reinforced with flanges formed of the same material from which the box is constructed or by continuous welding which will provide equivalent strength to flange construction.
 - 4. Preferably not provided with 'knockouts'.
- C. Box covers shall be fastened in place by machine screws or hinges and latches. Self-tapping or sheet metal fasteners are not acceptable.

2.05 SUPPORTS

- A. Hangers and brackets shall be made of steel pipe, channel iron, angle iron or prefabricated steel channel. Prefabricated steel channel shall be by B-Line, Hilti, Powerstrut or Unistrut.
- B. Anchors shall be lead shield anchors or plastic expansion anchors for small loads, and expansion or epoxy anchors for large loads. Powder-driven anchors shall not be used.

2.06 LABELS AND DIRECTORIES

- A. Equipment nameplates shall be engraved .125 inch (1/8") thick 'Lanaloid' (Lanacoid) plastic. White, with black letters. The engraved letters shall be at least one quarter inch (1/4") high.
- B. Receptacles and lighting switch covers shall be labeled using clear adhesive backed nylon or Mylar tape with black text permanently laminated to the tape.
- C. Panel directories shall be typed on supplied card stock with panel, or card stock similar in thickness and material as those supplied with the panels. Install supplied clear plastic cover, or one of like material.

PART 3 - EXECUTION

3.01 GENERAL

- A. All work shall conform to all applicable Codes and Construction Standards.
- B. All installations shall be warranted for a period of one (1) year against defects in material and workmanship.
- C. The Owner reserves the right to relocate any device fifteen (15) feet prior to installation at no additional cost.
- D. Material Storage
 - 1. All materials shall be new and in original factory packaging.
 - 2. All material shall be kept dry and clean.
 - 3. The Owner reserves the right to reject any material not properly stored.
- E. Contractor shall swab clean the interior of all raceway prior to pulling wire.
- F. Device plate screw slots shall be oriented vertically.

3.02 RACEWAYS

- A. Size conduits in accordance with the NEC, but not less than the sizes shown on the drawings. Minimum power, fire alarm and control conduit size shall be $\frac{3}{4}$ ". Minimum telecommunications conduit size shall be 1".
- B. Install concealed and exposed conduits and cable trays parallel to or at right angles to building lines. Conduits shall not be embedded in concrete slabs except where specifically shown. Install surface raceways as close to room corners or trim features as possible to make the surface raceways less obvious.
- C. Make directional changes in primary power distribution conduits above ground with sweeps and long radius elbows, and underground with 20' minimum radius bends.
- D. Conceal conduits wherever possible and practical. When conduits cannot be concealed in finished areas, use surface raceways with matching boxes from the same manufacturer as the raceways.
- E. Metal conduits, fittings, enclosures and raceways shall be mechanically joined together in a firm assembly to form a continuous electrical conductor providing effective electrical grounding continuity.
- F. Provide expansion fittings at the intervals specified in the manufacturer's instructions.
- G. Conduits entering panels located outdoors, in parking structures, in steam tunnels and on cooling towers shall enter from the sides, back, or bottom. Conduits shall not enter from the top.
- H. Separate raceways from uninsulated steam pipes, hot water pipes, and other hot surfaces by a minimum of 4" horizontally or 12" vertically. Separate raceways from ventilation ducts and insulated pipes so that they do not come into contact with each other.
- I. Low voltage signal circuits shall be separated or shielded from power circuits to prevent the induction of noise into the signal circuits.
- J. EMT entering sheet metal enclosures and outlet boxes shall be secured in place by a connector with a locknut. Rigid conduit shall be secured with locknut inside and outside and a bushing. Sufficient thread on the connector or conduit shall extend into the enclosure so that the bushing will butt tight into the connector or conduit. Bushings shall not be used as jamb nuts or in lieu of locknuts.
- K. Flexible metallic conduit to motors and similar equipment shall not exceed 3'-0" in length, and shall have adequate slack to absorb the maximum vibration. Flexible conduit connections to lighting fixtures shall not exceed 6'-0" in length.

3.03 MOUNTING HEIGHTS

- A. Except where shown otherwise, install equipment and devices at the following heights:
 - 1. Receptacles (Wall): 18" A.F.F. to center
 - 2. Receptacles (Above Counter): 48" A.F.F. to center or 4" minimum above countertop or backsplash.
 - 3. Receptacles (Unfinished Area): 48" A.F.F. to center
 - 4. Surface Raceway Receptacle Strips: 42" A.F.F. to bottom
 - 5. Light Switches: 48" A.F.F. to center
 - 6. Telephone Outlets (Wall Phone): 48" A.F.F. to center
 - 7. Telephone/Data Outlets: 18" A.F.F. to center
 - 8. Clock Outlets: 88" A.F.F. to center
 - 9. Fire Alarm Pull Stations: 45" A.F.F. to center
 - 10. Fire Alarm Horn/Strobes: 80" A.F.F. to bottom or 1' below finished ceiling whichever is lower.
 - 11. Card Readers: 48" A.F.F. to card slot

12. Security System Controls: 48" A.F.F. to center
13. Thermostats/HVAC Controls: 48" A.F.F. to center
14. Panelboards: 72" A.F.F. to top
15. Safety Switches/Motor Starters: 72" A.F.F. to top (except top of handle shall not exceed 78" A.F.F.)
16. Motor Control Pushbuttons: 60" A.F.F. to center
17. Verify with the Owner for heights not otherwise listed.

3.04 SUPPORTS

- A. Provide 4" thick concrete housekeeping pads for floor-mounted equipment.
- B. Support all electrical items independently of supports provided by the other trades.
- C. Support conduits and boxes using steel conduit straps or 1/4-inch minimum diameter threaded rod hangers. Suspended ceiling hangers or hanger wire shall not be used (except to support flexible metallic conduit and manufactured wiring systems).
- D. Support cable trays with support brackets or 3/8" diameter minimum threaded rod hangers at intervals not exceeding 8'-0" for straight runs. Additional supports shall be provided at tray fittings.
- E. Hangers shall be of sufficient strength that their deflection at mid span does not exceed 1/240 of the hanger span length after the cables are installed.
- F. Route flexible metallic conduit, manufactured wiring systems and Type MC cable parallel to or perpendicular to building lines, and in a neat and workmanlike manner. Coil the excess manufactured wiring systems and Type MC cable, and support independently of the ceiling grid system at intervals not exceeding 3 feet.

3.05 PENETRATIONS, SLEEVES AND FIRE SEALS

- A. Cut floor and wall penetrations neatly and to the minimum size required for installation of the equipment and raceways.
- B. Provide galvanized steel pipe sleeves for all conduits penetrating floors, exterior walls and roofs.
 1. Extend floor sleeves above the floor a minimum of 2 inches.
 2. Embed sleeves in new concrete or step-core concrete and grout sleeves into existing concrete with epoxy grout.
 3. Seal floor sleeves using fire-sealing systems approved by a Nationally Recognized Testing Laboratory.
 4. Seal exterior wall and roof penetrations water tight.
- C. Patch both sides of wall penetrations cut for electrical equipment and raceways to seal against the passage of air, sound and fire.
 1. Seal cable tray penetrations in fire rated walls using fire sealant bags approved by a Nationally Recognized Testing Laboratory.
 2. Seal conduit penetrations in fire rated walls using firesealing caulk approved by a Nationally Recognized Testing Laboratory.
 3. Seal conduit penetrations in non-rated walls using masonry materials that match the wall construction.
 4. Fire seal between recessed outlet boxes located on opposite sides of a fire rated wall if the box openings are over 16 square inches and the boxes are less than 24 inches apart.

3.06 EXPANSION FITTINGS

- A. Provide expansion fittings at all building expansion joints.

- B. Provide expansion fittings, in accordance with manufacture recommendations, in all areas subject to swings in temperature of more than 15 degrees C.
- C. Install expansion fittings in all locations where expected expansion difference is 1/4", or more, between boxes

3.07 IDENTIFICATION

- A. Provide nameplates and labels in accordance with Article 2.6.
 - 1. Lanaloid labels shall be mechanically secured in place with sheet metal screws and/or bolts and nuts
 - 2. Labels shall be neatly centered. Place labels in like positions on similar equipment.
- B. Color code wiring as noted in Section 26 05 19 3.01 B
- C. Color code junction boxes and box covers of
 - 1. Emergency power circuits with red paint
 - 2. Fire alarm circuits with red paint.
 - 3. Temperature control circuits with blue paint.
 - 4. Phone and Data circuits with orange paint.

END OF SECTION 260500

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SECTION 26 05 02 – SELECTIVE ELECTRICAL DEMOLITION

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Demolition of electrical items and associated materials as indicated herein or as indicated on the drawings.

1.02 SECTION INCLUDES

- A. Removal of designated equipment and devices.
- B. Removal of designated construction.
- C. Disposal or storage of removed materials.
- D. Identification of utilities.
- E. Refer to items as indicated.

1.03 SUBMITTALS FOR CLOSEOUT

- A. Project Record Documents: Accurately record actual locations of terminated utilities and subsurface obstructions.

1.04 REGULATORY REQUIREMENTS

- A. Conform to applicable code for demolition work, safety of structure, dust control, products requiring electrical disconnection and re-connection.
- B. Obtain required permits from authorities.
- C. Do not close or obstruct egress width to any building or site exit.
- D. Do not disable or disrupt building fire or life safety systems without 3 days prior written notice to Owner.
- E. Conform to procedures applicable when hazardous or contaminated materials are discovered.

1.05 SCHEDULING

- A. Perform work between the hours of 7 a.m. and 7 p.m.

1.06 PROJECT CONDITIONS

- A. Conduct demolition to minimize interference with adjacent and occupied areas.
- B. Maintain protected egress and access to the Work.

PART 2 – NOT USED

PART 3 – EXECUTION

3.01 PREPARATION

- A. Protect existing materials which are not to be demolished.
- B. Notify affected utility companies before starting work and comply with their requirements.
- C. Utilize OSHA lockout/tag-out procedures for disconnecting means.
- D. Label all wiring to remain (phase and device fed) to assure proper re-connection.
- E. Mark location and termination of utilities.

3.02 DEMOLITION

- A. Disconnect, remove, cap, identify designated utilities to remain and demolish in an orderly and careful manner.

- B. Remove demolished materials from site except where specifically noted otherwise.
- C. Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.

3.03 PROTECTION OF SALVAGED ITEMS

- A. Remove, store and protect the materials and equipment scheduled to be re-used.
- B. Protect wiring to be re-used by means of a Junction Box
 - 1. Junction Box shall be of sufficient size to permit reconnection of existing wiring to new wiring per NEC Requirements.
 - 2. In outdoor locations the junction box shall be NEMA 3R or a custom junction box with welded seams and gasketed cover.

END OF SECTION 26 05 02

SECTION 26 05 19 – LOW VOLTAGE WIRE AND CABLE

PART 1- GENERAL

1.01 DESCRIPTION OF WORK

- A. Extent of electrical wire and cable work is indicated by the Project drawings.
- B. Types of wire, cable and connectors in this section include the following
 - 1. 600 volt insulated copper conductors
 - 2. Twist on insulated metal spring connectors
 - 3. Compression connectors
 - 4. Split Bolt connectors

1.02 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of electrical wire and cable of types sizes and ratings required, whose products have been in satisfactory use in similar service for not less than five (5) years.
- B. Installers: Firm with at least five (5) years of successful installation experience with projects utilizing electrical wiring and cabling work similar to those required for this Project.
- C. NEC Compliance: Comply with NEC requirements as applicable to construction, installation and color coding of electrical wires and cable.
- D. U.L. Compliance: Comply with applicable requirements of UL Standard 83, "Thermoplastic-Insulated Wires and Cables", and UL Standard 486A, "Wire Connectors and Soldering Lugs For Use With Copper Conductors".
- E. UL Labels: Provide wire, cable and connectors which are UL listed and labeled.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Deliver wire and cable properly packaged in factory-fabricated type containers or wound on NEMA Specified type non-returnable wire and cable reels.
- B. Store wire and cable in a clean dry space. Protect products from weather, damaging fumes, construction debris and traffic.
- C. Handle wire and cable carefully to avoid abrading, puncturing, or tearing wire and cable insulation and sheathing. Ensure that dielectric resistance integrity of wire and cable is maintained.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be used on this Project include, but not limited to, the following:
 - 1. Low Voltage Wire:
 - a. American Insulated Wire and Cable
 - b. Southwire Company
 - c. Others as Approved

2. Electronic Cable
 - a. Belden
 - b. Alpha
 - c. Anixter
3. Twist on insulated metal spring connectors
 - a. Ideal
 - b. Thomas and Betts Corp
 - c. 3M Company
4. Compression
 - a. Square D / Anderson
 - b. Thomas and Betts

2.02 DESCRIPTION THHN / THWN

A. Conductor:

1. Bare, soft annealed copper per ASTM B-3.
2. Sizes 14 - 10 AWG: Solid, bunched, unilay concentric combination unilay or compressed stranded (class C) alternate ASTM B-787, ASTM B-3 or ASTM B-8 and UL-83.
3. Sizes 8 - 2 AWG: Concentric, compressed stranded (class C) alternate ASTM B-787, ASTM B-8, UL-83 and UL-1063.
4. Sizes 1 AWG - 750 KCMIL: Concentric, compressed stranded (class B) ASTM B-8, UL-83 and UL-1063.

B. Insulation:

1. High dielectric polyvinyl chloride (PVC) per UL-83 and UL-1063.
2. Overall Jacket: Nylon per UL-83 and UL-1063.

C. Cable Identification:

1. Ink print on jacket for Sizes 14 - 10 AWG (solid conductors): "(size) AWG Type THHN or THWN GAS AND OIL RES II 600V(UL) or AWM VW-1---(Company Name).---C-UL Type T90 NYLON or TWN 75"
2. Ink print on jacket for Sizes 14 AWG - 750 KCMIL (stranded): "(size) AWG (or KCMIL) Type MTW or THHN or THWN or GAS AND OIL RES II 600V (UL) or AWM---(Company Name).- --C-UL Type T90 NYLON or TWN 75."
3. Also "VW-1" and "FT1" on sizes 14 through 6 AWG and "for CT USE SUN RES" on sizes 1/0 AWG and larger in black.

D. Cables conform to the following standards:

1. UL-83 for THHN-THWN, UL-1063 for MTW (stranded conductors only)
2. Federal Specification J-C-30B, NEMA WC-5, UL-758 for AWM Styles 1316 through 1321, 1408 through 1414, 1452 and 1453.

2.03 ELECTRONIC CABLE - COMMUNICATION AND SIGNAL

- A. Shall conform to the recommendations of the manufacturers of the communication and signal systems; however, not less than what is shown.
- B. Wiring shown is for typical systems. Provide wiring as required for the systems being furnished.

- C. Multi-conductor cables shall have the conductors color coded.

2.04 CABLES AND CONNECTORS

- A. General: Provide electrical cables and connectors of Manufacturer's standard materials, as indicated by published product information.
- B. Provide copper conductors with conductivity of not less than 98% at 68° F (20° C).
- C. Electronic cable shall be Plenum rated and as recommended by the Equipment Supplier
- D. Connectors shall be for copper to copper connections
- E. Insulation: All connectors shall be fully insulated to match insulation type and rating of conductors being spliced.

PART 3 – EXECUTION

3.01 INSTALLATION OF WIRES AND CABLES

- A. General: Install electrical cables, wires and wiring connectors as indicated, in compliance with applicable requirements of NEC, NEMA, UL and NECA's "Standard of Installations", and in accordance with recognized industry practices.
- B. Feeder phase identification from left to right or front to back facing front of equipment shall be one of the following:

Phase A	Phase B	Phase C	Neutral	System
X	Y	Z	N	Any voltage
BLACK	RED	BLUE	WHITE	120/208 volt feeders
BROWN	ORANGE	YELLOW	GRAY	277/480 volt feeders

- C. Install all wiring in conduit except as indicated on the drawings or directed by Owner.
- D. Pull conductors together where more than one is being installed in a raceway.
- E. Use pulling compound or lubricant where necessary. Compound must not deteriorate conductor or insulation. Use of soap is not permitted as a pulling lubricant.
- F. Pulling means must not damage cable or raceway.

3.02 COMPRESSION CONNECTORS

- A. Use only compression indenter tools designed for the type of connector used.
- B. For multiple indentations start at center and indent outward.

3.03 FIELD QUALITY CONTROL

- A. Prior to energizing, test all cables and wires with "Megger" to determine insulation resistance levels to ensure insulation integrity.
- B. Prior to energizing, test wires and cables for electrical continuity and for short circuits.

END OF SECTION 26 05 19

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SECTION 26 05 26 – GROUNDING AND BONDING

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide grounding for all systems and equipment.

1.02 GROUNDING SYSTEM REQUIREMENTS

- A. Each ground rod shall have a maximum resistance to ground of 10 ohms before connection to the other ground rods. If reading is above 10-ohms, drive one extension. Further testing of that individual rod is not needed.
- B. The total grounding system with all connections completed shall have a maximum resistance to ground of 2 ohms for primary services or 5 ohms for secondary services.

1.03 CONNECTION REQUIREMENTS

- A. Provide exothermic weld type, or Burndy Hyground, ground connections for concealed, underground, and concrete encased ground connections, for ground connections to structural steel, connections between sections of the main ground bus and all connections to the substation room ground bus bars.
- B. Exposed ground connections (except connections to structural steel and substation room ground bus bars) may be made with copper or bronze compression ground fittings or bolted compression ring lugs.
- C. Provide exothermic weld type, or Burndy Hyground ground connections for splices and taps of grounding conductors No. 8 AWG and larger. Exposed splices and taps shall be taped.

PART 2 - PRODUCTS

2.01 GROUND RODS

- A. Unless shown otherwise, ground rods shall be 3/4" diameter by 10' long, copper clad steel. Ground rods shall be capable of being extended when additional length is required.

2.02 GROUNDING CONDUCTORS

- A. Grounding conductors for direct burial underground, for encasement in concrete, and for grounding of unit substations shall be No. 4/0 AWG minimum, bare, stranded copper.
- B. Grounding conductors for general use shall be stranded, copper conductor, sized in accordance with the NEC unless shown otherwise on the drawings, and insulated with green NEC Type THHN insulation rated 90 degrees C, 600 volts.

2.03 GROUND CONNECTIONS

- A. Ground connections shall be Burndy Hyground, Cadweld, Thermo-weld or Thomas & Betts Blackburn only.

PART 3 - EXECUTION

3.01 INSTALLATION REQUIREMENTS

- A. Ground duct banks and manholes in accordance with Specification Section 26 05 13
- B. Provide bare copper grounding conductors from duct banks, manholes, unit substations, primary switches, transformers, switchgear, panelboards, motor control centers and control panels to the building grounding system. Equipment rated above 480 volts or 600 amps shall be grounded by a minimum of two independent grounding conductors.
- C. Bond transformer, UPS system, central battery/inverter system, emergency generator, and separately derived electrical system neutrals to the building grounding system.

- D. Ground motors rated 460 volts and below by motor feeder equipment grounding conductors. Stranded copper grounding conductors connected to building steel shall also bond motors rated over 460 volts.
- E. Provide green insulated equipment grounding conductors in all service, feeder, and branch circuits for connection of load devices to the power source ground. Raceways shall not be used as equipment grounding conductors.
- F. Equipment grounding conductors shall not be daisy-chained.
- G. Bond equipment-grounding conductors in boxes and enclosures where the grounding conductors are terminated or spliced.
- H. Bond conduits, cable trays, wireways, surface raceways, boxes, and enclosures together, and to the building grounding system. Provide bonding bushings and bonding jumpers to bond conduits where they enter a box or enclosure.
- I. Ground the lightning protection system with separate ground rods. The building grounding system ground rods shall not be used. After completion of both systems, the lightning protection system shall be bonded to the building grounding system.
- J. Protect separately routed grounding conductors subject to damage or physical abuse by Schedule 40 PVC nonmetallic conduits. Grounding conductors shall not be routed in metallic conduits except when routed with phase conductors.

END OF SECTION 26 05 26

SECTION 26 05 33 – RACEWAY AND BOXES

PART 1 – GENERAL

1.01 SUMMARY

- A. This Section specifies raceways and boxes for building and structure electrical systems under 600 volts.
- B. Provide all labor, materials, and equipment as necessary to complete all work as indicated on the drawings, and as specified herein.
- C. Related Sections:
 - 1. Division 01 - General Requirements
 - 2. Applicable sections of Division 26 - Electrical

PART 2 – PRODUCTS

2.01 GENERAL INFORMATION

- A. All boxes, brackets, bolts, clamps, etc., shall be galvanized or electro-galvanized.
- B. All hardware used outdoors shall be hot dipped galvanized.

2.02 CONDUIT

- A. Rigid galvanized conduit shall be installed in poured concrete slabs, walls and partitions. Rigid or I.M.C. shall be installed in damp locations and inaccessible places.
- B. All rigid conduit, I.M.C. and E.M.T. shall be hot dipped galvanized or electro-galvanized.
- C. E.M.T. may only be installed exposed, above suspended ceilings, or in partitions.
- D. Flexible steel conduit may be used for short runs to individual pieces of equipment.
- E. Flexible sheathed metallic conduit shall be used for runs less than 6' in length to individual pieces of equipment in mechanical rooms, penthouses, etc.
- F. MC Cable is permitted in existing walls where installation of EMT is not possible to devices
- G. No E.M.T. or aluminum conduit shall be used in concrete, direct burial or in corrosive locations.
- H. Aluminum conduit may only be used in sizes 1-1/2 inch and larger. No aluminum conduit will be permitted in concrete. When aluminum conduit is used, all bends shall be galvanized steel.
- I. Size and type of conduit shall comply with the National Electric Code. Where conduits are indicated on the drawing to be larger than required by Code, the larger conduit shall be used.
- J. Minimum conduit size shall be 3/4 inch in all runs.

2.03 PULL AND JUNCTION BOXES

- G. All pull boxes shall be galvanized sheet steel, sized as required, with thickness not less than no. 14 gauge.

2.04 OUTLET BOXES

- A. All outlets, except as otherwise specified, shall consist of approved galvanized steel boxes of pattern adapted to the special requirements of each outlet, securely fastened in place in an approved manner.

PART 3 – EXECUTION

3.01 CONDUIT

- A. Conduit shall be concealed in all new walls and run above suspended ceilings.

- B. Use Wiremold type metal raceway where necessary to run exposed on existing walls and/or ceilings in finished areas as shown on the drawings.
- C. All conduit shall be fastened or suspended from structural members, slabs, or walls only. It shall not be run on or fastened to tee bars of suspended lay-in ceilings.
- D. All conduit shall be supported by approved hangers at spaced per NEC.
- E. All exposed conduit shall be run parallel to the structural members of the building in a neat manner, securely fastened in place.
- F. When metal conduit extends below the bottom of a slab on the ground, the slab shall be thickened in the area of the conduit so as to encase the conduit in concrete by at least 2 inches on all sides. The responsibility for and expense of this work shall be borne by the Contractor.

3.02 OUTLET BOXES

- A. Recessed outlet boxes for single gang or 2-gang installations shall be 4" square with appropriate device ring or plaster ring for the required number of devices.
 - 1. All device rings and plaster rings shall be installed vertically unless instructed otherwise by the A/E or Owner.
 - 2. All plaster rings shall not extend past flush with wall surface or be recessed more than 1/4" from wall surface.
 - 3. For installations of more than two devices use the appropriate wall box for the number of devices required. If approved by the Owner the use of gangable wall boxes is allowed.
 - 4. For surface installations in Mechanical Area or similar locations 4" square boxes shall be used with 1/4" raised cover.

3.03 PULL AND JUNCTION BOXES

- A. Pull boxes shall not be installed in inaccessible locations.

END OF SECTION 26 05 33

SECTION 26 09 23 – LIGHTING CONTROLS

PART 1 – GENERAL

1.01 SCOPE

- A. The Contractor shall furnish and install a lighting control as specified and as shown on the contract drawings.

1.02 RELATED SECTIONS

- A. Section 26 05 00 Common Work Results for Electrical
- B. Section 26 05 19 Low Voltage Wire and Cable
- C. Section 26 05 33 Raceway and Boxes
- D. Section 26 51 00 Interior Lighting

1.03 SUBMITTALS -- FOR REVIEW/APPROVAL

- A. The following information shall be submitted to the Architect/Engineer and Owner
 - 1. Manufacturer's product cut-sheet
- B. Submit electronically in PDF format.

1.04 SUBMITTALS -- FOR INFORMATION

- A. When requested by the Engineer the following product information shall be submitted:
 - 1. Descriptive bulletins
 - 2. Product sheets.
- B. Submit electronically in PDF format.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

1.06 OPERATION AND MAINTENANCE MANUALS

- A. One (1) paper copy and one (1) USB flash Drive of the equipment operation and maintenance manuals shall be provided.
- B. Operation and maintenance manuals shall include the following information:
 - 1. Instruction books and/or leaflets
 - 2. Recommended renewal parts list
 - 3. Drawings and information required by section 1.06.

PART 2 – PRODUCTS

2.01 TIME CLOCK

- A. Manufacturers
 - 1. Paragon

2. Tork

B. Ratings

1. Like Paragon Model EC71st /120V Electronic Sun Tracker
2. 120-volt ac control voltage
3. Single Channel control
4. Contact Rating, 15 amp
5. NEMA 1 enclosure

2.02 PHOTOCONTROL

A. Manufacturers

1. Tork
2. Precision

B. Ratings

1. Weatherproof Lexan® housing
2. Photocell: 1 inch cadmium sulfide light sensitive element.
3. Turn on: 1 to 3 foot-candles. External light level slide allows field adjustment between 3 to 10 foot-candles.
4. Turn on / turn off ratio 1:3
5. Minimum 15 second time delay.
6. Single-pole, single-throw switch. Contact position at night normally closed.
7. Temperature Range -40 to 158 degree F
8. ½"-14 threaded stem.

2.03 LIGHTING CONTACTOR

A. Manufacturers

1. ASCO
2. Cutler Hammer
3. Square D

B. Ratings

1. 30 amp minimum
2. Number of poles as required
3. Control/coil voltage 120 volt
4. Electrical held
5. Installed in NEMA 1 enclosure or as required for location.

2.04 OCCUPANCY SENSORS

A. Wall Mounted

1. Wall Mounted occupancy sensors shall be a multi-technology (Ultrasonic & PIR) wall switch that turns lights on and off based upon occupancy and ambient light levels. Type 2 sensors shall contain two separate relays and manual override controls for dual level switching of light fixture. Sensors shall have built-in light level sensor, adjustable time delays, zero crossing switching, and smart technology. Provide necessary device box. Type 1 sensors shall be Hubbell Building Automation #LHMTS1 or pre-approved equal. Type 2 sensors shall be Hubbell Building Automation #LHMTD2 or pre-approved equal. Color of devices shall be as selected by owner but generally shall match color of wiring devices.

B. Ceiling Mounted

1. Ceiling Mounted occupancy sensors, indicated by OS on plans, shall be a multi-technology (ultrasonic & PIR) sensor that turns lights on and off based upon occupancy. Sensor shall have adjustable time delays, zero crossing switching, and smart technology. Provide necessary back-box. Sensor shall be Hubbell Building Automation #OMNIDT2000 or pre-approved equal.

C. Power Packs and Relays

1. The power packs shall provide both the 24VDC power supply to operate sensors as well as the 20-amp line voltage relay to control the load. Power pack shall be mounted to a junction box located above accessible ceiling. Housing shall be plenum rated. Power packs shall be Hubbell Building Automation #UVPP Universal Voltage Power Pack, or pre-approved equal.

2.05 WALL BOX DIMMERS

- A. Wall box dimmers shall be Leviton Renoir II series or approved equal.
- B. Shall be compatible with light fixture/driver and shall be capable of multi-location applications.

2.06 COMBINATION WALL BOX DIMMER AND OCCUPANCY SENSOR

- A. Wall box device providing both digital PIR occupancy sensor and 0-10V dimming shall be Hubbell LHD MIRS-3 series or approved equal.
- B. 3 buttons provide on/off, raise and lower light levels.

2.07 ELECTRONIC WALL BOX TIMERS

- A. Timer shall be like Hubbell DT300 or Legrand TS-400
 1. Multiple timer intervals
 2. Energy code presets for Title 24, IECC, and ASHRAE 90.1
 3. Visual and audio turnoff warning
 4. 3 Way and Multiple Way Switching
 5. No Neutral Required
 6. No Load Requirement
- B. Do not use in unconditioned spaces where temperature may fall below 30 degrees F.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. The Contractors shall install all equipment per the manufacturer's recommendations and the contract drawings.
- B. Protect the equipment from damage and keep clean and dry during construction.
- C. **Installation of in wall switch replacement occupancy sensors must be approved by the Owner.**
- D. Install power packs above accessible ceilings and locate near door to room. If space has no ceiling, install power pack within a minimum 4" square junction box and locate near the door to the room, as neatly as possible. Coordinate with manufacturer.

END OF SECTION 26 09 23

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SECTION 26 24 16 - PANELBOARDS

PART 1 – GENERAL

1.01 SCOPE

- A. The Contractor shall furnish and install the panelboards as specified and as shown on the contract drawings.

1.02 RELATED SECTIONS

- A. Section 26 09 23 – Lighting Control System
- B. Section 26 43 13 – Transient Voltage Surge Suppression

1.03 REFERENCES

- A. The panelboards and all components shall be designed, manufactured and tested in accordance with the latest applicable standards of NEMA and UL as follows:
 - 1. UL 67 – Panelboards
 - 2. UL 50 – Cabinets and boxes
 - 3. NEMA PB1
 - 4. Fed. Spec. W-P-115C
 - 5. Circuit breaker – Type I class I
 - 6. Fusible switch – Type II class I.

1.04 SUBMITTALS – FOR REVIEW/APPROVAL

- A. The following information shall be submitted to the Engineer:
 - 1. Breaker layout drawing with dimensions indicated and nameplate designation
 - 2. Component list
 - 3. Conduit entry/exit locations
 - 4. Assembly ratings including:
 - a. Short-circuit rating
 - b. Voltage
 - c. Continuous current
 - 5. Cable terminal sizes
 - 6. Product data sheets.

1.05 SUBMITTALS – FOR CONSTRUCTION

- A. The following information shall be submitted for record purposes:
 - 1. Final as-built drawings and information for items listed in paragraph 1.04
 - 2. Installation information
 - 3. Seismic certification and equipment anchorage details.

- B. The final (as-built) drawings shall include the same drawings as the construction drawings and shall incorporate all changes made during the manufacturing process.

1.06 QUALIFICATIONS

- A. The manufacturer of the panelboard shall be the manufacturer of the major components within the assembly, including circuit breakers and fusible switches.
- B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.
- C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
- D. The equipment and major components shall be suitable for and certified to meet all applicable seismic requirements of Uniform Building Code (UBC) for zone 4 application. Guidelines for the installation consistent with these requirements shall be provided by the switchgear manufacturer and be based upon testing of representative equipment. The test response spectrum shall be based upon a 5% minimum damping factor, UBC: a peak of 2.15g's (3.2–11 Hz), and a ZPA of 0.86g's applied at the base of the equipment. The tests shall fully envelop this response spectrum for all equipment natural frequencies up to at least 35 Hz.
- E. The following minimum mounting and installation guidelines shall be met, unless specifically modified by the above referenced standards.
 - 1. The Contractor shall provide equipment anchorage details, coordinated with the equipment mounting provision, prepared and stamped by a licensed civil engineer in the state. Mounting recommendations shall be provided by the manufacturer based upon approved shake table tests used to verify the seismic design of the equipment.
 - 2. The equipment manufacturer shall certify that the equipment can withstand, that is, function following the seismic event, including both vertical and lateral required response spectra as specified in above codes.
 - 3. The equipment manufacturer shall document the requirements necessary for proper seismic mounting of the equipment. Seismic qualification shall be considered achieved when the capability of the equipment, meets or exceeds the specified response spectra.

1.07 REGULATORY REQUIREMENTS

- A. The panelboards shall be UL labeled.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

1.09 OPERATION AND MAINTENANCE MANUALS

- A. Equipment operation and maintenance manuals shall be provided with each assembly shipped and shall include instruction leaflets, instruction bulletins and renewal parts lists where applicable, for the complete assembly and each major component.
- B. Submit electronically in PDF format

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Cutler-Hammer
- B. Square D
- C. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.

2.02 RATINGS

- A. Panelboards rated 240V AC or less shall have short-circuit ratings as shown on the drawings or as herein scheduled, but not less than 22,000 amperes RMS symmetrical.
- B. Panelboards rated 480V AC shall have short-circuit ratings as shown on the drawings or as herein scheduled, but not less than 65,000 amperes RMS symmetrical.
- C. Panelboards shall be labeled with a UL short-circuit rating. When series ratings are applied with integral or remote upstream devices, a label or manual shall be provided. It shall state the conditions of the UL series ratings including:
 - 1. Size and type of upstream device
 - 2. Branch devices that can be used
 - 3. UL series short-circuit rating.

2.03 CONSTRUCTION

- A. Interiors shall be completely factory assembled devices. They shall be designed such that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors.
- B. Trims for branch circuit panelboards shall be supplied with a hinged door over all circuit breaker handles. Doors in panelboard trims shall not uncover any live parts. Doors shall have a semi flush cylinder lock and catch assembly. Doors over 48 inches in height shall have auxiliary fasteners.
- C. Distribution panelboard trims shall cover all live parts. Switching device handles shall be accessible.
- D. Surface trims shall be same height and width as box. Flush trims shall overlap the box by 3/4 of an inch on all sides.
- E. A directory card with a clear plastic cover shall be supplied and mounted on the inside of each door.
- F. All locks shall be keyed alike.

2.04 BUS

- A. Main bus bars shall be copper sized in accordance with UL standards to limit temperature rise on any current carrying part to a maximum of 65 degrees C above an ambient of 40 degrees C maximum.
- B. A system ground bus shall be included in all panels.

- C. Full-size (100%-rated) insulated neutral bars shall be included for panelboards shown with neutral. Bus bar taps for panels with single-pole branches shall be arranged for sequence phasing of the branch circuit devices. Neutral busing shall have a suitable lug for each outgoing feeder requiring a neutral connection. 200%-rated neutrals shall be supplied for panels designated on drawings with oversized neutral conductors.

2.05 BRANCH CIRCUIT PANELBOARDS

- A. The minimum short-circuit rating for branch circuit panelboards shall be as specified herein or as indicated on the drawings. Panelboards shall be fully rated. Panelboards shall be like Cutler-Hammer type Pow-R-Line 1a, Pow-R-Line 2a or Pow-R-Line 3a.
- B. Bolt-on type, heavy-duty, quick-make, quick-break, single- and multi-pole circuit breakers of the types specified herein, shall be provided for each circuit with toggle handles that indicate when unit has tripped.
- C. Circuit breakers shall be thermal-magnetic type with common type handle for all multiple pole circuit breakers. Circuit breakers shall be minimum 100-ampere frame and through 100-ampere trip sizes shall take up the same pole spacing. Circuit breakers shall be UL listed as type SWD for lighting circuits.
 - 1. Circuit breaker handle locks shall be provided for all circuits that supply exit signs, emergency lights, energy management, and control system (EMCS) panels and fire alarm panels.
- D. Circuit breakers shall have a minimum interrupting rating of 22,000 amperes symmetrical at 240 volts, and 42,000 amperes symmetrical at 480 volts, unless otherwise noted on the drawings.

2.06 DISTRIBUTION PANELBOARDS – CIRCUIT BREAKER TYPE

- A. Distribution panelboards with bolt-on devices contained therein shall have interrupting ratings as specified herein or indicated on the drawings. Panelboards shall be fully rated Panelboards and shall be like Cutler-Hammer type Pow-R Line 3a or Pow-R-Line 4B. Panelboards shall have molded case circuit breakers as indicated below.
- B. Where indicated, provide circuit breakers UL listed for application at 100% of their continuous ampere rating in their intended enclosure.
- C. Provide shunt trips, bell alarms, and auxiliary switches as shown on the contract drawings.

2.07 ENCLOSURE

- A. Enclosures shall be at least 20 inches wide made from galvanized steel. Provide minimum gutter space in accordance with the National Electrical Code. Where feeder cables supplying the mains of a panel are carried through its box to supply other electrical equipment, the box shall be sized to include the additional required wiring space. At least four interior mounting studs with adjustable nuts shall be provided.
- B. Enclosures shall be provided with blank ends.
- C. Where indicated on the drawings, branch circuit panelboards shall be column width type.

2.08 NAMEPLATES

- A. Provide an engraved nameplate for each panel section.
- B. Owner shall provide label information

2.09 FINISH

- A. Surfaces of the trim assembly shall be properly cleaned, primed, and a finish coat of gray ANSI 61 paint applied.

PART 3 – EXECUTION

3.01 FACTORY TESTING

- A. Standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of NEMA and UL standards.

3.02 INSTALLATION

- A. The Contractors shall install all equipment per the manufacturer's recommendations and the contract drawings.

3.03 QUALITY CONTROL

- A. Prior to energizing the Contractor shall:
 - 1. Torque all connections per the Manufacturer's recommendations.
 - 2. With a 1000 volt Megger test all phase and neutral bus for shorts and grounds.

END OF SECTION 26 24 16

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SECTION 26 27 26 – WIRING DEVICES

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. Types and locations of wiring devices are indicated by the Project drawings.
- B. Types of wiring devices in this section include the following
 - 1. Receptacles
 - 2. Switches
 - 3. Cover plates

1.02 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of wiring devices, whose products have been in satisfactory use in similar service for not less than five (5) years.
- B. Installers: Firm with at least five (5) years of successful installation experience with projects utilizing wiring device work similar to those required for this Project.
- C. NEC Compliance: Comply with NEC requirements as applicable to construction, installation and coding of wiring devices.
- D. UL Labels: Provide wiring devices that are UL listed and labeled.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Deliver wiring devices properly packaged in factory–fabricated type containers.
- B. Store wiring devices in a clean dry space. Protect products from weather, damaging fumes, construction debris and traffic.

PART 2 – PRODUCTS

2.01 GENERAL

- A. General use receptacles shall be heavy-duty 20-amp duplex 2 pole 3 wire grounding type.
- B. All switches shall be specification grade quiet switches, 120-277 volt 15 amp.
- C. Device colors shall be a selected by the Owner but generally all devices shall be white on painted walls and brown on wood walls unless for special application.
- D. Devices on emergency circuits shall be red.
- E. All exterior receptacles and any receptacle within six (6) feet of any water shall be GFCI.

2.02 MANUFACTURERS AND CATALOG NUMBERS

- A. Hubbell, legrand, Leviton and Pass & Seymour are the only acceptable manufacturers.
- B. The following is an approved list of receptacles by type (based on Hubbell).
 - 1. 20 amp duplex- # HBL5362 or approved equal
 - 2. 20 amp isolated ground- #IG5362 (orange) or approved equal
 - 3. 20 amp single- # HBL5461 or approved equal
 - 4. 20 amp duplex with two USB charging ports- # USB20X2 or approved equal

5. 20 amp GFCI - # GFR5362SG or approved equal
- C. The following is the approved list of switches by type 15 amp (based on Hubbell).
1. Single pole toggle switch-# HBL1201 or approved equal
 2. 2 pole toggle switch - # HBL1202 or approved equal
 3. 3 way toggle switch-# HBL1203 or approved equal
 4. 4 way toggle switch- # HBL1204 or approved equal
 5. Single pole key switch with key- # HBL1201L
 6. 2 pole key switch with key- # HBL1202L
 7. 3 way key switch with key- # HBL1203L
 8. 4 way key switch with key- # HBL1204L
 9. Maintained contact 3 position, 2 circuit, center off, single pole, double throw 20 amp- # HBL1385
 10. Momentary contact 3 position, 2 circuit, center off, 20 amp- # HBL1557
- D. All interior device cover plates are to be polycarbonate type (thermoset plastic not allowed), color to match device color unless otherwise noted.
- E. All exterior device cover plates shall be weatherproof type unless otherwise noted.

PART 3 - EXECUTION

3.01 INSTALLATION OF WIRING DEVICES

- A. General: Install wiring devices as indicated, in compliance with applicable requirements of NEC, NEMA, UL and NECA's "Standard of Installations", and in accordance with recognized industry practices.
- B. Install all wiring in approved boxes or enclosures.
- C. For vertically install receptacles with ground up and on horizontal receptacles the ground on the left.
- D. Verify proper orientation of all switches
- E. Cover plates must cover all openings around devices and boxes.
- F. All devices must be installed plumb with the surroundings
- G. All device cover plate screws slots shall be vertical.

END OF SECTION 26 27 26

SECTION 26 51 00 – INTERIOR LIGHTING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General, Supplementary, and Special Conditions apply to all lighting installations.
- B. Section 26 05 00 Common Work Results Electrical
- C. Section 26 05 33 Raceway and Boxes
- D. Section 26 05 19 Low Voltage Wiring
- E. Section 26 09 23 Lighting Controls

1.02 REQUIREMENTS OF WORK

- A. The Basic Electrical Requirements apply to all electrical materials, equipment, installations and services supplied under Dimmer package.
- B. The Electrical Contractor shall obtain a Bill of Materials from the Lighting Supplier(s) listed herein or proposed for substitution. The Bill of Materials shall be submitted with the Contractor's bid and shall include, but not limited to, the following.
 - 1. All lighting fixtures
 - 2. All fixture accessories
 - 3. Number, fixture type and luminaire type to be provided
- C. The Electrical Contractor (Sub-Contractor) and the Lighting Supplier(s) are responsible for the installation of a complete and operating lighting system in accordance with the intent of the Contract Documents.

1.03 SUBMITTALS

- A. The following items shall be submitted for approval prior to ordering.
 - 1. Lighting Fixtures
- B. All submittals shall be submitted electronically in PDF format

1.04 INSTALLER QUALIFICATIONS

- A. A firm with at least five (5) years of successful installation experience on projects with electrical works similar to this project.

PART 2 – PRODUCTS

2.01 LIGHTING FIXTURE MANUFACTURERS

2.02 FIXTURE SCHEDULE

- A. See fixture schedule on Drawings

PART 3 – EXECUTION

3.01 GENERAL

- A. All equipment shall be installed in a workmanlike manner and shall conform to industry Standards for this type on installation.
- B. All fixtures shall be plumb and square with ceilings and walls
- C. Support for fixtures in or on a grid type ceiling. Use grid for support.
 - 1. Install grid support wires on all four corners of each fixture.
 - 2. Install support wires or support chains, minimum of two, independent of the ceiling grid to each fixture not more than 6 inches from the corner on diagonally opposite corners of each fixture.
- D. Flange mounted fixture installation shall be per Manufacturer's instruction.

3.02 TESTING

- A. "Megger" all wiring prior to energizing.
- B. Test all switches and sensors for proper operation
- C. Verify proper operation of each fixture.
- D. Test each emergency fixture by interrupting the power to the fixture.

3.03 CLOSEOUT

- A. Prior to final acceptance and Project closeout the Contractor shall:
 - 1. Clean all fixtures and lenses inside and outside
 - 2. Replace any burned out lamps or LED arrays.

3.04 WARRANTY

- A. As Specified on each individual fixture listed herein.
- B. In lieu of a specific fixture warranty, all parts and labor on this Project shall be warranted for a period of one (1) year after start-up and Owner acceptance.

END OF SECTION 26 51 00

SECTION 27 00 00 - GENERAL REQUIREMENTS BY OWNER

Telecommunications Equipment Rooms - General:

1. All ER's and TR's shall have access doors from public spaces.
2. All telecommunications room floors are to be clean and sealed before data racks, patch panels, or other equipment is installed.
3. Room layout and equipment layout within racks shall be approved by Owner before any equipment is installed.
4. All ER's and TR's shall have **24/7/365 temperature and humidity control**. Typically this shall be a separate unit from building HVAC systems. Main data wiring center will typically have a 7,000 watt heat load from the data switch gear. This heat load needs to be considered in unit sizing. ER and TR HVAC units shall be capable of operation below zero degrees Fahrenheit external temperature.
5. No lines that do or may carry any liquid shall be installed in or pass through ER's and TR's.
6. No electrical switch gear shall be installed with any ER or TR.
7. ER's and TR's shall not be shared spaced used for any other purpose.
8. There shall be no less than 60 inches clearance between the back of any row of racks and the nearest wall or row of racks. There shall be no less than 42 inches clearance between the front of any row of racks and the nearest wall. There shall be no less than 42 inches clearance at the end of any row of racks on the end opposite the starting wall of the row. There shall be no less than 6 inches clearance between the start of any row of racks and the nearest wall. (this includes wire management)

Telecommunications and Networking Requirements -General:

1. There shall be a Cat6A outlet anywhere a wall mounted TV or video display is shown.
2. There shall be a Cat6A wall mounted telephone outlet at ADA height in each classroom, conference room, and lab specifically for an ENS (Emergency Notification System) phone. This is stand alone and separate from any general use telephone(s) in the room. Where appropriate these shall be installed near the teaching station or at the front of the room.
3. There shall be a wireless access point connection in the ceiling per 25 students in a given area such as classrooms, labs, etc. All wireless access point locations shall have one CAT6A connection. **In areas with high ceilings wireless access points shall be installed no higher than twelve feet above finished floor.** Wireless access point layout must be approved by Owner before installation.
4. There shall be a Cat6A wall mounted telephone jack installed at ADA height near the doorway in all mechanical rooms, electrical rooms, storage rooms, etc.
5. All jacks called out for Data and Voice shall be Electrical Ivory. Face plates shall also be Electrical Ivory unless contract specifies face plate color to be the same as electrical face plate color.
6. **Every space including hallways, restrooms, closets, stairwells, etc shall have a unique room number identifier.** Final room numbers shall be confirmed with the Owner before construction documents are issued. **Once construction begins room numbers shall not change.**
7. Please clarify any questions with Owner prior to bidding, construction, or installation.
8. Contractor shall maintain and provide to ISU a Microsoft Excel spreadsheet in electronic format of all connections installed with the following fields filled out. **NO DATA PORTS WILL BE ACTIVATED UNTIL THIS SHEET IS PROVIDED FULLY FILLED OUT TO OWNER:**
 - a. Room Number

- b. Jack Label
- c. Wire label
- d. IDF Room Number
- e. Rack Label for patch panel
- f. Patch Panel label
- g. Patch panel port
- h. Cable Length

Telecommunications and Networking Room -Architectural:

1. The (ER) minimum room size shall be 10' deep and 12' wide for the main equipment room.
2. The minimum size for a Telecommunications Room(s) (TR) shall be 10' deep and 8' wide.
3. The minimum ceiling height shall be 9 feet above finished floor (AFF).
4. To permit maximum flexibility and accessibility of cabling pathways, false ceilings are not permitted.
5. Walls SHALL extend to structural ceiling.
6. Ceiling, floor, and wall finish that minimizes dust shall be used.
7. Design ER/TRs to have fully opening (to 180 degrees recommended), lockable doors that are minimally 42 inch wide and 80 inches tall.
8. Door sills are not allowed because they impede the movement of equipment.
9. Removable center posts are permitted, if required.
10. Install doors to be removable.
11. Dust and Static Electricity; Avoid dust and static electricity by:
 - a. Installing tile instead of carpet.
 - b. Treating floors, walls, and ceiling to minimize dust.
12. Doors SHALL open outward.
13. Doors SHALL have locks with campus master "FM5" installed.

Telecommunications and Networking Rooms - Environmental Control:

Provide HVAC that will:

1. Maintain continuous and dedicated environmental control (**24 hours per day, 365 days per year.**)
2. If emergency power is available, consider connecting it to the HVAC system that serves the ER/TR.
3. Maintain positive pressure have have a minimum of one air change per hour in the ER/TR.
4. Dissipate the heat generated by active devices.
5. Provide 300ft cubed of 54 degrees conditioned air per 20 ampere (A) dedicated electrical outlet.
6. The temperature range should be 64 degrees to 75 degrees.
7. The humidity range should be 30% to 55% relative humidity.
8. Keep changes in temperature and humidity to a minimum.
9. ERs/TRs should be calculated using 7500 BTU/HR from communications equipment.

Fire Protection

1. If sprinkler heads are provided, install wire cages to prevent accidental operation.

2. For wet pipe systems, drainage troughs are required to protect equipment from any leakage that may occur.
3. To prevent water damage, consider using "dry pipe" sprinkler systems.

Lighting

1. Provide a minimum equivalent of 500 lux (50 footcandles) measured 3 feet AFF.
2. Coordinate closely with the rack/cabinet placements.
3. Locate light fixtures a minimum of 9 feet AFF.
4. Light fixtures SHALL be positioned to provide adequate light to front and rear of racks as well as backboards.
5. Emergency lighting is required. Place emergency lighting to ensure that the loss of power to normal lights will not hamper an emergency exit from the TR.
6. ER/TR shall not have motion and/or timer based lighting.ER/

Other Uses

1. ER/TRs should be dedicated to the telecommunications function and related support facilities. Equipment not related to the support of the ER/TRs (e.g. piping, duct work, and distribution of building power) should not be located in, or pass through, the ER/TR.
2. The ER/TR shall not be shared with building users or custodial services.

Power

1. On the wall at the end of each row of relay racks install two (2) 5-20 110vac outlets.
2. On the wall at the end of each row of relay racks install two (2) L6-30 208vac outlets per 224 data/voice outlets terminated in the relay racks. L6-30 208vac outlets are to be installed in pairs. One of each pair is to be on building commercial power. And one of each pair is to be on the building emergency generator power.
3. Make sure there are a minimum of two (2) quad 5-20 110vac outlets evenly spaced on each of the four walls.
4. All outlets in telecommunications rooms are to be on building emergency generator power except as noted in item #2 above.
5. All outlets must have labels indicating the circuit / breaker panel and if they are commercial or generator feed.
6. Consider providing emergency power to the ER/TR with automatic switchover capability.
7. Distribution panels that serve telecommunications equipment should be separate from those that serve lighting fixtures.
8. At least one electrical outlet shall be on normal power, and one electrical outlet shall be on emergency power.
9. Outlets requirements on backboards as well as racks/cabinets as shown on the enlarged floorplans.

Data Communications Equipment

1. Owner shall provide network electronics – Network Switches and Access Points.
2. Ceiling mount Access Point identification and installation.
 - a. All locations shall have labeling consistent with wall plate labeling specified in 27.11.16.0.

- b. Optimal mounting height is 8 to 12 feet in height from the floor. Exceptions need to be approved by the owner.
- c. Access points that mount to ceiling grid / drop ceilings shall have the label placed on the grid at the location of the terminated cable. 10' service loops only apply to these types.
- d. Access points that mount to hard ceilings will have a duplex box mounted flush with the ceiling and the network cable terminated and through the box. No wall plate is required. No extra service loop required.
- e. Access points that mount in open concept ceilings will have an appropriate conduit and box to mount the Access point to. Should the ceiling exceed 12' in height a conduit with a quad box shall be mounted and extended down from the structure to the desired height. The Box and Conduit can be painted as desired to match the decore. The final height of the should be even or slightly below any other hanging objects such as lights, ventilation etc. to offer optimal wireless coverage.
- f. All ceiling access points and necessary brackets will be provided by the owner and the contractor will hang the access points. Installation shall be in accordance with the designated location and methods required by the specific mounting type. Installation shall not occur until after the cable is tested / certified and while lifts and ladders are still available to mount the equipment.
- g. The contractor will add the cable labels to the face of each access point after mounting so that they are easily identifiable in addition to the labeling already provided by the owner.
- 3. Office Wall mount Access points identification and installation.
 - a. All locations shall have labeling consistant with wall plate labeling specified in 27 11 16 0.
 - b. All locations shall have a duplex wall box and have 2 network drops provided to the location. No wall plate is required.
 - c. All wall mount access points and necessary brackets will be provided by the owner and the contractor will mount the access points in accordance to the designated location and methods required by the specific mounting type, after the cable is tested / certified.
 - d. The acces point will have the first network drop connected to the Pass-Thru port and the second to the access point port.
 - e. The contractor will add the cable labels to top of the Access points after mounting so that they are easily identifiable in addition to the labeling already provided by the owner.
- 4. General area mount Access Point identification and installation.
 - a. All locations shall have labeling consistant with wall plate labeling specified in 27 11 16.0.
 - b. Optimal mounting height is 8 to 12 feet in height from the floor. Exceptions need to be approved by the owner.
 - c. All locations shall have a duplex wall box and have 1 network drop provided to the location. No wall plate is required.
 - d. All wall mount access points and necessary brackets will be provided by the owner and the contractor will mount the access points in accordance to the designated location and methods required by the specific mounting type, after the cable is tested / certified.
 - e. In some locations protective guards (plexiglass shields) may be required and will be provided by the owner to be installed by the contractor.

Voice Communications Equipment

- 1. Viking E-1600-65A phones shall be installed in all areas of refuge as designated by ISU Public Safety. These areas may include those such as elevator lobbies, stairwell access areas, etc. Owner shall confirm these locations prior to installation.

Requirements for ER/TR data commucation equipment Installation

1. The owner will not install the final set of equipment in an ER/TR until the following conditions are completed per the specifications. It will take 3 to 5 days to install and test equipment in each ER/TR once turned over.
 - a. HVAC is operational
 - b. All plywood and significant construction in the room is completed.
 - c. All copper terminations are completed, tested and labeled per the specifications.
 - d. Fiber uplinks to either the appropriated ER or Core networking location is terminated and tested.
 - e. All Power and lighting is installed, labeled and completed. Additionally the power will not be or minimally interrupted.
 - f. ER/TR is cleaned and floor is mopped and sealed.
 - g. ER/TR is lockable with final specified key.
2. Interim temporary switches can be installed for critical infrastructure like HVAC and similar systems. Equipment will be a small 8 port switch that will be mounted to the plywood covered wall. However the following must be met and 1 to 3 days are required to install and test equipment in each ER/TR as required.
 - a. Fiber or copper uplinks to either the appropriate ER or Core networking location is terminated and tested.
 - b. Plywood is mounted on the wall nearest the end of the rack row.
 - c. Power and lighting is installed and active.
 - d. ER/TR is lockable / secured during non-working hours.
3. Construction related infrastructure network activation requests must be directed to the owner project liaison for proper request processing. Typically HVAC, cameras and similar systems. They can only be completed when either option 1 or 2 above for "Requirements for ER/TR data communication equipment Installation" are completed.

Occupant / General Network Access

1. Once the final set of equipment is installed in the ER/TR and the access points are installed / mounted. The wireless should become active in 1 to 3 business days.
2. Network wired ports are activated on request of the occupant. The owner (user support consultant) will work to coordinate identifying and activating the necessary ports through the owner Help Desk system.
3. By default only one (1) network port will be activated per single person office as identified. Second port can be active on request with reasonable justification.
4. All activation requests, if not coordinated by the owner (user support consultant), must be directed through the owner Help Desk by the occupants.
5. Each building is assigned unique sets of IP addresses. Therefore all occupants moving between buildings will be required to re-register their wired devices for a new IP address before it will function.
6. Port activation SLA is typically 1 working day unless there are multiple activities occurring (i.e. start of the semester etc.) that may extend this delivery time. It will be on a first come first serve best effort process.
7. Occupants should plan to bring any existing network cables currently connected to their devices from their previous location. Should the occupant need a different length cable they can request one through the owners help desk. All office patch cables must be CAT5e or higher.
8. Network jack locations are designated in the construction plan. Should occupants disagree with the location and want to add an new jack they must:

- a. If the building has not been turned over and while the project is still under way, then they must work with the owner Facilities Management team and request a change order to the project with justification to have the additional network drop added or relocated.
- b. If the building has been turned over and the project is officially completed, then they must request any additional network jacks through the owner defined processes and are subject to installation fees per the owner specifications.

END OF SECTION 27 00 00

SECTION 27 00 10 - GENERAL REQUIREMENTS FOR COMMUNICATIONS

PART 1 GENERAL REQUIREMENTS

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. Supplementary to Division 1, Refer to Division 27 Section(s) for additive information where applicable.

1.2 SUMMARY

- A. The following items are additional requirements for Division 27 "Communications" Work.
- B. If after reviewing all documents and drawing there is any questions or doubt, or if a conflict or discrepancy is found between the documents and the drawings, contact the Owner in writing for clarification before proceeding. Clarification will be issued by Addendum.
- C. Each Item below has the Division 01 00 00 specification section number (in parenthesis) of the article where the base requirements are found. The additional requirements are to be considered additive to the Division 01 00 00 section and apply only to Division 27 work.
- D. Each Division 27 Specification Section may add additional requirements specific to that Section.

1.3 REQUIREMENTS

- A. (01 25 00 Substitution Procedures)
 - 1. Substitutions
 - a) All products provided as Work of this Project shall be in compliance with, and meet the physical, functional, and operational requirements of the products as outlined in Part II of each Division 27 specification Section.
 - b) Product Substitutions
 - 1) Substitution requests must be received by the Owner as required by Division 1.
 - 2) No substitutions will be accepted without prior approval. Only changes issued in an Addendum will be allowed.
 - 3) See Substitution Submission below.
 - c) Standard of Quality
 - 1) A Standard of Quality will be set by applying a Manufacturer and Catalog number to each item in Part II of each applicable specification section.
 - 2) A standard of quality item has the physical, functional, and operational attributes to provide the designed functionality.
 - 3) Additional approved manufacturer(s)
 - i) Listing as an additional approved manufacturer for an item is not an assurance that the manufacturer has products that meet the requirements; at minimum, the written description must be met along with any key attributes used in the Project design.
 - ii) When a listed "additional manufacturer" has a product that meets the written description and has the physical, functional, and operational attributes, that product may be used in place of the product that was listed as the standard of quality without submission for prior approval.
 - (A) If such a substitution is made, the requirements for items by the "same manufacturer" shall be adhered to.

- (1) Requirements for "system" type warranties requiring the same manufacturer or manufacturing "partnership" items for warranty application shall be adhered to.
 - (B) It will be the sole responsibility of the Contractor to provide adequate design compensation for fulfillment of the intent of the Specification for any change in Scope due to an "approved manufacturer's" product change from this Section (i.e., required rack space, box size, support requirements, etc.).
 - (1) Adequate compensation shall be determined by the Owner.
 - 4) Where 2 or more Manufacturers and Catalog numbers are listed, one of the two products must be utilized. Item listed first is Owner's preferred product.
- B. (01 25 13 Product Substitution Procedures)
 - 1. Substitution Submission
 - a) Each item submitted must meet the physical, functional, and operational attributes of the Standard of Quality item.
 - b) All requests for substitutions shall be accompanied by a complete system brochure and/or individual product data sheets.
 - 1) Contractor shall state a reason for the substitution request (i.e. familiarity, availability, functionality, Brand specific training, Manufacturer's warranty issue, etc.)
 - 2) Contractor shall provide comparison list of features, functions and specifications where proposed substitute product differs from specified product.
 - 3) Each request must reference the Specification Section number and paragraph and include a description of any deviation from the specified functional requirements of the equipment and/or system(s).
 - 4) A demonstration of the proposed equipment and/or system(s) may also be requested. This information must be submitted in compliance with Division 1 Section "Substitutions."
 - c) Failure to provide all information may result in the substitute product being rejected.
 - d) Owner reserves the right to reject any substitute.
 - 2. Substitution Responsibility
 - a) Contractor shall be responsible for all additional costs, both direct and indirect, including costs for additional equipment, materials and labor necessary to properly integrate a substitute product, including additional costs which may be incurred by other trades, the Owner, Architect or Owner. (i.e., required rack space, box size, support requirements, etc.).
- C. (01 26 13 Requests for Interpretation)
 - 1. Contradictions, discrepancies, or conflicts
 - a) This Contractor shall carefully study and compare the Contract Documents and shall at once report to the Authority as set forth in 01 31 00 "Project Management and Coordination" any error, inconsistency or omission discovered.
 - b) In the case of a contradiction, conflict, or discrepancy between Division 27 Sections and Divisions 0 and/or 1.
 - 1) Division 27 Specifications will be considered additive. It is not intended that Division 27 Sections supersede any legal or contractual requirements set forth in Division 0 or 1.
 - c) In the case of a contradiction, conflict, or discrepancy between T Series Drawings and/or Division 27 Specification Sections
 - 1) If during the Bid period the Contractor discovers a contradiction, discrepancy, or conflict of information on any Drawing, between any two drawings,

between Drawings and specification Sections, within any Division 27 Section, between related Sections, between individual parts of a Section, or within any part of any Section; the contradiction, discrepancy, or conflicting information shall be called to the attention of the Owner in writing and will be clarified by Addendum.

- 2) A contradiction, discrepancy, or conflict of information that has not been clarified in writing at Bid time will be considered to be the more costly of the available options.
- 3) If a contradiction, discrepancy, or conflict of information is discovered after award of Contract; the discrepancy or conflict will be submitted to the Owner in writing for evaluation. The result will be clarified by a Change Order. This Change Order will be of \$0 or will require a deduct to change the requirement to a less costly option if so decided by the Owner.
 - i) If Contractor performs any construction activity knowing it involves a recognized contradiction, discrepancy, or conflict in the contract documents without such notice to the Owner or Owner, the Contractor shall assume appropriate responsibility for such performance and shall bear an appropriate amount of the cost required for correction.

D. (01 31 13 Project Coordination)

1. Coordination

- a) Coordination shall commence immediately upon award of contract. Failure of this contractor in coordinating (including providing and extracting related information to and from other trades for review) in a timely manner, shall not result in any subsequent additional reimbursement, special allowances or additional construction time being made for any facet of the project. Work fabricated or installed before properly coordinating with all other trades shall be done at the Contractor's own risk.
- b) Sequence, coordinate, and integrate installations of communications materials and equipment with the Division 26 electrical contractor any all other applicable trades for efficient flow of the Work.
- c) The contract document drawings are an outline to indicate the approximate location and arrangement of required work. The drawings shall be followed as closely as possible in coordination and in execution of the work.
- d) This contractor shall work in harmony with all building contractors and sub-contractors, so as not to cause any delays in pouring concrete, building masonry walls, etc. This contractor shall consult the Architectural, Plumbing, HVAC and Structural plans in all instances before installing his work so that his work will not interfere with those branches.
- e) This contractor shall participate in coordination efforts and in preparation of coordination drawings prior to fabrication or installation of any equipment, materials, etc. Coordinate actual clearances of all installed equipment.
- f) Conflicts in equipment and materials shall be corrected prior to installation. Should there be a conflict with the drawings of other trades, this contractor shall work with the trades to correct the conflict while coordinating the project (prior to installation). If the conflict cannot be resolved, refer the matter to the owner's representative for a final decision as to method or material. This contractor shall refer to drawings of all other trades for details, dimensions and locations of other work and route their work so as not to conflict with any other branch. Any work installed or equipment placed in position by this contractor creating a conflict shall be readjusted to the satisfaction of the owner's representative at the expense of this contractor.
- g) Plans are diagrammatic indicating design intent and indicating required size, points of termination and, in some cases, suggested routes of raceways, etc. However, it is not intended that drawings indicate fully coordinated conduit routing, all

necessary offsets, etc. All cable assemblies, etc. shall be run as straight as possible and symmetrical (perpendicular to or parallel with) with architectural items and in a consistent elevation. Work installed diagonal to building members shall not be permitted.

- h) The Contractor shall coordinate his work with all other trades and locate equipment accordingly. This Contractor shall refer to coordination drawings of the other trades. Any communications work fabricated or installed before the above referenced coordination with all other trades shall be done at the respective contractors' risk.
 - i) It is intended that all apparatus be located symmetrical with architectural elements and shall be installed at exact height and locations as shown on architectural drawings. If a device height or location is in question it shall be the responsibility of this Contractor to immediately seek clarification from the Owner.
- E. (01 31 16 Multiple Contract Coordination)
- 1. Coordinate work with Division 26 Contractor (where applicable); prior to Division 26 Contractor's installation of outlet boxes, conduit, conduit stubs, raceways and any other provisions in support of Division 27 Contractor's work.
 - 2. Coordinate with all other Contractor's and the Owner, as applicable and necessary to ensure a clean, professional looking and operating systems.
- F. (01 31 19.16 Site Mobilization Meetings)
- 1. The Contractor shall fully inform himself regarding all peculiarities and limitations of space available for installation of all work and materials furnished and installed under the contract. He shall exercise due and particular caution to determine that all parts of his work are made quickly and easily accessible. Although the locations of equipment and conduit may be shown on the drawings in certain positions, the architectural details and conditions existing at the job site shall guide the Contractor, coordinating his work with that of others. Provide all offsets as required to provide a neat workmanlike arrangement
- G. (01 33 23 Shop Drawings, Product Data, and Samples)
- 1. Submittals required after Award of Contract but before starting Work include:
 - a) Complete BOM list
 - 1) BOM shall include the following information for each product:
 - b) Product Information Sheets "Datasheets": Include catalog information, sizing, and technical data on each item to be used on the Project.
 - 1) Each product datasheet must reference the specific paragraph for which the product is being submitted. Each product must be listed in the exact same order as it appears in the Section for which the products are being submitted.
 - i) Datasheets shall each include a clearly identifiable label applied in upper corner of each sheet that clearly references the specification section and drawing (as applicable) to which it applies. Labels shall be consistently affixed in the same location on all sheets unless the labels will obstruct pertinent technical information.
 - 2) All datasheets shall be original manufacture datasheets, first generation printed copies of manufacturer's electronic datasheet (i.e. printed copy of a PDF file), or high quality photocopy of original manufacturer's datasheets.
 - i) Fax versions of product datasheets or any photocopies thereof are not acceptable.
 - ii) Submit original printing or "clean" reproductions.
 - 3) Where datasheets depict multiple products, versions or options, the Contractor shall highlight (indicate with an arrow) all applicable model(s), version(s) and option(s) applying to the specific product the Contractor will be providing. Exact catalog number must be indicated. The submitted items must be from "approved materials" as specified in each Specification Section.

- 4) Product datasheets shall be "approved" by the Owner before delivery to the Project site. Any product not approved through the submittal process is at the sole risk of the Contractor.
 - i) A copy of "Approved" datasheets shall be included in O & M manual requirements
 - 5) Required Information
 - i) Complete Bill of Materials (BOM) List
 - (A) The manufacturer's name (Brand) and full model number shall be used. (Distributor and Contractor assigned names and model numbers are unacceptable).
 - ii) Manufacturer Product Datasheet for each product.
 - (A) Product datasheets shall be manufacturer originals, or first generation printed versions of manufacturer's official electronic product sheets.
 - (B) Manufacture model shall be highlighted on each sheet.
 - (C) Datasheets shall be organized to match the order and organization of this section
2. Submission Format
- a) Submit Shop Drawings and Product Data Sheets in a bound form
 - 1) Submittals shall be supplied in an appropriately sized 3-ring binder(s). Separate binders shall normally be used for each Division 27 Contract.
 - 2) Manuals shall be bound in hard cover, 3 ring binders with clear plastic "pocket" covers to insert Project Information on the exterior of the Binder.
 - 3) Maximum individual Binder spine size shall be 3"; utilize multiple binders as required.
 - b) Submittal Manuals shall include the information listed below and be assembled as follows:
 - 1) Binder shall be marked on the cover and spine with the following information
 - i) Project Information
 - (A) Title of Project
 - (B) Name and address of Owner, Contractor, Architect, Owner
 - (C) "Submittals for " (specification Section(s)
 - (D) Date of Submittal
 - 2) Organization
 - i) The binder is subdivided into specification sections.
 - ii) Each Binder shall be organized as follows
 - (A) Master Tab 1: Project and contact information
 - (B) Master Tab 2: (First) Specification Section
 - (1) Section 1: Title Page
 - (2) Specification section name & number
 - (3) Contractor/Subcontractor Information Including:
 - (4) Name, address and phone
 - (5) Project manager name and phone
 - (6) Section 2: Bill of Materials
 - (7) Section 3: Product Datasheets
 - (8) Section 4: 11 x 17 inch reduced scale versions of full size shop drawings. Drawings shall be folded, punched and inserted into the binder.
 - (C) Master Tab 3 through (x): Additional Specification Section(s)
 - (1) Repeat Sections 1-5 above for each Specification Section.
 - iii) Division 27 submittals may not be combined with submittals from any other Division.
 - 3) Full-size shop drawings shall be printed to scale and bound along the left edge of the drawings with the Title block on the right edge.

- 4) The Contractor shall provide a record of shop drawings using AutoCAD Release 2000 or higher.
 - i) Detail drawings may be submitted in Visio 2000 format.
 3. Submission
 - a) Provide minimum of (5) copies of all submittal items.
 - 1) Two copies of all Submittals will be retained by the Owner.
 - 2) Three copies will be returned.
 - i) One copy of approved Submittals will be required to prepare Record Drawing for the O&M (Owner's) Manual.
 - ii) One Copy for the Project site
 - iii) One Copy for the Contractor's records
 - 3) Provide additional quantities as may be required by other applicable sections (including Division 1), as requested by the Owner, and as required by the Contractor for its own purposes.
 - b) Timetable
 - 1) Contractor shall make all Submittal submissions as soon as practical after award of Contract.
 - 2) Provide submittals in adequate time so as not to negatively impact the completion of the project or the schedule of other trades.
 - i) Contractor shall allow a minimum of 2 weeks in its schedule for the Owner's review of submittals.
 4. Review of shop drawings does not relieve the Contractor of responsibility for correct ordering of material and equipment. Contractor review should ensure that equipment will fit in available space.
 - a) PARTIAL OR INCOMPLETE SUBMITTALS WILL BE REJECTED PRIOR TO FULL REVIEW.
 - b) Unacceptable submittal items:
 - 1) Fax copies of datasheets
 - 2) Datasheets that are not legible.
 - 3) Datasheets that do not clearly depict and/or enumerate all specification requirements.
 - 4) Non-manufacture datasheets (i.e. from a distributor)
 - 5) HTML web page printouts that are not the manufacturer's official product datasheet.
 - 6) Identification of products by Contractor or Distributor assigned part numbers, catalog numbers or private label brand names.
- H. (01 41 13 Codes)
1. Building Codes:
 - a) National Electrical Code (NFPA 70)
 - b) Life Safety Code (NFPA 101)
 - c) Uniform Building Code (Or adopted State Code)
 - d) Federal Communications Commission (FCC) Part 68
 - e) State specific agencies:
 - 1) Administrative Building Council
 - 2) State Board of Health
 - 3) State Fire Marshal
 - f) Local Codes (City, County, etc.)
 - g) Local Utility Company requirements
- I. (01 41 26 Permits)
1. Contractor shall obtain and pay for all permits or certificates of inspection and approval required for his branch of the work.

- a) Permits shall be posted in a prominent place at the building site properly protected from weather and physical damage.
- J. (01 42 16 Definitions)
 - 1. Wherever the words "Contractor", "This Contractor" or "Subcontractor" appears in Division 27 specifications, it shall refer to the Division 27 Communications Contractor (or Subcontractor of the Communications Contractor where applicable).
 - 2. A reference to Owner shall be referring to the Owner's Representative involved in the design of the System(s). The Owner may or may not be affiliated with the Architect and or Engineer for the Project. All information exchanged between the Contractor(s) and the Owner shall be within the information exchange process of the Project. (i.e. through a Construction Manager, General Contractor, Architectural Firm, etc.)
 - 3. Wherever the words "Designer", "Consultant" or "Engineer" appears in Division 27 specifications or its related drawings, it shall be interpreted to mean the specifying authority responsible for the creation of the Division 27 specifications and related drawings.
 - 4. Wherever the word "Install" appears on the drawings or in these Division 27 specifications it shall mean to supply all labor, tools and incidental materials necessary to handle, store, mount, terminate, program, configure and adjust product as necessary to fulfill project requirements.
 - 5. Wherever the word "Provide" appears on plan drawings or in Division 27 specifications, it shall be interpreted to mean that the Contractor shall "Furnish and Install", including all necessary accessories, miscellaneous materials and labor necessary to render the respective system fully operational.
 - 6. Wherever the word "Work" appears in Division 27 specifications or on communication technology drawings, it shall be interpreted to mean any and all labor, materials, accessories, services, etc. necessary to fulfill project requirements.
 - 7. Wherever the word "Furnish" appears on the drawings or in these Division 27 specifications it shall mean to supply the specified labor or specified product (context dependant), including all associated shipping, storage and warranty expenses.
 - 8. Wherever the words "Site", "Project Site", or "Premises" appears in Division 27 specifications or its related drawings, it shall be interpreted to mean all real estate, buildings and structures where work will be performed and where products will be installed and reside.
 - 9. Wherever the phrase "or Approved equal" appears in Division 27 specifications or its related drawings, the contractor shall interpret this to mean that pre-bid approval of specific models of equipment is required before submission of the Contractor's bid.
 - 10. Wherever the phrase "or Equal from", or "or Equal by" appears in Division 27 specifications or its related drawings, the Contractor shall interpret this to mean that the Contractor may supply any product manufactured by the given list of manufacturer's meeting or exceeding the overall quality, functional, technical performance, construction, finish and general fit and fitness as the "Standard of Quality" design product. The final authority as to whether a product is equal shall remain with the Owner. Pre-bid approval is highly recommended.
 - 11. Wherever the phrase "Additional Approved Manufacturer(s)" appears in Division 27 specifications or its related drawings, the Contractor shall interpret this to mean that the Contractor may supply any product manufactured by the given list of manufacturer's meeting or exceeding the overall quality, functional, technical performance, construction, finish and general fit and fitness as the basis of design product. The final authority as to whether a product is equal shall remain with the Owner.
 - 12. Wherever the phrase "Standard of Quality" appears in Division 27 specifications or its related drawings, the Contractor shall interpret this to mean that the listed Manufacturer

and Catalog number for each item has the physical, functional, and operational attributes to provide the designed functionality.

13. Substantial Completion:

- a) The point at which the following has been completed:
 - 1) All specified work, and;
 - 2) All punch-list items that affect the full and complete use of the system, and;
 - 3) Successful acceptance testing by the Owner, and;
 - 4) Successful inspection and demonstration of the work to the Owner's representative, and;
 - 5) Contractor's delivery of a request for "Letter of Substantial Completion"
 - i) The request shall include the Specification Section(s) completed, confirmation of completion of the items listed above, and the requested Substantial Completion date (no more than 7 calendar days prior to this Letter).
 - 6) Contractor has received a Letter of substantial Completion for the Owner.

14. Nominal Operating Levels: The standard signal voltage/power reference level which a manufacturer has designed its product's inputs and outputs to operate at to achieve the manufacturer's specified performance levels.

15. Wherever the words "This Division" appears in Division 27 specifications or its related drawings, it shall be interpreted to mean these Division 27 specifications and all of its related drawings.

16. Wherever the words "Low Voltage", or "Low-Voltage" appears in Division 27 specifications or its related drawings, it shall be interpreted to mean less than or equal to 70.7 volts, AC or DC.

17. Wherever the words "High Voltage", or "High-Voltage" appears in Division 27 specifications or its related drawings, it shall be interpreted to mean greater than 70.7 volts, AC or DC.

K. (01 43 00 Quality Assurance)

1. Quality Assurance

- a) Requirements
 - 1) Contractor shall have a minimum five (5) years experience in the installation of Communication Technology system(s) of similar size, type, scope and contract value.
 - 2) The Prime Contractor or his subcontractor responsible for this Section shall have a Registered Communications Distribution Designer (RCDD) on staff that will be ultimately responsible for this Project. The RCDD must have sufficient experience in this type project as to be able to lend adequate technical support to the field forces during installation, the warranty period, and any extended warranty periods or maintenance contracts. If in the opinion of the Owner, the RCDD does not possess adequate qualifications to support the Project, the Owner reserves the right to require the Contractor to assign an RCDD who, in the Owner's opinion, possesses the necessary skills and experience required of this Project.
 - 3) The lead technician(s) on the Project shall carry a current BICSI Technician Certificate or have five years of experience in projects of similar scope.
 - 4) The lead technician(s) on the Project shall have a thorough understanding of the following:
 - i) American National Standards Institute/Telecommunications Industry Association/Electronics Industry Association – ANSI/TIA/EIA 568B Commercial Building Telecommunications Cabling Standard.
 - ii) American National Standards Institute/Telecommunications Industry Association/Electronics Industry Association – ANSI/TIA/EIA 569A

- Commercial Building Standard for Telecommunications Pathways and spaces.
- iii) American National Standards Institute/Telecommunications Industry Association – ANSI/TIA/EIA 606 The Administrative Standard for the Telecommunications Infrastructure of Commercial Buildings.
 - iv) American National Standards Institute/Telecommunications Industry Association/Electronics Industry Association – ANSI/TIA/EIA 607 Commercial Building Grounding and Bonding Requirements for Telecommunications.
- 5) Contractor shall be a (factory trained) certified installer for all connectivity products.(cable and terminations).
- i) This minimum requirement shall apply to each Division 27 section independently. If Contractor is incapable of meeting the percent of product value requirement for each section, Contractor shall use a Subcontractor that can meet the percent of product value requirement, in whole, for all products and work of that section for which This Contractor is not qualified.
 - ii) The specific Contractor or Subcontractor meeting the requirements for a specific section shall be responsible for the supply of the products, supplemental engineering services and submittals as well as performing all technical labor associated with the installation, training and warranty servicing of work of that section.
- 6) Contractor shall have substantial business operations located within a 100 mile radius of the project site with a full-time employee staff actively engaged in the supply, installation and service of systems and equipment of the type and scope herein specified.
- 7) Contractor shall have full-time employee service staff based within a 100 mile radius of the project site.
- 8) Contractor shall provide any additional information requested by the Owner as determined appropriate by the Owner to validate a Contractor's (or its Subcontractor's) ability to perform and warranty the specified work in the quality, manner and time frame required.
- 9) In the absence of a requirement to provide a performance bond the Designer reserves the right to require a financial disclosure of the Contractor and any Subcontractor for the purpose of aiding the Designer in determining the ability of the Contractor or Subcontractor to perform.
- 10) Designer reserves the right to disqualify the use of any Subcontractor that This Contractor plans to use if the Subcontractor fails to meet the quality assurance requirements. Should this occur, This Contractor shall be required to choose another Subcontractor that does meet these quality assurance requirements.
- i) An equipment vendor not performing the technical labor associated with installation of the work of a given section shall not be considered a Subcontractor.
- 11) Superintendent/Project Manager
- i) This Contractor shall furnish the services of an experienced superintendent/Project Manager who shall be constantly in charge of the work, together with the qualified Foremen and specialists as required to properly install, connect, adjust, start, operate and test the work involved.
 - ii) The superintendent's/Project Manager's qualifications shall be subject to the review and acceptance by the Owner/Owner. Unless the Owner/Owner grants prior special permission, the same communication Superintendent/Project Manager shall be utilized

- throughout the duration of the project and be responsible for the complete scope of the Contract.
- b) Documentation to be submitted upon request pre or post bid for evaluation includes:
- 1) A complete material list by specification section for each specification section:
 - i) Include description, the manufacturer being used, and the manufacturer's part number.
 - ii) Submission of this list does not constitute acceptance by the Owner or relieve the Contractor from providing approved items in the proper quantities to fulfill the Scope of this Project.
 - 2) References:
 - i) A minimum of five reference accounts at which similar work, both in scope and design for each system specified, has been completed by the Contractor within the last four years.
 - (A) The list shall include contact names and telephone numbers for each.
 - (B) Each listed Project shall include a Summary of Work.
 - (C) Each listed Project shall include initial and final contract amounts.
 - (D) Each listed Project shall include initial Contract award date and completion date.
 - (E) Each listed Project shall identify the name of Contractor's project manager and lead technician responsible for the project.
 - 3) List of test equipment:
 - i) Proposed equipment for use in verifying the installed integrity of copper and fiber optic cable systems on this Project.
 - 4) Technical resume:
 - i) Provide experience of the Contractor's Superintendent/Project Manager and onsite installation supervisor (Foreman) who will be assigned to this Project.
 - 5) List of technical product training:
 - i) Training attended by the Contractor's personnel that will be working on this Project.
 - 6) Subcontractors list for Work of this Project.
 - i) List Scope of Work for each Subcontractor
 - ii) List References for each subcontractor
 - iii) Technical resume as described above for each subcontractor
 - iv) List of technical product training as described above for each subcontractor.
 - 7) Each specification section may detail additional Quality Assurance requirements in the PART I, Quality Assurance paragraph.
 - i) Submit each item identified in each Specification Section.
 - (A) Manufacturer Certification documentation as requested in each Section.
 - 8) Documentation substantiating the Contractor's factory authorization and warranty service status for all products specified and all other major products proposed for use by the Contractor.
 - 9) Financial Disclosure.
- c) Failure to supply a complete quality assurance submittal; failure to supply accurate references or references which yield favorable performance marks; or failure to supply other quality assurance information required shall be taken as a statement of the Contractor's inability to perform and shall be grounds for the Owner and/or Owner to reject the Contractor's bid.

L. (01 62 00 Product Options)

1. The contract documents are prepared on the basis of a single specific product as the "design equipment," even though other manufacturers' names and models may be listed as acceptable, or equal. The first manufacturer make and model for each product is the "design equipment" or "Standard of Quality".
 - a) This section is designed to provide the Contractor with a minimum standard of quality and functionality for the products used for telecommunications infrastructure.
 - b) This standard will be considered in force for the original response as well as for any additions or changes to this Project. Due to this, there may be items listed in the Products section that are not required under the scope of this contract.
 - c) Project design is based on the "Standard of Quality" listed products' physical, functional, and operational attributes. The use of any product not listed as the Standard of Quality must be compared for full functionality to the listed Product.
 - d) When several materials, products or items of equipment are specified by name for one use, the first item shall be considered Owner's preferred product. Contractor may select any one of those specified for requested approval. It shall be the responsibility of the Contractor to provide an item that meets or exceeds the qualities and functional characteristics of the device specifically listed by brand name and model number.
 - e) The Contractor is responsible for any other ancillary changes required to meet the Project objectives when utilizing substitutions. Approval of items submitted during the submittal process does not relieve the Contractor of this responsibility.
2. Product acceptability and substitutions are determined by criteria as required this section under "Substitutions".
3. Materials installed shall be new, full weight and of the best quality. All similar materials shall be of the same type and manufacturer. All materials, apparatus and equipment shall bear the Underwriter's Laboratory, Inc. label where regularly supplied, or required by Code.
4. In the event that a specified product is discontinued by the manufacturer and is no longer available for purchase, the Contractor shall provide replacement product of equal or greater value, performance and function. The replacement product shall be from the same manufacturer as the specified equipment unless written approval to use an alternate manufacture is obtained from the Owner.

M. (01 65 00 Product Delivery Requirements)

1. Product Procurement
 - a) The Contractor shall not procure, deliver or install any product until after the contractor's submittal has been reviewed by the Owner and the submittal has been returned to the Contractor's marked "No Exceptions", "Exceptions Noted" or "Exceptions Noted, Submit Record Copy" or "Approved". Advance procurement, delivery or installation of product prior to the return of submittal is entirely at the Contractor's own risk. Contractor should schedule its work and procurement accordingly.
 - b) Prior to procurement of any equipment or materials, Contractor shall review the model numbers, compatibility and interoperability of all products.
 - c) Prior to procurement, Contractor shall, through coordination with other trades and through field measurements and project site inspections, verify that products to be supplied can be physically installed as planned.
 - d) No claim for additional payment will be considered for the return of any equipment determined incompatible, or procured without adhering to the aforementioned conditions, including claim for reimbursement of manufacturer's "restock" fees.

- e) Contractor shall factor all of these conditions into its bid and plan its scheduling and resource needs accordingly to ensure that all work shall be performed according to the Owner's schedule and requirements of this contract.
- N. (01 66 00 Product Storage and Handling Requirements)
 - 1. Product Delivery, Storage and Handling
 - a) Receipt of materials
 - 1) The Contractor is responsible for receiving, handling, storing, and protecting all materials used on this Project until Substantial Completion.
 - b) Upon request, submit a schedule of equipment and materials required to complete installation, quantity ordered, order date, and promised delivery date.
 - c) Deliver equipment and materials in accordance with factory shipping requirements.
 - 1) Pack components in factory-fabricated protective containers.
 - 2) Units shall be delivered in sections of such size as will pass through available openings.
 - d) Until ready for installation, store products in original factory containers.
 - 1) Products shall be stored in a clean, dry space and as additionally recommended by the product manufacturer.
 - 2) Keep products out of the weather and away from construction traffic and debris, including drywall finish dust.
 - 3) Do not exceed structural capacity of the floor or platform on which the products are stored.
 - e) Until final acceptance of the system, protect all supplied products from damage resulting from moisture, fumes, dirt, dust and debris or any other source of potential damage.
 - f) Handle all products with care before, during and after installation so as to prevent damage.
 - 1) Replace any products damaged prior to final acceptance with new replacement products.
 - i) Replacement shall be done at not charge to the owner.
 - 2) Contractor is responsible for the safety and good condition of the materials and equipment installed until final acceptance by the Owner.
 - g) Save original product shipping containers and related packaging materials for major products until final acceptance.
 - 1) Prior to disposal, check with owner to determine if the owner wishes any of the packaging materials.
 - 2) Deliver specified packaging materials to the owner as requested.
- O. (01 71 00 Examination and Preparation)
 - 1. Examination of the Site
 - a) Contractor shall visit the Site to familiarize himself with the local conditions under which the work is to be performed and correlate his observations with the requirements of the Contract Documents. No allowance shall be made for claims for concealed conditions which the Contractor, in exercise or reasonable diligence in observations of the Site and review of the local conditions under which the work is to be performed, learned or should have learned of, unless otherwise specifically agreed by Owner and Owner in writing.
 - b) Before ordering any materials or doing any work, the Contractor shall verify all measurements and be responsible for correctness of same. No extra charge or compensation will be allowed for duplicate work or material required because of an unverified difference between an actual dimension and the measurement or size indicated in the drawings or specifications. Any discrepancies found shall be submitted in writing to the Project Manager and Owner for consideration before proceeding with the work.

- c) This Contractor must verify all dimensions locating the work and its relation to existing work, all existing conditions and their relation to the work and all man made obstructions and conditions, etc. affecting the completion and proper execution of the work as indicated in the Contract Documents.
- P. (01 73 19 Installation)
- 1. Work and workmanship
 - a) Provide all required labor, materials, equipment and Contractor's services necessary for complete installation of systems required to comply with the requirements of authorities having jurisdiction, as indicated on Drawings, and as specified.
 - b) Work shall be functional and complete in every detail, including any and all items required to complete the system, whether or not these items have been enumerated or shown on the Drawings.
 - c) Special attention shall be given to access to working and controlling parts. Adjustable parts shall be within easy reach. Removable parts shall have space for removal.
 - d) Each Contractor shall be fully knowledgeable of the details of all Work to be performed by other trades and take necessary steps to integrate and coordinate his Work with other trades.
 - e) Wherever tables or schedules show quantities of materials, they shall not be used as a final count. These figures serve only as a guide for the Contractor. Each Contractor shall be responsible for furnishing all materials on the Drawings or as specified.
 - f) The Consultant and Owner's Representative have full power to condemn or reject any Work, materials or equipment not in accordance with these Specifications and Construction Drawings or the manufacturer's specifications or drawings approved by the Owner or Consultant.
 - g) Work or equipment that is rejected shall be removed and replaced to the satisfaction of the Owner at the Contractor's expense. Work or equipment that is rejected shall be so stated in writing by the Owner or Consultant.
 - h) Such decisions that the Owner or Consultant may make with respect to questions concerning the quality, fitness of materials, equipment, and workmanship shall be binding upon the parties thereto.
 - i) All Work shall fully comply with these specifications and related Drawings and all manufacturers recommended installation practices.
 - j) All Work shall be performed with the best practices of the trade for performance, functionality, safety, endurance, and aesthetics.
 - k) Coordinate ordering and installation of all equipment with long lead times or having a major impact on work by other trades so as not to delay the job or impact the schedule.
 - l) Where mounting heights are not detailed or dimensioned, install systems, materials and equipment to provide the maximum headroom possible, as appropriate to the application.
 - m) Set all equipment to accurate line and grade, level all equipment and align all equipment components.
 - n) Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery of equipment and apparatus furnished into the premises. These items shall be removed from premises when no longer required.
 - o) No equipment shall be hidden or covered up prior to inspection by the owner's representative. All work that is determined to be unsatisfactory shall be corrected immediately.

- p) All work shall be installed level and plumb, parallel and perpendicular to other building systems and components.
 - q) Install all equipment and materials in strict accordance with manufacturer's written instructions. Bring any conflicts between the manufacturer's written instructions and these specifications to the attention of the Designer for recommendations.
 - r) Upon completion of installation of equipment and communication circuitry, energize circuitry and demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with re-testing.
- Q. (01 73 29 Cutting and Patching)
- 1. Where demolition of existing surfaces are required by the Work, the same shall be restored to at least as good a condition as they were before.
 - 2. Contractor shall be responsible for painting, patching, repairing and replacing any building surface, furnishing, wall/floor/ceiling covering that is damaged or penetrated in the process of performing work on the project site.
 - 3. Additional work required to repair work performed under this Contract shall be at the expense of This Contractor.
 - 4. The Division 27 contractor shall do all cutting as required for the admission of Division 27 work. Unless directed otherwise in field, provide all related patching and painting to match surrounding methods, materials and colors. Any damage done by this contractor to the building during the progress of this contractor's work shall be made good at this contractor's expense. Perform cutting, fitting, and patching and materials as required to:
 - a) Uncover Work to provide for installation of ill-timed Work.
 - b) Remove and replace defective Work.
 - c) Remove and replace Work not conforming to requirements of the Contract Documents.
 - d) Remove samples of installed Work as specified for testing.
 - e) Install equipment and materials in existing structures.
 - f) Upon written instructions from the owner's representative, uncover and restore work to provide for observation of concealed work by owner's representative or by inspection authority having jurisdiction.
 - g) During cutting and patching operations, protect adjacent installations (structure, finishes, furnishings, etc.). Where applicable, provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to system components and components of other trades.
 - h) Patch surfaces and building components using new materials matching existing materials and using experienced Installers. Refer to Division 1 for definition of experienced "Installer" or determine qualifications as directed in field by owner's representative.
 - i) Patching through fire rated walls and enclosures shall not diminish the rating of that wall or enclosure. All materials used for patching shall be installed to meet or exceed the smoke and fire rating of the respective surface being patched.
 - j) Neatly cut and drill all openings in walls and floors required for the installation. Secure approval of Owner's Representative before cutting and drilling in existing facilities. Neatly patch all openings cut.
 - k) Cutting and patching shall be held to a minimum by arranging with other contractors for all sleeves and openings before construction is started.
 - l) Provide factory-assembled watertight wall and floor seals, of types and sizes required; suitable for sealing around conduit, pipe, or tubing passing through concrete floors and walls. Construct seals with steel sleeves, malleable iron body,

neoprene sealing grommets and rings, metal pressure rings, pressure clamps, and cap screws.

- m) Pipe sleeves shall be fabricated from Schedule 40 rigid, heavy wall, full weight galvanized steel pipe; remove burrs. Use sleeves which are two standard sizes larger than conduit passing through respective sleeve.
 - n) Provide sleeve seals for piping which penetrates foundation walls below grade, exterior walls or roofs, caulk between sleeve and pipe with non-toxic, UL-classified caulking material to ensure watertight seal. Elsewhere modular provide mechanical type seals, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.
 - o) Install standard Schedule 40 black steel pipe sleeves two sizes larger than pipes passing through floors, bearing walls, fire walls and masonry construction. Sleeves through walls shall be cut flush with both faces. Sleeves through floor shall extend one inch above floor top elevation. Pipes penetrating roof shall use a pipe curb assembly equal to Pate Co. Furnish and set all forms required in masonry walls or foundation to accommodate pipes.
5. Grout
- a) Provide non-shrink, nonmetallic grout, premixed, factory-packaged, non-staining, non-corrosive, nongaseous grout, recommended for interior and exterior applications.
6. General Joint Sealer Application
- a) Joint sealers, joint fillers, and other related materials compatible with each other and with joint substrates under conditions of service and application.
 - b) Apply joint sealers under temperature and humidity conditions within the limits permitted by the joint sealer manufacturer. Do not apply joint sealers to wet substrates.
 - c) Clean all affected surfaces, joints, etc. immediately before applying joint sealers to comply with recommendations of joint sealer manufacturer.
 - d) Apply sealant primer to substrates as recommended by manufacturer. Protect adjacent areas from spillage and migration of sealant, using masking tape. Remove tape immediately after tooling without disturbing seal.
 - e) Comply with joint sealer manufacturers' printed application instructions applicable to products and applications indicated, except where more stringent requirements apply.
 - f) Comply with recommendations of ASTM C 962 for use of elastomeric joint sealers.
 - g) Comply with recommendations of ASTM C 790 for use of acrylic-emulsion joint sealants.
 - h) Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
 - i) Colors for exposed seals shall be as selected by the Owner's representative from manufacturer's standard colors.
7. Elastomeric Joint Sealers
- a) One-part, nonacid-curing, silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25, for uses in non-traffic areas for masonry, glass, aluminum, and other substrates recommended by the sealant manufacturer.
 - b) One-part, mildew-resistant, silicone sealant complying with ASTM C 920, Type S, Grade NS, Class 25, for uses in non-traffic areas for glass, aluminum, and

nonporous joint substrates; formulated with fungicide; intended for sealing interior joints with nonporous substrates; and subject to in-service exposure to conditions of high humidity and temperature extremes. Silicone Sealant shall be equal to the following:

- 1) "Dow Corning 790", Dow Corning Corp.
- 2) "Gesil N SCS 2600", General Electric Co.
- 3) A/D Fire Protection Systems.

8. Acrylic-Emulsion Sealants

- a) One-part, non-sag, mildew-resistant, paintable complying with ASTM C 834 recommended for exposed applications or interior and protected exterior locations involving joint movement of not more than plus or minimum 5 percent. Subject to compliance with requirements, provide one of the following:
 - 1) "Chem-Calk 600", Bostik Construction Products Div.
 - 2) "AC-20", Pecora Corp.
 - 3) "Sonolac", Sonneborn Building Products Div.
 - 4) "Tremco Acrylic Latex 834", Tremco, Inc.

R. (01 74 16 Site Maintenance)

1. During the progress of the work, the Contractor shall clean up after his men and leave the premises and all portions of the building in which he is working in a clean and safe condition. This cleaning shall occur on a daily basis.

S. (01 74 23 Final Cleaning)

1. Clean all parts of the apparatus and equipment. Exposed parts, which are to be painted, shall be cleaned of cement, plaster and other materials and all oil and grease spots shall be removed. Such surfaces shall be carefully wiped and all corners and cracks scraped out.

T. (01 77 16 Final Closeout Review)

1. Project Closeout

- a) Contractor shall meet all provisions of Substantial completion as defined earlier in this section and in each related section.
- b) Final Payment
 - 1) Final payment of contract will not be made until receipt, review and acceptance, by the owner's representative, of all of the following:
 - i) Substantial Completion
 - ii) Completion of all punch-list items.
 - iii) Approved submittals, including shop drawings;
 - iv) Owner's manuals;
 - v) Record documentation;
 - vi) Certification of warranty;
 - vii) Certificate of final acceptance signed by the Owner and the Owner;
 - viii) Copies of all training sign-in sheets, signed by owner's representative;
 - ix) Signed delivery receipt indicating that the owner has received all training recordings produced to-date;
 - x) All additional applicable closeout provisions of Division 1;
- c) 100% of all closeout documents shall be supplied within 30 calendar days following the substantial completion.

U. (01 77 19 Closeout Requirements)

1. Acceptance Testing

- a) Upon the Designer's receipt of and approval of the Contractor's pre-test submittal, the Contractor shall contract the Designer to schedule acceptance testing. Contractor shall allow not less than 10-business days of advance notice to the Owner.

- b) In the presence of the Owner, the Contractor shall demonstrate the presence of all specified products, cabling and installation methods. The Contractor shall demonstrate the operation of the system (and any requested sub-component thereof) and shall be prepared to make any electronic, physical or software related adjustments to the system or any of its sub-components to the satisfaction of the Owner, as required to achieve full compliance with the specifications.
 - c) The contractor shall have available at the project site all test equipment, cables, tools and personnel necessary to demonstrate full compliance with these specifications as determined necessary by the designer.
 - d) During the acceptance testing the Contractor shall have a clean and fresh copy of the contractor's most up-to-date as-built record documentation, printed to scale.
 - e) This Contractor shall provide all required labor services required to completely verify and test the systems in the presence of the Owner.
 - f) Verify that each system, as a whole system, meets these Specifications and complies with all applicable standards.
 - g) Rectify deficiencies indicated by tests and completely retest work affected by such deficiencies at Contractor's expense.
 - h) Should the Owner be required to return to the project site to perform acceptance testing more the once for any system the Contractor shall be responsible for all costs, up to \$1500 per day, plus travel and expenses, for each return trip to the project site. Payment of this may be required before final payment will be authorized.
2. Supplemental Engineering Services
- a) This Contractor is responsible for all supplemental engineering services specifically outlined in these specifications and otherwise required for the completion of the work specified. Contractor shall estimate its costs accordingly, taking into account all information provided.
 - b) In the event that the Owner is required to provide additional services as a result of Contractor's errors, omissions or failure to conform to the requirements of the Contract Documents, or if the Owner is required to examine and evaluate any changes proposed by the Contractor solely for the convenience of the Contractor, then the Owner's expenses in connection with such additional services shall be paid by the Contractor and may either be deducted from any monies owed to the Contractor, or billed to the contractor, entirely at the discretion of the Owner. The contractor shall be billed at prevailing hourly rates.
 - c) In the event that the Owner is required to provide additional services as a result of substitution of equivalent materials or equipment by the Contractor, or changes by the Contractor in dimension, weight, power requirements, etc., of the equipment and accessories furnished, or if the Owner is required to examine and evaluate any changes proposed by the Contractor for the convenience of the Contractor, then the Owner's expenses in connection with such additional services shall be paid by the Contractor. Costs will be calculated based upon the Owners prevailing rates.
- V. (01 78 13 Completion and Correction List)
- 1. Owner shall be furnished with a certificate of final inspection and approval prior to final acceptance of this branch of the work.
- W. (01 78 36 Warranties)
- 1. Warranty Period
 - a) Specified materials and workmanship provided shall be fully guaranteed by the Contractor for one year from the transfer of title via notice of substantial completion against any defects in materials or workmanship.

- i) Extended (additional) warranty(ies) may be required and will be identified in the individual Specification Section and will be considered additive to this base Contractor Warranty.
 - ii) Requirements for Manufacturer's Warranties, required by a Specification Section, shall run concurrent to this base Warranty by the Contractor but may exceed the Contractor's Warranty Period.
 - 2) Manufacturer's Warranties shall also begin on Substantial Completion; not on purchase of equipment or delivery of equipment to the site.
- b) The Warranty shall begin upon Substantial Completion.
 - 1) Note: Delivery of closeout documents is not a conditional requirement to commencement of the warranty.
- 2. This warranty shall in no manner cover equipment that has been damaged or rendered unserviceable due to negligence, misuse, acts of vandalism, or tampering by the Owner or anyone other than employees or agents of the Contractor.
 - a) The Contractor's obligation under its warranty is limited to the cost of repair of the warranted item or replacement thereof, at the Contractor's option.
 - b) Insurance covering said equipment from damage or loss is to be borne by the Contractor until full acceptance of equipment and services.
- 3. Individual specification sections may have additional warranty requirements for the work in that section. The warranty above will cover all materials and work where not covered by an extended warranty listed in the individual specification section.
- 4. Warranty Coverage
 - a) Specified materials and workmanship provided shall be fully guaranteed by the Contractor against any defects in materials or workmanship.
 - 1) Contractor shall provide a full "System Warranty" which shall cover all materials, labor and related product shipping expenses for a period of five years from the date of Owner acceptance.
 - i) Supplied products with manufacturer's warranties of less than the System Warranty term shall be extended by the Contractor for the full specified term
 - 2) During this period the Contractor will remedy (at no cost to the owner) any problem with the system, or any of its related components that is the result of defective materials, settings, workmanship, or loss or programming.
 - 3) Any defective items or work shall be removed and replaced at the Contractor's expense to the satisfaction of the owner's representative and the Owner.
 - 4) During the Warranty Period, the Contractor shall respond by phone within four (4) business hours of notice by the owner of a problem. Within (1) business day or (72) contiguous hours, which ever comes first, the Contractor shall have qualified personnel onsite to remedy the problem if the problem cannot be quickly be remedied over the phone.
 - i) The contractor shall make available to the owner on-call emergency response service labor to the Owner. Cost for emergency service labor during the warranty period shall not exceed the Contractor's published emergency service rates, or two-times its standard rate, whichever is lower.
 - 5) The period of the Contractor warranty(ies) for any items herein are not exclusive remedies, and the Owner has recourse to any warranties of additional Scope given by the Contractor to the Owner and all other remedies available by law or in equity.
 - 6) Additional Warranty requirements may be added by an individual Specification Section.

- i) Scope of these extended (additional) warranty(ies) will be identified in the individual Specification Section and will be considered additive to this base Contractor Warranty.
 - ii) Requirements for Manufacturer's Warranties, required by a Specification Section, shall run concurrent to this base Contractor Warranty by the Contractor.
 - (A) Manufacturer's Warranties shall also begin on Substantial Completion; not on purchase of equipment.
- X. (01 78 39 Project Record Documents)
 - 1. Project Record Document requirements for Division 27 "Communications" shall be described in Section 27 01 00 "Operation and Maintenance of Communications Systems".
- Y. (01 79 00 Demonstration and Training)
 - 1. Training
 - a) Proper operation in many cases is a function of adequate training of key users on new systems.
 - 1) Each Division 27 section may specify special Training requirements.
 - i) Training requirements will be for a quantity of hours, allow for multiple trips.
 - 2) If no special requirements are specified in the individual section, allow for 4 hours and 2 trips to provide basic overview, operation and maintenance information.
 - 3) Each Specification Section will indicate any training criteria specific to that Section.
 - 4) Train Owner's maintenance personnel on the procedures and schedules involved in operating, general troubleshooting, and preventative maintenance of the system.
 - 5) All training sessions shall be audio and video recorded. Recordings shall be supplied in DVD formats and playable on standard consumer grade reproduction equipment. Recordings do not need to be professionally edited but shall have intelligible audio and a clear image of the subject trainer and any supplemental visual content critical to the training.
 - 6) Recordings shall be turned over and signed for by an owner's representative at the end of each training session.
 - 7) Contractor shall require all attendees to sign-in for each training session. The sign-in form shall summarize the training to be conducted, specification section and subsection being trained on, as well as the starting time and duration of training. Following training, a representative of the owner shall sign the form, acknowledging the same. Contractor shall retain the original copy of these forms and turn over a photo copy of the form to the owner's representative as evidence of training. Training conducted without this official record of training shall not be considered as part of the Contractor's training obligation.
 - b) Schedule training with the Owner's representative, at least 14 days in advance.
 - c) Contractor shall assume training will be conducted in a minimum of (2) separate sessions, on non-contiguous days and will require separate trips to the project site, and should be bid accordingly.
 - d) Owner shall have the right to use its allocated training for a period of 365 calendar days following acceptance of the system.

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SECTION 27 01 00 - OPERATION AND MAINTENANCE OF COMMUNICATIONS SYSTEMS

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. Supplementary to Division 1, Refer to Division 27 Section(s) for additive information where applicable.

1.2 SUMMARY

- A. Section Includes:
 - 1. Basic materials, methods and installation guidelines applicable to the installation of all communication systems.
 - a) This Section is a "Common Work Results" Section that includes information that is applicable and "Related" to all Division 27 Sections.
- B. Related Sections
 - 1. All Division 27 Sections.
- C. Related Drawings
 - 1. All Technology (T-Series) Drawings

1.3 RECORD DOCUMENTS FOR COMMUNICATIONS SYSTEMS

- A. The Operations and Maintenance Manual (Owner's Manual) paragraph below details the basic information required to be documented.
- B. Each specification section will detail applicable additional Record Document requirements in the PART I, Submittals paragraph under Close-out documentation.
 - 1. All Record Document information, except for full size floor plans and detail drawings, will be placed in the appropriate location in the Operations and Maintenance Manual described below.
 - 2. Full sized drawing sheets shall be supplied in triplicate and on electronic media.

1.4 OPERATIONS AND MAINTENANCE MANUALS (OWNER'S MANUAL)

- A. Prepare Operations and Maintenance Manuals in accordance with Division 1 Section "Maintenance and Operation." In addition to the requirements specified in Division 1, provide additional information as detailed in each Section and include the following information for equipment items:
 - 1. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions, regulation, control stopping, shutdown, and emergency instructions.
 - 2. Equipment Maintenance Manuals indicating routine preventative maintenance and troubleshooting, disassembly, repair, and reassembly, aligning and adjusting instructions.
- B. Schedule:
 - 1. A review copy of the O&M Manual shall be submitted to the Owner within 2 weeks of substantial completion of the Project.
 - 2. The corrected reproductions of the Manual shall be submitted within 2 weeks of the return of the review copy by the Owner.
- C. Construction

1. Manuals shall be bound in hard cover, 3 ring binder(s) with clear plastic "pocket" covers to insert Project Information on the exterior of the Binder.
2. Maximum individual Binder spine size shall be 3"; utilize multiple binders as required.
- D. Operations and Maintenance Manuals shall include the information listed below and be assembled as follows:
 1. Binder shall be marked on the cover and spine with the following information
 - a) Project Information
 - 1) Title of Project
 - 2) Name and address of Owner, Contractor, and Architect/Engineer
 - 3) Completion date of Project
 - b) Contents of Binder
 2. Section 1:
 - a) Index
 - 1) Provide additional information if multiple binders are utilized.
 3. Section 2 through x (Provide one (1) Tabbed Section for each Specification Section).
 - a) Each Specification Section Tab shall include the following information:
 - 1) Sub Tab 1
 - i) Specification Section Identification
 - 2) Sub Tab 2
 - i) Warranty Information
 - ii) Copy of "Substantial Completion" Document establishing warranty period.
 - iii) Punch List Final Inspection certificate
 - 3) Sub Tab 3
 - i) A listing of all materials and equipment that was submitted for approval shall be bound into this manual separated into individual sections (by the Division 27 Section number) for each system.
 - ii) A List of Drawings included as attachments to the O & M Manual.
 - (A) Full Size drawings shall be submitted with the Manual and a index including sheet Title and Number be placed in this Tab
 - 4) Sub Tab 4
 - i) A copy of the Shop Drawings "Product Information Sheets" for each item required to perform Work as specified
 - (A) Include a copy of the "stamped" and "approved" Product Information Sheets for each product utilized on the Project.
 - 5) Sub Tab 5
 - i) Manufacturer provided information (As Applicable)
 - (A) Installation instructions published by the manufacturer
 - (B) Operating instructions published by the manufacturer
 - (C) Maintenance Manuals furnished with the equipment
 - (1) Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and re-assembly; aligning and adjusting instructions.
 - (2) Parts list pertaining to that equipment
 - (D) Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
 - (E) Manufacturer's printed operating procedures including start-up, break-in, normal operating instructions, regulation, control, stopping, shutdown, and emergency instructions.

- (F) Emergency operating instructions or a list of service organizations (including addresses and telephone numbers) capable of servicing various parts of the system.
- 6) Sub Tab 6
 - i) Test reports (as applicable)
 - (A) Infrastructure
 - (1) Copper Backbone tests
 - (2) Fiber Optic Backbone Tests
 - (3) Horizontal cable tests
 - (B) Systems
 - (1) As required by the individual Specification Section
 - ii) Summary test reports shall be placed in the O & M manual.
 - (A) Provide an electronic copy (CD-ROM) of all test results
 - (1) Provide "Reader" software on the disk.
 - (B) Provide a single copy of each detailed test.
 - (1) Tests shall be placed in (a) binder(s) in the same order as submitted on the summary reports.
 - (2) Submit with final "Approved" O & M Manual submission.
- 7) Sub Tab 7
 - i) Items listed in individual Division 27 sections and as previously described in the Record Documents paragraph. (Additional Tabs to separate Section(s) requirements.

E. Distribution:

- 1. Provide one review copy for Consultant approval prior to reproduction.
 - a) Consultant will review, correct or approve, and return.
- 2. Provide (5) copies of the complete (corrected) manual.
 - a) Include one printed copy of test results as detailed above.
 - b) Provide 5 copies of all attachments (drawings; electronic test reports, etc.).

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

- A. Record Documents (A.K.A. AS-BUILTS)
 - 1. Shall be prepared as outlined above.
 - 2. Record actual site specific information
 - a) Make arrangements for providing two complete sets of communication prints which shall be used to provide record drawings which shall be separate, clean, prints reserved for the purpose of showing a complete picture of the work as actually installed (including routing of all conduit and cables).
 - b) Drawings shall serve as work progress report sheets and the Contractor shall make any notations, neat and legible thereon daily as work proceeds. The drawings shall be available for inspection at all times and shall be kept at the job at a location designated by the owner's representative.
 - c) Maintain the clean, undamaged set of prints of Contract Drawings as well as a set of submittal drawings and coordination drawings where applicable. Mark the sets to show the actual installation where the installation varies from the Contract Documents as originally shown. Record drawings shall include locations of underground and concealed items if placed other than shown on the Contract Documents. Do not permanently conceal any construction until this required information is recorded. Mark which drawing is most capable of showing conditions fully and accurately. Where shop drawings are used, record a cross-

reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

- d) Record documents shall show changes in: size, type, capacity, etc., of material device or piece of equipment, location of device or piece of equipment; location of outlet or source of building service systems; routing of piping, conduit, or other building services. These drawings shall also record location of concealed equipment, communication service work, conduits and other piping/work by indication of measured dimensions to each line from readily identifiable and accessible walls or corners of building. Indicate all approved substitutions, contract modifications, and actual equipment and materials installed.
- e) Record documents shall include a detail diagram of all mounting devices and method of rigging those devices to the structure. Record documents shall include plan view drawings indicating cable paths, cable types identified, device identification, riser diagrams, system block diagrams and rack layouts. System block diagrams shall indicate device selection and location in signal flow schematically. Contractor shall provide legend defining all devices and symbols used.
- f) For communication work installed below slabs, pavements, grade, etc., these drawings shall also record location of nearby concealed water piping, sewers, wastes, vents, ducts, conduit and other piping, etc. by indication of measured dimensions to each line from readily identifiable and accessible walls or corners of building and from adjacent communication work. Show inverted elevation of underground communication work relative to work installed by other trades.
- g) Upon substantial completion of the work make arrangements for obtaining a complete set of CAD computer files for the project. All information from the print record drawings shall be neatly drafted/digitized (using pre-established layering system) into the applicable CAD drawing. Neatly erase and redraft work as required to reflect the work as actually installed. Perform drafting in a manner in which all work shall be shown in its actual locations, existing as well as new, by erasing inaccurate locations and redrawing proper routing/locations. This applies for all concealed work as well as work visible. All work shall be performed using AutoCAD Release 2000 or more recent release of AutoCAD.
- h) Affix near the title block on each drawing of the set of record drawing prints the Contractor's Company Names, signature of Contractors' Representative and current date. Deliver one set of prints to the Designer. Deliver the second set of prints, the original reproducibles, the CAD computer files and the marked-up field prints to the architect.
- i) All prints shall be signed and dated by the General Contractor, This Contractor and applicable Subcontractor.
- j) In addition to the above, provide "as-built" record documentation for shop drawings (and coordination drawings where applicable).

END OF SECTION 27 01 00

SECTION 27 05 01 - BASIC MATERIALS AND METHODS FOR COMMUNICATIONS

PART 1 MATERIALS AND METHODS

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. Supplementary to Division 1, Refer to Division 27 Section(s) for additive information where applicable.

1.2 SUMMARY

- A. Section Includes:
 - 1. Basic materials, methods and installation guidelines applicable to the installation of all communication systems.
 - a) This Section is a "Common Work Results" Section that includes information that is applicable and "Related" to all Division 27 Sections.
- B. Related Sections
 - 1. All Division 27 Sections.
- C. Related Drawings
 - 1. All Technology (T-Series) Drawings

1.3 QUALITY ASSURANCE

- A. Welding
 - 1. Welding shall be performed by persons licensed by the authority having jurisdiction where the work is performed. This shall apply to all work which is routinely regulated by said authority.
- B. High Voltage Wiring
 - 1. High voltage wiring and connections shall be performed by persons licensed by the authority having jurisdiction where the work is performed. This shall apply to all work which is routinely regulated by same authority.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 RELATED OPERATIONS

- A. Welding
 - 1. Onsite welding, where it is necessary, shall not be performed without the express written consent of the owner's representative. All project specifications governing welding shall apply, regardless of whether said specifications are referenced within the Division 27 specifications.
- B. High Voltage Wiring
 - 1. Review all high voltage provisions for This Contractor's work with the Division 16 electrical contractor. Coordinate specific device termination, loading and circuiting requirements with the electrical contractor.

3.2 INSTALLATION OF COMMUNICATIONS SYSTEMS

- A. General

1. All work installed in finished areas shall be concealed. All work installed in unfinished areas may be exposed at the discretion of the Owner's representative.
2. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings. Any exceptions to be approved by Owner.
3. Install equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations.
4. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
5. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
6. Verify all dimensions by field measurements. Take measurements and be responsible for exact size and locations of all openings required for the installation of work. Figured dimensions are reasonably accurate and should govern in setting out work. Where detailed method of installation is not indicated or where variations exist between described work and approved practice, direction of the owner's representative on job shall be followed.
7. The symbols used to indicate the purpose of which the various outlets are intended are identified in the Legend.
8. If during construction it becomes apparent that certain minor changes in layout will affect a neater job or better arrangement, such alterations shall be made as part of the contract. Owner's review shall be obtained before making such changes.
9. Workmanship throughout shall conform to the standards of best practice. Marks, dents or finish scratches will not be permitted on any exposed materials, fixtures or fittings. Inside of panels and equipment boxes shall be left clean.
10. Use caution not to exceed the allowed bending radius for respective cables and not to compromise the integrity of the cables during installation by pulling cable management devices too tightly, damaging cables, etc. Raceway/Cabling bending radii shall be minimum as directed by cable manufacturer. Use pulling compound or lubricant, where necessary; compound must not deteriorate conductor or insulation.

B. Cable

1. General

- a) Provide color-coded jackets to identify runs of different systems.
 - 1) See related specifications and drawings for applicable color coding.
- b) Neatly route cables parallel, perpendicular and plumb to building architectural lines.
- c) **Neatly comb out multiple cable bundled runs to remove tangling and crossing of cables within the bundles. Neatly dress all cable work and provide vertical and horizontal cable management** (or other approved method) for properly dressing all work at racks, control panels, backboards etc. See detail(s) if applicable.
 - 1) To avoid Alien Crosstalk, do not cinch UTP cables into tight bundles.
- d) Plenum-rated hook and loop one-inch-wide tape shall be used wherever wire ties are permitted and wherever plenum rated cable is used.
- e) Plenum-rated hook and loop one-inch-wide tape shall never be used in a manner that causes deformation of the cable jacket, damage to the cable, or has any adverse affect on the usability, specifications or longevity of the cable(s) on which it is applied.
- f) Plenum-rated hook and loop one-inch-wide tape (Velcro) type wire ties shall be used in plenum spaces; in equipment racks; in rack cabinets, and; in related equipment housing enclosures.

2. Support

- a) All cables shall be supported/anchored every 5 feet (or less) and within 12" of device boxes, outlets, racks/cabinets and cable tray.
- b) Use J-Hook type cable supports for all cables run outside of conduit or cable tray. Bridle rings shall not be used for Communications Technology cables.
- c) Use separate J-Hook cable support systems for cables belonging to different systems and for cables carrying different operating levels. See Cable Separation guidelines in this section.
- d) Loosely secure cables at each J-Hook.
- e) Cables shall not be directly or indirectly supported by a suspended ceiling or any other surface, support, material or structure not permissible for this use by all applicable codes and standards.
- f) Cable trays or messenger strand positioning
 - 1) Used to route cables in hallways
 - 2) Each must have a minimum twelve inches (12") vertical clear space above the top of the cable tray or messenger strand, and a minimum six inches (6") clear space below and on each side of the cable tray or messenger strand.

3. Cable Separation

- a) Cables carrying signals of different nominal operating level shall be kept separated to reduce the risk of undesirable cross-talk interference between cables.
 - 1) As a general rule, for each 25dB of nominal level voltage difference between cables, Contractor shall provide an additional 6 inches of physical separation between the cables. For example: cables with a 25dB voltage difference shall be separated by at least 18 inches. As the difference increases the distance shall increase proportionally.
 - 2) This guideline shall be used to govern the separation of low voltage Communications Technology cabling from AC power circuits as well. For example: A Microphone line running parallel to a 480v power line shall be separated by nearly 27-30 inches.
 - 3) Provide greater separation than this guideline where the contractor believes and/or determines it is necessary to prevent or remedy interference between cables.
- b) Keep length of parallel runs to a minimum. Cross cables of different nominal levels at 90 degrees.
- c) Provide additional separation as necessary to prevent and remedy any crosstalk which:
 - 1) Adversely affects the performance and usability of the system, or;
 - 2) Exceeds specific crosstalk performance specified in individual specifications.
- d) Contractor shall take all precautions necessary to keep low-voltage cable away from sources of EMI and RF interference. Where close proximity is absolutely necessary to satisfactory appearance, performance or installation of the Work, provide all necessary shielding necessary to ensure that ingress interference is minimal and has no negative impact of the Work.

4. Cable Termination

- a) The cables terminating at a device outlet shall be left not less than 10 inches to facilitate installation and servicing of devices. Longer working lengths shall be provided as appropriate to the application.
- b) All termination types shall correctly match the cable and device termination point. Connectors of the appropriate type, size, color and rating shall be used to match with the mating equipment

- c) Tools as recommended by each specific connector manufacturer shall be used in attachment of all connectors.
- d) Spade connectors.
 - 1) Spade type connectors shall be used on cable ends where screw-type terminal connectors are used.
 - i) All spade connectors shall be insulated. Provide heat shrink type insulation where solder-type or non-insulated spade connectors are used.
 - 2) Spade connectors used shall be rated by the manufacturer for the gauge, insulation, type and stranding of the cable to which it is applied. Spade connectors shall be sized to exactly match the stud size and spacing of mating termination connector.
 - 3) Tools as recommended by the specific connector manufacturer shall be used in attachment of the connector to the cable.
 - 4) When spade connectors are the required to be used for audio circuits operating at $\leq +8\text{dBv}$ nominal, solder type spade connectors only shall be permitted.
 - 5) No more than two spade connectors shall be permitted under a single terminal. Fewer should be used when recommended by the specific manufacturer's equipment or connector.
- e) Wire Nuts
 - 1) Wire nuts shall not be used in any audio circuit, except when necessary, in the following:
 - i) 25 Voltage Constant-Voltage loudspeaker circuits.
 - ii) 70 Voltage Constant-Voltage loudspeaker circuits.
 - 2) Wire nuts shall not be used in any data or voice communications or remote-control circuit.
 - 3) Wire nuts shall not be used in any circuit which radiates RF energy.
 - 4) Contractor must advise and gain prior approval of the Owner for any circuit which the Contractor desires to use wirenuts as the means of termination.
- f) Drain Wires, Non-insulated Ground Wires and Shields
 - 1) Drain or non-insulated ground conductors shall be insulated with appropriately sized heat-shrinkable insulated sleeving immediately upon exit from the jacket of the cable. Contractor shall use GREEN colored sleeving unless otherwise necessary to resolve specific color-coding conflicts on a given cable. This methodology shall apply to ALL methods of termination, including inline connectors, device plates, direct equipment terminations etc... Sleeving shall be applied to twisted and braided shields once the internal conductors have been combed out or otherwise removed from the center of the shield.
 - 2) Wherever a cable contains a non-insulated conductor within a jacketed cable, the conductors, as they exit the manufacturer's jacket, shall have a piece of heat shrinkable sleeving applied equally over the jacket and the exposed insulated conductors. The length of this sleeving shall be 1" for all cable diameters of .250" or less. For cables diameters larger than .250" the length of the sleeving shall be approximately equal to 4 times the diameter of the cable jacket. Note: This added sleeving is recommended but not mandatory when cable termination occurs fully within the confines of a fully insulated and strain relieved connector. Black shall be used unless otherwise necessary for specific cosmetic or cable identification purposes.
 - 3) A heat-gun of the appropriate temperature, size, type and rating for shrinking the tubing shall be used as recommended by the manufacturer of the sleeving used. Open flame (i.e. matches, cigarette lighters, torches) and direct metal conduction (i.e. soldering iron) methods to shrink the sleeving

- shall not be permitted. Sleeving which is burnt or otherwise marred shall be removed and replaced.
- 4) There shall not be any non-insulated exposed conductors within a device backbox, junction box, or equipment rack/cabinet.
- g) Unused Conductors
 - 1) Unused conductors shall not be "clipped" or removed from any jacketed cable. Conductors which are not required or used at the end of a jacketed cable shall be kept intact. Conductors shall be fully insulated from one and other to prevent shorts which could occur at either end of the cable. Conductor ends shall also be insulated to prevent shorts to other conductive materials which could come in contact with the conductor.
 - 2) Unused conductors shall be kept the same length as the longest conductor of the cable being used.
 - h) Cable and Conductor Nicks
 - 1) Attention shall be paid to the proper preparation of all cables and all conductors of these cables. There shall not be nicks to cable jackets, conductor insulation, or the conductors themselves.
 - 2) Special attention should be paid to nicked conductors. Should a conductor be nicked during preparation or termination the cable shall be reworked/replaced to remove the nick.
 - i) Cut, Disconnected, or Not Terminated Cables
 - 1) Any voice, data, or coaxial cable that is cut, disconnected, or not terminated at both ends shall be completely removed end to end. Any labels at either end shall be erased. Record drawings shall reflect the removal of these cables.

END OF SECTION 27 05 01

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SECTION 27 05 28 - PATHWAYS FOR COMMUNICATIONS SYSTEMS

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. Supplementary to Division 1, Refer to Division 27 Section(s) for additive information where applicable.

1.2 SUMMARY

- A. Section Includes:
 - 1. This Section includes requirements and minimum standards for:
 - a) Raceways
 - b) Fittings
 - c) Boxes
 - d) Penetrations
 - e) Pathway accessories
 - 2. This Section is a "Common Work Results" Section that includes information that is applicable and "Related" to all Division 27 Sections.
 - 3. This Section requires the addition of basic items, not specified elsewhere, to the installation of pathways.
 - a) Add the following to the pathways:
 - 1) Provide a pull rope in each installed pathway and leave a pull rope in the pathway after the cabling is installed.
 - 2) Provide proper identification, labeling, and documentation of key pathway locations and components.
 - 3) All pathways designed for fiber optic cables will require an innerduct for the installation of the fiber optic cable unless interlocking armored cable construction is utilized.
 - 4) Provide cable spillways where cabling will drop out of sleeve(s), unsupported for more than six inches:
- B. Related Sections
 - 1. All Division 27 Sections
- C. Related Drawings
 - 1. Technology (T-Series) Drawings

1.3 REFERENCES

- A. ANSI/TIA/EIA-569-B – Commercial Building Standard for Telecommunications Pathways and Spaces.
- B. ANSI/TIA/EIA-606-A – The Administrative Standard for the Telecommunications Infrastructure of Commercial Building.
- C. "TELECOMMUNICATIONS DISTRIBUTION METHODS MANUAL" published by the Building Industry Consulting Services International (BISCI).

1.4 GENERAL INFORMATION

- A. NFPA Compliance:
 - 1. Comply with NFPA 70 "National Electrical Code" for components and installation.
- B. Coordinate layout and installation of raceway and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

- C. UL Compliance:
 - 1. Cable tray shall be UL certified.
 - 2. Sleeves shall be UL listed assemblies.
- D. All Work shall fully comply with these Specifications and related Drawings and all manufacturers' recommended installation practices.

1.5 SYSTEM DESCRIPTION / DESCRIPTION OF WORK

- A. The work covered by this Specification Section includes any and all requirements for this type work required for proper installation of work specified in each related Division 27 Specification Section and/or as shown on the Drawings.
 - 1. This Specification Section is a Materials and Methods Section for Division 27. All requirements herein are required by each related Section and will be enforced for each related Section.
 - 2. Pathways for Communications are to be provided to create a re-usable pathway for Communications cables.

1.6 SUBMITTALS

- A. General
 - 1. Product Data and Shop Drawing submittals for work of this section shall be SUBMITTED TOGETHER, complete, as a single submittal. Product Data and Shop Drawings are not to be submitted separately.
 - 2. Samples shall be submitted with or immediately following submission of Product Data submittals.
- B. Items to be submitted for approval prior to commencement of work:
 - 1. Product Data
 - a) Manufacturer datasheets for all items
 - 1) Data sheets shall include
 - i) Manufacturer name
 - ii) Manufacturer model number (as it appears on manufacturer's product data sheet)
 - iii) Manufacturer product description
 - iv) Paragraph number of this section where the product is specified.
 - v) Picture or Drawing of item

PART 2 PRODUCTS

2.1 PRODUCT STANDARDS

- A. General
 - 1. Part II is designed to provide the Contractor with a minimum standard of quality and functionality for the products used for telecommunications infrastructure.
 - a) This standard will be considered in force for the original response as well as for any additions or changes to this Project. Due to this, there may be items listed in the "Products" section that are not required under the Scope of this Contract.

2.2 RACEWAYS

- A. Conduits
 - 1. Rigid steel conduit:
 - a) Threaded rigid steel conduit shall be manufactured from mild steel, zinc galvanized both inside and outside including threads. It shall be constructed in accordance with ANSI C80.1, Federal Specification WW-C-581; UL listed.
 - 2. Intermediate metallic conduit:

- a) Threaded intermediate metallic conduit shall be manufactured from mild steel, zinc galvanized both inside and outside including threads. It shall be constructed in accordance with ANSI C80.6, Federal Specification WW-C-581; UL listed.
- 3. Electric metallic tubing:
 - a) Electric metallic tubing shall be manufactured from mild steel, zinc galvanized both inside and outside. It shall be constructed in accordance with ANSI C80.2, Federal Specification WW-C-563; UL listed.
- 4. Flexible metallic conduit:
 - a) Flexible metallic conduit with neoprene jacket shall be spirally wound steel, strip zinc galvanized both inside and outside, integral ground conductor.
 - 1) Unless otherwise indicated, flexible metallic conduit provided for telecommunications cabling can only be provided as a pathway from the telecommunications outlet box to the ceiling space above and cannot exceed 6 meters.
- 5. Non-metallic raceways
 - a) Polyvinylchloride (PVC):
 - 1) PVC conduit shall be virgin C300 type, Schedule 40 or 80 (90° C). It shall be constructed in accordance with NEMA TC2 and Federal Specifications W-C-1094A.
- B. Surface raceways:
 - 1. Single compartment raceway:
 - a) Single compartment electrical ivory raceway as indicated, surface mounted base with cover.
 - 1) Provide appropriate elbows (Panduit RAFC10IW-X), tees (Panduit TFC10IW-X), entrance end fitting (Panduit DCEFXIW-X), etc. to follow wall layout.
 - 2) Standard of quality shall be Panduit Panway LDP-10IW8-A.
 - 3) Additional approved manufacturers: Wiremold, Hubbell
 - 2. Large Single compartment raceway:
 - a) Single compartment electrical ivory raceway as indicated, two piece surface mounted with snap on cover.
 - 1) Provide appropriate elbows, tees, entrance end fitting, etc. to follow wall layout. Provide wire T45WR-X retainers at a minimum of every three feet and as necessary to contain cabling.
 - 2) Standard of quality shall be Panduit Panway T-45.
 - i) Additional approved manufacturers: Wiremold, Hubbell
 - 3. Two compartment raceway:
 - a) Dual channel electrical ivory raceway as shown on the Drawings, two-piece surface mounted with snap on cover, compartment for power, and compartment for data.
 - 1) Provide appropriate elbows, tees, entrance end fittings, etc. as recommended by the manufacturer.
 - 2) Standard of quality shall be Panduit Panway Twin-70.
 - i) Additional approved manufacturers: Wiremold, Hubbell
- C. Telecommunications/power poles:
 - 1. Construction:
 - a) Two compartment.
 - b) 10 foot – 5 inch height and 2 ½ inches x 2 5/16 inch overall width.
 - c) Removable covers.
 - 2. Provide mounting hardware, entrance end fitting, and ceiling trim plate.
 - 3. Standard of quality shall be Panduit Pan-pole.
 - a) Additional approved manufacturer: Wiremold, Hubbell

D. Cable tray:

1. Wall Mounted

- a) Provide cable tray sized and located as indicated on the Drawings.
- b) Cable tray shall comply with NEMA 8B, 12B, or 12C. Cable tray and all fittings and accessories shall effect a complete structural system in the form of a rigid mechanical tray of compatible material and design, functional to support all cabling.
- c) Provide aluminum, rectangular tube, center spine with rungs perpendicular to the spine and spaced 6 inches on center.
- d) Prefabricated structure consisting of a longitudinal rail with transversely connected members (rungs) that project from one side; single or double tiered; aluminum alloy.
- e) Provide gray-colored manufacturer's rung caps on all rungs.
- f) Sections to be joined by bolted splice connectors.
- g) 4 inches overall depth per tier, 6 inches rung spacing.
- h) Rung ends shall be factory bent upward to a height as indicated on the Drawings.
- i) The rungs shall be positioned at the side of the spine at the top such that the spine is not part of the cable laying area (for example see Mono-Systems "top rung" cable tray).
- j) Provide all manufacturer recommended fittings and accessories for a complete and functional system as indicated.
 - 1) Accessories: Provide crosses, tees, angles, wyes, drops, rises, etc., and other accessories required for the installation specified.
- k) Standard of quality shall be Mono Systems 6114-0323 and 9114-0323.
 - 1) Approved manufacturers include: Allied Support Systems, B-Line.

2. Center Hung

- a) Provide cable tray sized and located as indicated on the Drawings.
- b) Cable tray shall comply with NEMA 8B, 12B, or 12C. Cable tray and all fittings and accessories shall effect a complete structural system in the form of a rigid mechanical tray of compatible material and design, functional to support all cabling.
- c) Provide aluminum, rectangular tube, center spine with rungs perpendicular to the spine and spaced 6 inches on center.
- d) Prefabricated structure consisting of a longitudinal rail with transversely connected members (rungs) that project from both sides; aluminum alloy.
- e) Provide gray-colored manufacturer's rung caps on all rungs.
- f) Sections to be joined by bolted splice connectors.
- g) 4 inches overall depth per tier, 6 inches rung spacing.
- h) Rung ends shall be factory bent upward to a height as indicated on the Drawings.
- i) The rungs shall be positioned at the side of the spine at the top such that the spine is not part of the cable laying area (for example see Mono-Systems "top rung" cable tray).
- j) Provide all manufacturer recommended fittings and accessories for a complete and functional system as indicated.
 - 1) Accessories: Provide crosses, tees, angles, wyes, drops, rises, etc., and other accessories required for the installation specified.
 - 2) Provide waterfall fittings in every location that cable is designed to exit the tray downward at the end of a run or between the rungs.
 - 3) Support with threaded rod and U-channel supports systems (See Accessories, Supporting Devices – Field Fabricated)
- k) Standard of quality shall be Mono Systems .
 - 1) Additional approved manufacturers include: Allied Support Systems, B-Line.

E. Telecommunications cabling support: Where necessary, provide additional cable support to create a re-usable pathway for Communications cables:

1. General

- a) Primary pathways are those supporting the cabling infrastructure from the Equipment Rooms/Telecommunications Rooms through the corridors and chases to the secondary pathways.
- b) Secondary pathways are those supporting the cabling infrastructure from the primary pathway to telecommunications outlets.
- c) Cable supporting devices manufactured with small round surfaces (i.e. bridal rings) are not acceptable.

2. Primary pathways

a) Messenger Strand

- 1) Anchors shall be securely mounted to building structure at each end.
- 2) Tensioners shall be installed to connect strand.
- 3) Additional supports shall be installed with threaded rod from the deck above to support the strand approximately 6-8" above suspended ceiling in all locations.
 - i) Support with threaded rod and U-channel supports systems (See Accessories, Supporting Devices – Field Fabricated)
 - ii) Properly sized.
 - (A) Multiples of strands (100 horizontal cables each) appropriate to handle the required cable quantities plus 25% spare capacity.
 - (B) Separate strand for Backbone cables.
 - iii) Provide minimum 1/4" steel strand with applicable hardware.

b) Open top cable supports

- 1) Plenum rated
- 2) Complies with UL, cUL, NEC, and ANSI/TIA/EIA requirements for structured cabling systems.
- 3) Shall be mounted to building structure or suspended by threaded rod from the deck above approximately 6-12" above suspended ceiling.
 - i) Support with threaded rod and U-channel supports systems (See Accessories, Supporting Devices – Field Fabricated)
 - ii) Properly sized.
 - (A) Multiples of J-Hooks (80 cables each) appropriate to handle the required cable quantities plus 25% spare capacity.
 - (B) Multiples of J-Hooks (300 cables each) appropriate to handle the required cable quantities plus 25% spare capacity.
 - iii) Provide Erico CAT32/CAT64 or approved equal for all primary pathway cable support.
 - iv) Additional approved manufacturers: B-Line, Panduit

3. Secondary pathways (those extending from the primary pathways to the space above the telecommunications outlets).

- a) J-hooks with galvanized finish to provide smooth surface and corrosion resistance.
- b) Complies with UL, cUL, NEC, and ANSI/TIA/EIA requirements for structured cabling systems.
- c) Accommodates up to 16 horizontal UTP cables.
- d) Shall be mounted to building structure or suspended by threaded rod from the deck above approximately 6-12" above suspended ceiling.
 - 1) Support with threaded rod and U-channel supports systems (See Accessories, Supporting Devices – Field Fabricated)
- e) Standard of Quality shall be Erico CAT12xx/CAT21xx
 - 1) Additional approved manufacturer(s): B-Line, Panduit

4. Small Secondary pathways
 - a) Mounting for up to ten 4 pair UTP cables may be supported from ceiling grid support wires (at least every 5').
 - b) Standard of quality shall be Erico CAT12TS
 - 1) Additional approved manufacturer(s): B-line, Panduit

2.3 FITTINGS

- A. Rigid steel or intermediate metallic conduit:
 1. Fittings shall be threaded zinc galvanized steel.
 2. At least one bushing shall be grounding type
 - a) Equipped with a ground lug
 - b) Provide on each conduit or sleeve where surface extends below ceiling line.
- B. Electric metallic tubing:
 1. Fittings shall be compression type.
 2. At least one bushing shall be grounding type
 - a) Equipped with a ground lug
 - b) Provide on each conduit or sleeve where surface extends below ceiling line.
- C. Flexible metallic conduit:
 1. Fittings shall be suitable for the specific application.
 2. Use oil-tight fittings with neoprene jacketed flexible metallic conduit.
- D. Non-metallic conduit:
 1. Fittings shall be of the same type and manufacturer as the raceway, connected in accordance with manufacturer's written instructions.
- E. Expansion:
 1. Expansion fittings shall be of a type suitable for the particular condition and shall be complete with bonding jumper.

2.4 BOXES

- A. Box Eliminator devices
 1. Standard outlet size brackets that securely clamp to drywall.
 2. Available in single and dual gang sizes.
 3. Standard of quality shall be Caddy by Erico MP-1
 - a) Additional approved manufacturer(s):
- B. Floor Boxes
 1. Shall be utilize only with prior Owner approval
 2. FSR type boxes; see Division 26 specifications for exact sizing.
 3. Separate Telecommunications and Electrical compartments.
 4. A minimum of two 1" conduits or a 1 1/4" conduit for Communications cables.
- C. Outlet boxes:
 1. General:
 - a) Stamped steel, code gauge, galvanized, minimum 2 1/2 inches deep.
 - b) Provide single or double gang outlet boxes as indicated in details on the Drawings.
 2. In masonry or tile walls:
 - a) Rectangular boxes, 4" square, with square corners minimum 2 1/2 inches deep where the box is at the end of the run.
 - 1) Provide 1" deep single or 2 device trim ring.

- b) Rectangular boxes, 4 11/16" square, with square corners minimum 2 1/2 inches deep where the box is in a continuing run.
 - 1) Provide 1" deep single or 2 device trim ring.
 - 3. In gypsum board walls
 - a) Single and dual gang outlet boxes with a depth of 3 to 3.5".
 - 4. Surface mounted and exterior use:
 - a) Single or dual gang Cast aluminum boxes with threaded hubs
 - 5. No through-wall boxes or utility boxes will be accepted.
 - 6. Where surface raceway is indicated, provide outlet boxes designed for use with the raceway by the same manufacturer as the surface raceway.
- D. Junction boxes:
- 1. Covers shall be screw attached (unless otherwise noted on the drawing) and of same type of material as the box. All covers shall be easily accessed.
 - 2. Boxes in exterior or moist locations shall meet NEMA 3R (at minimum)
 - a) The box must meet the NEMA requirements for the atmospheric condition in which the box is installed.
 - 3. Surface raceway boxes
 - a) Where surface raceway is indicated, provide junction boxes by the same manufacturer as the surface raceway.
- E. Pull boxes:
- 1. Required after every 100' or after 180 degrees of bends in a conduit run
 - 2. Shall be sized as follows:
 - a) One 4" conduit straight through pull:
 - i) 15" wide, 60" long, and 8" deep; minimum.
 - ii) Add 8" to the width for each additional conduit.
 - iii) Information about other trade sizes; reference EIA/TIA 569 standard.
- F. Splice boxes:
- 1. Required after every 100' or after 180 degrees of bends in a conduit run
 - 2. Used to hold splice hardware.
 - 3. Shall be sized as follows:
 - a) One 4" conduit straight through pull:
 - i) 42" wide, 66" long, and 11" deep; minimum.
 - ii) Add 7" to the width for each additional conduit.
 - iii) Information about other trade sizes; reference EIA/TIA 569 standard.
- G. Poke-thru systems:
- 1. Assembly consisting of disposable plate, barriered raceway, conduit adaptor, housing, base, barrier, and faceplate.
 - a) Provide Wiremold RC900-FF3 series multi-service poke-thru with 341-H/B assembly and FP2R faceplates as indicated.
 - 1) Additional approved manufacturers: Hubbell, Walker

2.5 ACCESSORIES

- A. Pull wires:
- 1. Pull wires shall be nylon type as manufactured by Arnco or approved equal.
 - 2. Provide in all empty conduits, sleeves, raceways, and all cabling pathways for future use.
 - a) Additional approved manufacturers: Greenlee, Condux
- B. Fiber optic innderduct:
- 1. NEMA TC 5, UL listed, corrugated, specifically designed for optical fiber cable pathways.

- a) Fiber optic innerduct shall be orange in color
 - b) Innerduct shall be 1-inch minimum inside diameter, and a minimum pulling strength of 600 pounds.
 - c) Each innerduct shall include a factory installed pull rope
 - d) Each duct shall be suited for the environment in which it is installed.
 - e) Standard of Quality shall be Carlon DF4X1C-xxxx for installation in Riser rated applications; and, Carlon CF4X1C-xxxx for installation in Plenum environments.
 - 1) Additional approved Manufacturers: Arnco, Endot, Opti-Com, Pyramid
- C. Cable spillways
- 1. Provide Bejed BJ-2049B-002 Spillway on four-inch sleeves; provide Bejed BJ-2049A-001 Cable Spillway on two-inch sleeves.
 - a) Additional approved manufacturers: B-Line, Panduit
- D. Labels
- 1. Standard of quality shall be Brady
 - a) Additional approved manufacturers: Panduit, Hellerman-Tyton
- E. Penetrations through floors and walls
- 1. Sleeves through floors and walls:
 - a) All penetrations through floors or walls to allow Division 27 cable or pathway to pass through will require a UL listed device for the purpose of penetrating the construction.
 - b) Penetrations through walls of spaces utilizing a chemical or pressure system for fire suppression must utilize Wiremold FS series penetration unless an alternate assembly is pre-approved by the Owner.
 - c) Refer the Penetration Sectional View Drawings for UL listed assemblies.
 - 1) Concrete, block, brick, and gypsum drywall construction providing a fire rating of greater than one hour for walls and floors will require a UL rated sleeve assembly installed to manufacturer's requirements allowing the penetration(s) to not degrade the designed fire rating of the wall or floor.
 - i) Standard of quality shall be as manufactured by Unique Fire Stop Products (USFP). Utilize USFP's Threaded Penetrator system for all fire-rated penetrations.
 - ii) Additional approved manufacturers : Specified Technologies E-Z Path, Wiremold FS Series
 - 2) All other penetrations and gypsum drywall constructed walls providing a fire rating of one hour or less will require a UL rated sleeve assembly installed to manufacturer's requirements allowing the penetration(s) to not degrade the designed fire rating of the wall or floor.
 - i) Standard of quality shall be as manufactured by Unique Fire Stop Products (USFP). Utilize USFP's Smooth Penetrator system for all fire-rated penetrations.
 - ii) Additional approved manufacturers : Specified Technologies E-Z Path, Wiremold FS Series
 - 3) All penetrations found to be improperly sleeved after the installation of cabling will be sleeved and firestopped to restore the proper aesthetics and required fire rating to the obstruction.
 - i) Standard of quality shall be as manufactured by Unique Fire Stop Products (USFP). Utilize USFP's split-sleeve system for all fire rated penetrations.
 - d) Penetrations into fire rated walls with gypsum board construction.
 - 1) All penetrations required in gypsum board walls for installation of horizontal cabling, where conduit is not stubbed into the ceiling cavity for this purpose,

will require a sleeved penetration through the drywall membrane or the wall cap.

- i) Each penetration will require a UL listed sleeve assembly installed by an installer trained on proper installation of the sleeving device.
 - ii) Standard of quality shall be as manufactured by Unique Fire Stop Products (USFP). Utilize USFP's Membrane Penetrator or Cap Penetrator system for all fire rated penetrations.
 - iii) Additional approved manufacturers : Specified Technologies E-Z Path, Wiremold FS Series
- 2) Standard of quality shall be Unique Fire Stop Products.
- i) Additional approved manufacturers : Specified Technologies E-Z Path, Wiremold FS Series

F. Supporting devices – Field Fabricated:

1. General

- a) Shop or field-fabricated supports or manufactured supports assembled from U-channel components.
- b) Steel brackets: Fabricated of angles, channels, and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.
- c) All steel components utilized to fabricate supports shall be of U.S. manufacture.

2. Coatings:

- a) Supports, support hardware, and fasteners shall be protected with zinc coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish, or inherent material characteristic. Products for use outdoors shall be hot-dip galvanized.
- b) Where possible, supports shall have a finish similar to the device it is supporting.
 - 1) Where installed below the finished ceiling line, the support shall be painted to match the finish of the device it is supporting.

3. Material Types

- a) Concrete and masonry anchors:
 - 1) Shall be a guaranteed anchoring system with field training available.
 - i) Standard of quality will be as manufactured by Hilti or approved equal.
 - ii) All onsite personnel performing this work will be required to be manufacturer trained on the anchoring system being utilized, and upon request, to show proof of manufacturer's training certification.
- b) Raceway supports:
 - 1) Clevis hangers, riser clamps, conduit straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps.
- c) Fasteners:
 - 1) Types, materials, and construction features as follows:
 - i) Expansion anchors:
 - (A) Carbon steel wedge or sleeve type
 - ii) Toggle bolts:
 - (A) All steel springhead type
 - iii) Powder-driven threaded studs:
 - (A) Heat-treated steel, designed specifically for the intended service
- d) Conduit sealing bushings:
 - 1) Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit or tubing passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.
- e) Cable supports for vertical conduit:

- 1) Factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Provide plugs with number and size of conductor gripping holes as required to suit individual risers. Construct body of malleable-iron casting with hot-dip galvanized finish.
- f) Threaded Rod Stock (All-Thread Rod)
 - 1) Available in 1/4", 3/8", 1/2", and 5/8" sizes.
 - i) Utilize 1/2" for supporting of 12" ladder racks and cable trays.
 - ii) Utilize 5/8" for supporting of 24" ladder racks and cable trays.
 - 2) Rod lengths over 6' will require a "Rod Stiffener" installation for 1/2" and 5/8" rods.
 - i) A section of U-Channel stock is placed around the rod and stiffener clamp assemblies used to clamp to rod
 - (A) Place clamps a minimum of 6" from the top and bottom of the rod and every 18" in between.
 - (B) Standard of quality shall be B-Line SC228
 - (1) Additional approved manufacturer(s): Unistrut Diversified Products, GS Metals Corp., Haydon Corp., Kin-Line Inc.
- g) U-channel systems:
 - 1) 16-gauge steel channels, with 9/16 inch diameter holes, at a minimum of 8 inches on center, in top surface. Provide fittings and accessories that mate and match with U-channel and are of the same manufacture.
4. Slotted metal angle and U-channel systems:
 - a) Standard of quality shall be Unistrut Diversified Products
 - 1) Additional approved manufacturers: Allied Tube & Conduit, American Electric, B-Line Systems, Inc., Cinch Clamp Co., Inc., GS Metals Corp., Haydon Corp., Kin-Line Inc.

PART 3 EXECUTION

3.1 GENERAL

- A. Minimum raceway size shall be as necessary to comply with fill ratio of referenced standards, but in no case less than one and one quarter inch (1 1/4 inch).
- B. Provide specified pull wires in all cabling pathways.
- C. Ground and bond all systems in accordance with the NEC and ANSI/TIA/EIA 607.
- D. All installation material and practices shall fully comply with NFPA 70 "National Electrical Code" and ANSI/TIA/EIA 569A Commercial Building Standard for Telecommunications Pathways and Spaces.
- E. Coordinate work with the building structural systems and electrical installation.
- F. All work shall fully comply with these Specifications and related Drawings and all manufacturers' recommended installation practices.

3.2 PATHWAY INSTALLATION

- A. Raceways
 1. Conduit Usage:
 - a) Rigid Galvanized Steel (GRC):
 - 1) All exposed conduit installed above grade outside the building envelope.
 - 2) All conduits installed in moist locations.
 - b) Electric Metallic Tubing (EMT):
 - 1) All conduits within the building envelope.
 - c) Polyvinylchloride (PVC):

- 1) Underground which may continue from underground through floor slab to Equipment Room/Telecommunications Room.
- d) Flexible Metal Conduit (FMC):
 - 1) Unless otherwise indicated, FMC can only be provided for secondary pathways from the ceiling space to the telecommunications outlet box.
 - 2) Maximum length shall not exceed 6 meters.
2. Conduit installation:
 - a) Provide all conduit terminations with locknuts and bushings. Provide conduits 1 ½ inches and larger with insulating bushings and locknuts inside and outside the enclosure.
 - 1) At least one bushing per conduit shall be grounding type
 - i) Equipped with a ground lug
 - ii) Provide on each conduit or sleeve where surface extends below ceiling line and install Bonding Conductor to TMGB.
 - b) Support conduits by pipe straps or trapeze hangers. Space supports not more than 8 feet on center. Secure supports by means of toggle bolts, inserts or expansion bolts.
 - c) Space wall brackets supporting conduits not more than 4 feet 6 inches on center. Secure supports by means of toggle bolts, inserts or expansion bolts.
 - d) Support conduits directly from structural systems not from ceiling suspensions systems.
 - 1) Provide additional support at junction or pull boxes.
 - e) Wherever possible, conceal raceways under floors, in walls, above ceilings or in furred spaces in finishes areas.
 - f) Support single conduits 1 ½ inches and larger by means of rod and cast ring hangers. Support multiple runs in similar manner or use common trapeze hanger.
 - 1) Trapeze hanger:
 - i) Unistrut P2000 or P4000, or equal by Allied Support systems or Superstrut, as required for span and loading.
 - ii) Provide end caps on hangers.
 - iii) Fasten conduits by means of heavy galvanized straps.
 - g) Provide two hole sheet metal pipe straps for all surface mounted conduit supports on walls up to a height of 8 feet above the finished floor. Pinch type hangers similar to minerallac type may only be used at heights greater than 8 feet.
 - h) Protect conduits during construction with temporary plugs or caps. Securely cap all conduit until wire or cable is installed.
 - i) Minimum conduit size is 1 inch.
 - j) Do not install conduit in concrete slab.
 - k) Provide expansion fittings where raceway crosses the building expansion joints. (O.X. Type AX, EX, EXDS, TX, EXE, or approved equal).
 - l) Route and maintain conduits as shown on the Drawings.
 - 1) If no specific routing information appears on the Drawings, the routing shown shall be considered diagrammatic.
 - i) In such a case, the Contractor shall coordinate his Work with the different trades so that interferences between conduit, cable tray, piping, equipment, architectural, and structural work shall be avoided.
 - (A) Should an interference arise, the Contractor shall inform the Consultant before proceeding with the Work.
 - (B) Should the Contractor fail to contact the Consultant and interferences develop, the Owner's Representative will decide which equipment, piping, etc. must be replaced, regardless of which was installed first. The relocation shall be performed at no expense to the Owner.

- m) There shall not be more than the equivalent of 180 degrees of bends in any single run of conduit between adequately sized pull.
 - n) Conduit bends
 - 1) Bends shall be made so that the conduit will not be flattened or kinked and the internal diameter of the conduit will not be reduced.
 - 2) The radius of the curve of the inner edge of any bend shall not be less than as indicated by the National Electrical Code and ANSI/TIA/EIA 569A Commercial Building Standard for Telecommunications Pathways and Spaces.
 - 3) In no case shall any conduit be bent or any fabricated elbow be applied to less than the allowable bending radius as specified by the cable manufacturer of the installed conductor.
 - 4) When necessary to make field bends, use tools designed for conduit bending.
 - i) Heating of metallic conduit to facilitate bending is not permitted.
 - o) A conduit run shall not be longer than 100' between pull boxes for conduit runs inside a building.
 - p) The Contractor shall not cut, burn, or drill any structural member to mount electrical equipment or to facilitate tray or conduit installations without having previously received approval, in writing, from the Architect/Engineer/Consultant.
 - q) Mount all conduits a minimum of 7 inches above any accessible type ceiling.
 - r) Maintain conduit runs at least 6 inches from insulated pipes, steam lines or any other hot pipes they pass. Where the lines are not insulated, the clearances shall be increased until the temperature of the conduit, with no live conductors enclosed, does not rise above the ambient temperature of the installation area.
 - s) Conceal all raceways except where otherwise indicated.
 - 1) Provide flashing and counter-flashing or pitch pockets for waterproofing of all raceways, outlets, fittings, etc. that penetrate the roof.
 - 2) Route all raceways parallel or perpendicular to the building lines with symmetrical bends.
 - 3) Provide sleeves in forms for new concrete walls, floor slabs, and partitions for passage of raceways.
 - i) Seal in an approved manner all raceway openings and sleeves through fire rated walls, floors, and ceilings after raceway installation.
 - t) Waterproof all sleeved raceways where required.
- B. Surface Raceway
- 1. Surface raceway installation
 - a) Provide surface raceways as indicated.
 - b) Coordinate installation with casework before installation. Field verify lengths to be installed before ordering equipment.
 - c) Install plumb and level.
 - d) Anchor all raceways to walls with the anchors designed for that particular wall construction. Secure raceway at a minimum of every 2 feet and not less than 6 inches from raceway ends.
 - e) Install raceway per the manufacturer's written recommendation, including necessary entrance, end and bend fittings.
 - f) Provide all of the manufacturer's recommended fittings and accessories.
 - g) Where surface raceway is provided for a secondary pathway from the outlet to the ceiling space, extend surface raceway into the ceiling space not less than 4 inches.
- C. Telecommunications/power poles
- 1. Mount straight and anchor to building structure above the ceiling line.
 - 2. Provide mounting hardware, entrance end fitting, and ceiling trim plate.

D. Cable Tray

1. Planning

- a) Contractor shall plan entire cable tray system layout and all components required to provide a complete system, verifying dimensions and right-of-way clearances as needed.
- b) Design
 - 1) Wall mounted
 - i) Where 12" capacity is indicated on the drawings a single tiered 12" rung size tray will be utilized.
 - ii) Where 24" capacity is indicated on the drawings a two tiered 12" rung size tray will be utilized.
 - 2) Suspended
 - i) Where 12" capacity is indicated on the drawings a double sided 6" rung size tray will be utilized.
 - ii) Where 24" capacity is indicated on the drawings a double sided 12" rung size tray will be utilized.

2. Coordination and positioning

- a) Coordinate positioning with other trades to assure maximum accessibility.
 - 1) Tray shall be mounted securely along the wall at a minimum of 6" (lower tier) above the ceiling line.
 - i) Where two 12" trays connect to a two tier unit, the upper tray may continue at 12" (upper tier) above the accessible ceiling.
 - ii) Where tray cannot be wall mounted, (transversing hallways, etc.) mount span securely to wall at each end and provide 1/2" threaded rod supports, anchored into the concrete deck above, every 4' at minimum.
 - 2) Minimum access should be 12 inches clear above the tray (each tier) and 12 inches clear beside the tray to facilitate moves, adds and changes for telecommunications cabling.

3. Installation

- a) Cable tray shall be routed as shown schematically by Contract Documents, run level and true to building lines.
- b) Changes in direction, changes in elevation, tees, crosses, and bends shall be made with manufactured fittings and accessories.
- c) Where conduits terminate above a cable tray, the conduit shall be provided with an insulating bushing.
- d) Mounting heights shall be sufficient to clear light fixtures, piping, and equipment and permit ready access through lay-in ceiling grids. Do not install less than 6 inches above ceiling.
- e) Cable tray shall be grounded by a separate stranded #6 AWG copper ground conductor attached to the building grounding electrode system and connected to nearest section of the cable tray with UL approved aluminum/copper termination.
 - 1) See "Grounding and Bonding" specification for further details.
- f) Cable tray shall be installed in accessible area. Provide raceway system of equivalent cross section area of cable tray where ceiling system is not accessible.
- g) Cable tray and all fittings and accessories shall effect a complete structural system in the form of a rigid mechanical tray of compatible material and design, functional to support all cabling.
- h) Transition cable tray system around physical obstructions using manufacturer's recommended turns, sweeps, transition products, and materials to create a complete continuous cabling pathway free of obstructions and maintaining specified clearances.

- i) Where physical discontinuity is necessary, mechanically support cabling over the discontinuity as specified. Bond the ends of the cable tray together electrically over any discontinuity.
 - 1) Fire-wall penetrations shall be made with 4" sleeves (4 per 12" of tray width minimum).
 - i) Utilize requirements of the NFPA NEC to determine correct construction and sizing of wall penetration if tray is to penetrate fire rated wall.
 - 2) Ground and bond the system in accordance with the NEC and ANSI/TIA/EIA 607.
 - 3) Do not use copper fittings or hardware to connect any bonding conductor to aluminum cable tray.
 - j) Provide support for cable trays at a minimum of 4' 6" on center and at all splices, tees, elbows, bends, intersections, and transitions.
 - 1) Support with threaded rod and U-channel supports systems
 - i) 12" width – 1/2" ATR; 24" width – 5/8" ATR
 - 2) Rod lengths over 6' will require a "Rod Stiffener" installation.
 - i) A section of U-Channel stock is placed around the rod and stiffener clamp assemblies used to clamp to rod
 - (A) Place clamps a minimum of 6" from the top and bottom of the rod and every 18" in between.
 - k) Install system free of all sharp edges, burrs, or projections.
 - l) Provide rung caps on rung ends as specified.
 - m) Provide waterfall fittings in every location that cable is designed to exit the tray downward at the end of a run or between the rungs.
 - n) Route parallel and perpendicular to building surfaces.
 - o) Mount cable tray in such a fashion as to be re-usable.
 - 1) Install as straight and flat as practical and perpendicular to building lines.
 - i) Utilize manufactured 45-degree transitions up and down to change elevations.
 - ii) Utilize manufactured 45 or wide sweep 90-degree fittings to change route.
 - (A) Mount cable tray at approximately 6-12" above accessible ceiling.
 - (B) Locate in a position to allow at least 12" clearance on each side of the cable tray for access.
 - 4. Install as a complete system in accordance with manufacturer's installation instructions indicated on the Drawings and to ensure electrical continuity of the system and adequate support for the cabling. Provide all manufacturer's recommended fittings and accessories.
 - 5. Supports shall be attached to building structure.
- E. Messenger Strand
- 1. Anchors shall be securely mounted to building structure at each end.
 - 2. Tensioners shall be installed to connect strand.
 - 3. Additional supports shall be installed with threaded rod from the deck above to support the strand approximately 6-8" above suspended ceiling in all locations.
 - a) Support with threaded rod and U-channel supports systems (See Accessories, Supporting Devices – Field Fabricated)
 - b) Properly sized.
 - 1) Multiples of strands (100 horizontal cables each) appropriate to handle the required cable quantities plus 25% spare capacity.
 - 2) Separate strand for Backbone cables.

F. Open top discreet cable supports (J-Hooks)

1. Primary pathways (corridors, vertical chases, etc.) plenum rated, adjustable cable support that complies with UL cUL, NEC, and ANSI/TIA/EIA requirements for structured cabling systems and accommodates up to 425 horizontal UTP cables or multiples of CAT32 (80 cables each) appropriate to handle the required cable quantities plus 25% spare capacity.
 - a) Install j-hook pathway, supporting at least every 5', as straight as possible perpendicular to building structure at approximately 12" above accessible ceiling.
 - b) Attachment of J-Hooks must be to building structure directly or utilize a minimum of 1/4" all-thread rod anchored into deck above.
2. Secondary pathways (those extending from the primary pathways to the space above the telecommunications outlets) J-hooks with galvanized finish to provide smooth surface and corrosion resistance that complies with UL, cUL, NEC, and ANSI/TIA/EIA requirements for structured cabling systems and accommodates up to 16 horizontal UTP cables.
 - a) Install j-hook pathway, supporting at least every 5', as straight as possible perpendicular to building structure at approximately 12" above accessible ceiling.
 - b) Attachment of J-Hooks must be to building structure directly or utilize a minimum of 1/4" all-thread rod anchored into deck above.
 - c) Exception: Cable routes of less than ten 4 pair UTP (or equivalent weight) may be supported with ceiling grid support wiring when utilizing a support manufactured for that purpose.
 - 1) Must be supported every 5'
 - 2) Cannot interfere with the removal of the ceiling tile
 - 3) Must be installed approximately 12" above ceiling

3.3 BOXES

A. Outlet boxes:

1. Provide outlet boxes flush with the surface unless otherwise noted and properly centered in ceiling tiles, wall finishes, or casework elements. Heights as indicated or to match existing outlet boxes.
 - a) Install all telecommunication video outlet with control for locations indicated to be wall hung TV's or monitors 8 feet above finished floor or 12 inches below finished ceiling, whichever is lower.
2. Provide outlet boxes of a type appropriate for the use and location. Gang adjacent devices in multiple gang boxes under a common finish plate.
3. Boxes shall be securely and rigidly attached and supported plumb, level, and true to building lines by any of the following methods:
 - a) Double bar installation for metal stud walls. Bar hanger punch, mounting clips, and retainer clips shall be used in strict accordance with manufacturer's instructions. Factory pre-punched stud holes shall not be used to support the bar hangers.
 - b) Steel stud installed behind box for support without caddy-type mounting clips for metal stud wall construction.
 - c) Caddy screw gun bracket installed behind box for support. Installation shall be per manufacturer's instructions.
4. Finish plates shall not span different types of wall finishes either vertically or horizontally. Plates shall cover mortar joints and cut openings completely.

5. Outlet, junction, and pull boxes and their covers shall have corrosion protection suitable for the atmosphere in which they are installed. Provide gaskets for all boxes installed outside or in other wet or damp locations (tunnels, crawlspaces, pits, etc.).
6. Outlet boxes shall be protected from plaster. Debris shall be thoroughly cleaned from the box before installation of conductors.
7. Floor boxes shall be installed flush and true with the floor.
8. Finish plates:
 - a) Install a blank coverplate for each new or existing unused outlet box.
- B. Junction and pull boxes
 1. Provide junction and pull boxes as indicated in the Contract Documents and as required.
 2. Provide junction and pull boxes in accessible spaces or behind access panels. Boxes located above snap-in or lay-in removable ceilings will be considered accessible.
 3. Provide junction and pull boxes where necessary to facilitate the installation of raceways and pulling of wire or cable.
 4. Provide junction and pull boxes sized in accordance with NEC and installed such that conduit entry will permit the longest radius for conductors contained therein.
 5. Provide junction and pull boxes such that conduits enter and exit across from each other on opposite sides of the junction box. Do not provide junction and pull boxes in place of conduit bends.
 6. Support all such boxes in accordance with the National Electrical Code.
- C. Mounting heights
 1. Exceptions:
 - a) At junction of different materials in wall finishes.
 - b) Where outlet would occur in moldings, break in wall surface or unsuitable location in the tile, wood, or similar finish.
 - c) Where outlets would conflict with locations of wall-mounted equipment such as radiators, convectors, unit heaters, etc.
 - d) As noted otherwise.
 - e) Where electrical outlet on that wall is of different height.

3.4 PENETRATIONS THROUGH FLOORS AND WALLS

- A. General:
 1. Provide, locate and set sleeves where conduit passes through floors, walls, and other concrete or masonry structural materials except where tunnels, chases or shafts are provided in the constructions.
 - a) Sleeves through poured-in-place concrete floors shall be set before the pour and shall be of a design that will seal against passage of water between sleeves and concrete floor.
 2. Provide bushings on all conduit sleeves.
 3. Extend all wall sleeves a minimum of 2 inches or as required to allow the installation of conduit bushings.
 4. Extend floor sleeves 4-6 inches above finished floors unless otherwise specified.
 5. The void between the sleeve wall and conduit shall be neatly filled with an approved fire stop material.
- B. Quantity and sizing:
 1. Penetrations through floors, access through walls of Equipment Rooms and/or Telecommunications Rooms, and obstructions along a backbone or primary horizontal cabling route.

- a) Provide the required quantity of 4-inch sleeve assemblies as specified with a minimum of one 4-inch sleeve. Properly firestop after installation of the telecommunications cabling.
- b) Install sizes and quantities as specifically noted on the prints, or the quantity required so as to accommodate all planned cables, not exceeding a 40 percent maximum fill ratio in each sleeve, plus one spare 4-inch sleeve.
- 2. Penetrations through walls or along secondary horizontal cabling routes.
 - a) Provide a 2 inch or 4-inch sleeve assembly as specified with a minimum of one 2-inch sleeve. Properly fire stop after installation of the telecommunications cabling.
 - b) Install sizes and quantities as specifically noted on the prints, or the quantity required so as to accommodate all planned cables, not exceeding a 40 percent maximum fill ratio in each sleeve, plus one spare 4-inch sleeve.
- C. Construction:
 - 1. All penetrations through floors or walls to allow Division 27 cable or pathway to pass through will require a UL listed device for the purpose of penetrating the construction.
 - a) Concrete, block, brick, and gypsum drywall construction providing a fire rating of greater than one hour for walls and floors will require a UL rated sleeve assembly installed to manufacturer's requirements allowing the penetration(s) to not degrade the designed fire rating of the wall or floor.
 - 1) Each penetration will require a UL listed sleeve assembly installed by an installer trained on proper installation of the sleeving device.
 - 2) Each penetration shall have the accompanying certification paperwork completely filled out and attached to the building structure adjacent to the penetration.
 - 2. All other penetrations and gypsum drywall constructed walls providing a fire rating of one hour or less will require a UL rated sleeve assembly installed to manufacturer's requirements allowing the penetration(s) to not degrade the designed fire rating of the wall or floor.
 - a) Each penetration will require a UL listed sleeve assembly installed by an installer trained on proper installation of the sleeving device.
 - b) Each penetration shall have the accompanying certification paperwork completely filled out and attached to the building structure adjacent to the penetration. A copy of this paperwork will be required in the O & M Manual.
 - 3. All penetrations found to be improperly sleeved after the installation of cabling will be sleeved and firestopped to restore the proper aesthetics and required fire rating to the obstruction.
 - a) Each penetration will require a UL listed sleeve assembly installed by an installer trained on proper installation of the sleeving device.
 - b) Each penetration shall have the accompanying certification paperwork completely filled out and attached to the building structure adjacent to the penetration. A copy of this paperwork will be required in the O & M Manual.
 - 4. All penetrations required in gypsum board walls for installation of horizontal cabling, where conduit is not stubbed into the ceiling cavity for this purpose, will require a sleeved penetration through the drywall membrane or the wall cap.
 - 5. Each penetration will require a UL listed sleeve assembly installed by an installer trained on proper installation of the sleeving device.

3.5 SUPPORTS

- A. General:
 - 1. Coatings

- a) Coating: Supports, support hardware, and fasteners shall be protected with zinc coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish, or inherent material characteristic. Products for use outdoors shall be hot-dip galvanized.
 - b) Concrete and masonry anchors
 - 1) Shall be a guaranteed anchoring system with field training available.
 - i) All onsite personnel will be required to be manufacturer trained on the anchoring system being utilized, and upon request, to show proof of manufacturer's training certification.
- B. Manufactured supporting devices:
- 1. Raceway supports: Clevis hangers, riser clamps, conduit straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps.
 - 2. Fasteners: Types, materials, and construction features as follows:
 - a) Expansion anchors: Carbon steel wedge or sleeve type
 - b) Toggle bolts: All steel springhead type
 - c) Powder-driven threaded studs: Heat-treated steel, designed specifically for the intended service
 - 3. Conduit sealing bushings: Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit or tubing passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.
 - 4. Cable supports for vertical conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Provide plugs with number and size of conductor gripping holes as required to suit individual risers. Construct body of malleable-iron casting with hot-dip galvanized finish.
 - 5. U-channel systems: 16-gauge steel channels, with 9/16 inch diameter holes, at a minimum of 8 inches on center, in top surface. Provide fittings and accessories that mate and match with U-channel and are of the same manufacture.
- C. Fabricated supporting devices:
- 1. General: Shop or field-fabricated supports or manufactured supports assembled from U-channel components.
 - 2. Steel brackets: Fabricated of angles, channels, and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.
 - 3. Raceway supports: Comply with the NEC and the following requirements.
 - a) Conform to the manufacturer's recommendations for selection and installation of supports.
 - b) Strength of each support shall be adequate to carry present and future load multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 lbs. provide additional strength until there is a minimum of 200 lbs. safety allowance in the strength of each support.
 - c) Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
 - d) Support parallel runs of horizontal raceways together on trapeze-type hangers.
 - e) Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers for 1 ½ inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use ¼ inch diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.

- f) Support exposed and concealed raceway within 1 foot of an unsupported box and access fittings. In horizontal runs, support at the box and access fittings may be omitted where box or access fittings are independently supported and raceway terminals are not made with chase nipples or threadless box connectors.
- g) In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway terminals.
- 4. Miscellaneous supports:
 - a) Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, pull boxes, junction boxes, and other devices.
 - b) Support sheet metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved type of fastener not more than 24 inches from the box.
- 5. Conduit seals:
 - a) Install seals for conduit penetrations of slabs on grade and exterior walls below grade and where indicated. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal.
- 6. Fastening:
 - a) Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the building structure, including but not limited to; conduits, raceways, cables, cable traps, busways, cabinets, panelboards, transformers, boxes, disconnect switches, and control components in accordance with the following:
 - 1) Fasten by means of wood screws or screw-type nails on wood, toggle bolts on hollow masonry units, concrete inserts or expansion bolts on concrete or solid masonry, machine screws, welded threaded studs, or spring-tension clamps on steel. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts and machine or wood screws. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws.
 - 2) Holes cut to depth of more than 1 ½ inch in reinforced concrete beams or to depth of more than ¾ inch in concrete shall not cut the main reinforcing bars. Fill holes that are not used.
 - 3) Ensure that the load applied to any fasteners does not exceed 25 percent of the proof test load. Use vibration-and shock-resistant fasteners for attachments to concrete slabs.
- 7. Raceway supports: Hanger spacing shall be as required for proper and adequate support of raceway, but in no case shall be less than one hanger per 5 feet of raceway length.

END OF SECTION 27 05 28

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SECTION 27 05 50 - FIRESTOPPING FOR COMMUNICATIONS SYSTEMS

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. Supplementary to Division 1, Refer to Division 27 Section(s) for additive information where applicable.**

1.2 SUMMARY

- A. Section Includes:
 - 1. This Section is a "Common Work Results" Section that includes information that is applicable and "Related" to all Division 27 Sections.**
 - a) Refer to related Section 27 05 28 "Pathways for Communications Systems" for Sleeving requirements.
 - b) This Section includes firestopping for the following:
 - 1) Penetrations through fire-resistance/-rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
 - 2) Penetrations through fire-resistance/-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
 - 3) Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.
 - 4) Sealant joints in fire-resistance/-rated construction.
 - c) Label each firestopped sleeve with the label furnished with the sleeve assembly; each certification label shall be copied and added to the O & M Manual.
 - 2. System includes but is not limited to:**
 - a) Firestopping Compounds
- B. Related Sections
 - 1. All Division 27 Sections**
- C. Related Drawings
 - 1. Technology (T-Series) Drawings**

1.3 GENERAL INFORMATION

- A. Definitions:
 - 1. Firestopping**
 - a) A material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flames, smoke, and/or hot gasses through penetrations in fire-rated wall and floor assemblies.
- B. All Work shall fully comply with these specifications and related Drawings and all manufacturers recommended installation practices.

1.4 SYSTEM DESCRIPTION / DESCRIPTION OF WORK

- A. General:
 - 1. Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gasses.**

2. **Firestopping may be factory installed in a re-usable sleeve assembly or may be a removable/ re-usable material(s) inserted into a sleeve assembly to provide adequate protection.**
 3. **Refer to related Division 27 Section "Pathways for Communications Systems" for Sleeving requirements.**
- B. Fire stopping requirements/locations are not indicated on drawings. It shall be the responsibility of this contractor to review all architectural and other drawings to determine fire/smoke rated walls and floors and rating requirements of same. This contractor shall provide all required fire stopping work associated with all Division 27 penetrations. Provide fire stop pillows, putty and/or sealant, as applicable, with minimum UL classification for 1 hour fire and cold side temperature ratings.
1. **At a minimum, provide firestopping to equal or exceed the rating of the wall or floor.**
 2. **Provide Fire Stop Putty equal to Nelson FSP #AA400 series, or by 3M Fire Protection Products; Fire Protection Services, Inc.; UL Classified for 3 hour fire and cold side temperature ratings, reusable when penetrating items are removed or added and requiring no special tools, mixing, curing or drying time.**
- C. System Performance requirements:
1. **Provide re-usable firestopping system(s) in all backbone pathway and major horizontal routes.**
 2. **F-rated through-penetration firestop systems:**
 - a) Provide through-penetration firestop systems with F rating indicated, as determined per ASTM E 814, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.
 3. **T-rated through-penetration firestop systems:**
 - a) Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM E 814 where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupied floor areas. T-rated assemblies are required where the following conditions exist:
 - 1) Firestop systems protect penetrations located outside of wall cavities.
 - 2) Firestop systems protect penetrations located outside fire-resistive shaft enclosures.
 - 3) Firestop systems protect penetrations located in construction containing doors required to have a temperature-rise rating.
 - 4) Firestop systems protect penetrating items larger than a 4-inch (100 mm) diameter nominal pipe or 16 sq. in. (100 sq. cm) in overall cross-sectional area.
 4. **Fire-resistive joint sealants:**
 - a) Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E 119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.
 5. **For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.**
 - a) For floor penetrations with annular spaces exceeding 4 inches (100 mm) or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floorloads involved either by installing floor plates or by other means.
 - b) For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

6. For firestopping exposed to view, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450, as determined per ASTM E 84.

1.5 SUBMITTALS

A. General

1. **Product Data and Shop Drawing submittals for work of this section shall be SUBMITTED TOGETHER, complete, as a single submittal. Product Data and Shop Drawings are not to be submitted separately.**
2. **Samples shall be submitted with or immediately following submission of Product Data submittals.**

B. Items to be submitted for approval prior to commencement of work:

1. Product Data

- a) Manufacture datasheets for all items
 - 1) Data sheets shall include
 - i) Manufacturer name
 - ii) Manufacturer model number (as it appears on manufacturer's product data sheet)
 - iii) Manufacturer product description
 - iv) Paragraph number of this section where the product is specified.

2. Shop Drawings

- a) System block wiring diagram, detailed.

C. Quality Assurance / Control Submittals

1. **RCDD Certification for the staff member responsible for this project.**
2. **Resume of the last 10 projects of the RCDD responsible for this project**
3. **BICSI Technician's certificate for each lead Technician(s) on the project**

D. Closeout Submittal

1. **Manufacturer's Material Safety Data Sheets (MSDS) for each item.**
2. **Product certificates signed by manufacturers of firestopping products certifying that their products comply with specified requirements.**

PART 2 PRODUCTS

2.1 PRODUCT STANDARDS

A. General

1. **This section is designed to provide the Contractor with a minimum standard of quality and functionality for the products used for telecommunications infrastructure.**
2. **This standard will be considered in force for the original response as well as for any additions or changes to this Project. Due to this, there may be items listed in the Products section that are not required under the scope of this contract.**

2.2 FIRESTOPPING, GENERAL

A. Compatibility:

1. **Provide firestopping components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.**

B. Accessories:

1. **Provide components for each firestopping system required to install fill materials and to comply with “System Performance Requirements” Article in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Firestopping materials shall be asbestos-free and shall not contain flammable solvents. Accessories include but are not limited to the following:**

- a) Permanent forming/damming/backing materials including the following:
 - 1) Semi-refractory fiber (mineral wool) insulation
 - 2) Ceramic fiber
 - 3) Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state
 - 4) Fire-rated formboard
 - 5) Joint fillers for joint sealants
- b) Temporary forming materials
- c) Substrate primers
- d) Collars
- e) Steel sleeves

C. Applications:

1. **Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.**

2.3 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

A. Subject to compliance with requirements, provide one or more of the following types:

B. Ceramic-fiber and mastic coating:

1. **Ceramic fibers in bulk form formulated for use with mastic coating and ceramic fiber manufacturer’s mastic coating.**

- a) Standard of quality shall be 3M Fire Protection Products
 - 1) Additional approved manufacturer(s): Thermal Ceramics, FireMaster Bulk, FireMaster Mastic

C. Ceramic-fiber sealant:

1. **Single-component formulation of ceramic fibers and inorganic binders.**

- a) Standard of quality shall be 3M Fire Protection Products
 - 1) Additional approved manufacturer(s): Metacaulk 525, The RectorSeal Corporation

D. Endothermic, latex compound sealant:

1. **Single-component, endothermic, latex formulation.**

- a) Standard of quality shall be 3M Fire Protection Products
 - 1) Additional approved manufacturer(s): Fyre-Shield, Tremco Inc., Flame-Safe FS500/600 Series, International Protective Coatings Corp., Flame-Safe FS900/FST900 Series, International Protective Coating Corp., Cafco TYPS Type 1, Isolatek International, STI LC150, Specified Technologies, Inc.

E. Intumescent, latex sealant:

1. **Single-component, intumescent latex formulation.**

- a) Standard of quality shall be Fire Barrier CP 25WB Caulk, 3M Fire Protection Products
 - 1) Additional approved manufacturer(s): Metacaulk 950, The RectorSeal Corporation, Cafco TPS Type 1, Isolatek International, STI SSS100, Specified Technologies, Inc., Hilti

F. Intumescent putty:

1. **Nonhardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.**
 - a) Standard of quality shall be Fire Barrier Moldable Putty, 3M Fire Protection Products
 - 1) Additional approved manufacturer(s): Intumescent Putty, General Electric Co., Flame-Safe FSP1000 Putty, International Protective Coatings Corp., Cafco TPS Types P and EP, Isolatek International, Hilti
- G. Intumescent wrap strips:
 1. **Single-component, elastomeric sheet with aluminum foil on one side.**
 - a) Standard of quality shall be Fire Barrier FS-195 Wrap/Strip, 3M Fire Protection Products
 - 1) Additional approved manufacturer(s): CS2420 intumescent wrap, Hilti Construction Chemicals, Inc., STI SSW Red, Specified Technologies, Inc.
- H. Pillows/bags:
 1. **Reusable, heat-expanding pillows/bags composed of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.**
 - a) Standard of quality shall be Firestop Pillows, Bio Fireshield, Inc.
 - 1) Additional approved manufacturer(s): KBS Sealbags, International Protective Coatings Corp., SSB Pillows, Specified Technologies, Inc., 3M Fire Protection Products
- I. Intumescent collars:
 - a) Standard of quality shall be Cafco TPS Type D, Isolated International
 - b) Additional approved manufacturer(s): STI SSC Collars, Specified Technologies, Inc., 3M Fire Protection Products

2.4 FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS

- A. Elastomeric sealant standard:
 1. **Provide manufacturer's standard chemically curing, elastomeric sealants for base polymer indicated that complies with ASTM C 920 requirements, including those referenced for type, grade, class, and uses; and requirements specified in this Section applicable to fire-resistive joint sealants.**
- B. Single-component, neutral-curing silicone sealant:
 1. **Type S, Grade NS, Class 25, exposure-related Use NT, and joint-substrate related Uses M, G, A, and (as applicable to joint substrates indicated) O.**
 - a) Additional movement capability:
 - 1) Provide sealant with the capability to withstand the following percentage changes in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated:
 - i) 50 percent movement in both extension and compression for a total of 100 percent movement.
 - ii) 100 percent movement in extension and 50 percent movement in compression for a total of 150 percent movement.
- C. Single-component, nonsag, urethane sealant:
 1. **Type S, Grade NS, Class 25, and Uses NT, M, A, and (as applicable to joint substrates indicated) O.**
- D. Products: Subject to compliance with requirements, provide one of the following:
 1. **Single-component, neutral-curing, silicone sealant:**

- a) Dow Corning 790, Dow Corning Corp.
- b) Dow Corning 795, Dow Corning Corp.
- c) Silpruf, General Electric Co.
- d) Ultraglaze, General Electric Co.
- e) Omniseal, Sonneborn Building Products Div. Chem Rex, Inc.
- f) Hilti
- g) FS-One

2. Single-component, nonsag, urethane sealant:

- a) Isoflex 880 GB, Harry S. Peterson Co., Inc.
- b) Isoflex 881, Harry S. Peterson Co., Inc.
- c) Vulkem 921, Mameco International Inc.
- d) Sikaflex-15LM, Sika Corp.
- e) NP-1, Sonneborn building Products Civ., Chem Rex, Inc.

2.5 FIRE STOPPING FOR ALL OTHER WALL AND FLOOR OPENINGS

- A. Provide Fire Stop Sealant shall be equal to Nelson #AA491 series, or by 3M Fire Protection Products; Fire Protection Services, Inc.; UL Classified for 3 hour fire and cold side temperature ratings, non-sagging, permanently flexible, non-toxic, non-shrinking, water/air/smoke-tight and easily re-penetrated. The following shall be considered equal.
 - 1. For Floor Openings: Instant Firestop; 305-SL.**
 - 2. For Wall Openings: Instant Firestop; 344-GG.**
 - 3. Mineral Felt: Instant Firestop; Type MW.**
 - 4. For Insulated Pipes: Instant Firestop; Type PI.**
 - 5. For Fill Areas: Instant Firestop; C-1000.**
- B. Apply sealant primer to substrates as recommended by manufacturer (if any). Protect adjacent areas from spillage and migration of primers, using masking tape. Remove tape immediately after tooling without disturbing joint seal.
- C. Immediately after sealant application and prior to time shinning or curing begins, tool sealants to form smooth, uniform beads; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

- A. Environmental conditions:
 - 1. Do not install firestopping when ambient or substrate temperatures are outside limits permitted by firestopping manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.**
- B. Ventilation:
 - 1. Ventilate firestopping compounds per manufacturers' instructions by natural means or, when this is inadequate, forced air circulation.**

3.2 SEQUENCING AND SCHEDULING

- A. **Do not cover up those firestopping installations that will become concealed behind other construction until the Architect/Engineer/Consultant has examined each installation**

3.3 DELIVERY, STORAGE, AND HANDLING

- A. Deliver firestopping products to the Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life, if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multi-component materials.
 - 1. **Coordinate the delivery date of firestopping materials with the scheduled date of installation to minimize amount of storage time required at the Project site.**
 - 2. **Store with a copy of the manufacturer's MSDS sheet.**
 - a) Submit a copy of each sheet to the site manager.
- B. Store and handle firestopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.
- C. **Damaged or expired materials shall be removed from the site and shall not be used in the Work.**

3.4 FIRE-TEST-RESPONSE CHARACTERISTICS: PROVIDE FIRESTOPPING THAT COMPLIES WITH THE FOLLOWING REQUIREMENTS AND THOSE SPECIFIED IN THE "SYSTEM PERFORMANCE REQUIREMENTS" ARTICLE IN THIS SECTION.

- A. Firestopping tests are to be performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is an agency performing testing and follow-up inspection services for firestop systems that is acceptable to authorities having jurisdiction.
- B. Through-penetration firestop systems are identical to those tested per ASTM E 814 under conditions where positive furnace pressure differential of at least 0.01 inch of water (2.5 Pa) is maintained at a distance of 0.78 inch (20 mm) below the fill materials surrounding the penetrating items in the test assembly. Provide rated systems complying with the following requirements:
 - 1. **Through-penetration firestop system products shall bear classification marking of qualified testing and inspecting agency.**
 - 2. **Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by UL in their "Fire Resistance Directory," by Warnock Hersey, or by another qualified testing and inspecting agency.**
- C. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM E 119 under conditions where the positive furnace pressure differential is at least 0.01 inch of water (2.5 Pa) as measured 0.78 inch (20 mm) from the face exposed to furnace fire. Provide systems complying with the following requirements:
 - 1. **Fire-resistance rating of joint sealants**
 - a) As indicated by reference to design designations listed by UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.
 - 2. **Joint sealants, including backing materials, bear classification marking of qualified testing and inspection agency.**
- D. Where no UL test firestop application exists, manufacturer's engineering judgment derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation.
- E. Firestopping systems and their locations in the Project are not specifically indicated in the Drawings.
- F. It is the sole responsibility of the Firestopping Contractor to install tested and approved systems that comply with all applicable codes, standards and/or agencies having jurisdiction.

3.5 INSTALLER QUALIFICATIONS:

- A. Engage an installer with not less than two years' experience in the installation of firestopping similar in material, design, and extent to that indicated for this Project.

3.6 SINGLE-SOURCE RESPONSIBILITY:

- A. Obtain through-penetration firestop systems for each kind of penetration and construction condition indicated from a single manufacturer.

3.7 PROVIDE FIRESTOPPING PRODUCTS CONTAINING NO DETECTABLE ASBESTOS AS DETERMINED BY THE METHOD SPECIFIED IN 40 CFR PART 763, SUBPART F, APPENDIX A, SECTION 1, "POLARIZED LIGHT MICROSCOPY."

3.8 COORDINATING WORK:

- A. Coordinate construction of openings and penetrating items to ensure that designated through-penetration firestop systems are installed per specified requirements.

3.9 EXAMINATION

- A. Examine substrates and conditions with installer present for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.10 PREPARATION

- A. Surface cleaning:

1. Clean out openings and joints immediately before installation of firestopping to comply with firestopping manufacturer's recommendations and the following requirements:

- a) Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.
- b) Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
- c) Remove laitance and form release agents from concrete.

- B. Masking tape:

1. Use masking tape to prevent firestopping from contact with the following:

- a) Adjoining surfaces that will remain exposed upon completion of Work.
- b) Surfaces that would otherwise be permanently stained or damaged by such contact or cleaning methods used to remove smears from firestopping materials.

2. Remove tape as soon as it is possible to do so without disturbing firestopping seal with substrates.

3.11 GENERAL FIRE STOPPING MATERIAL APPLICATION

- A. Clean all affected surfaces, joints, etc. immediately before applying fire stopping to comply with recommendations of manufacturer.
- B. Comply with fire stop material manufacturers' printed application instructions applicable to products and applications indicated, except where more stringent requirements apply.
- C. Install fire stop materials, including forming, packing, and other accessory materials, to fill openings around services penetrating floors and walls, to provide fire-stops with fire-resistance ratings indicated for floor or wall assembly in which penetration occurs. Comply with installation requirements established by testing and inspecting agency.
- D. Caulk between sleeves and pipes with rockwool and caulk around sleeves with sealing compound. Material must meet all applicable fire ratings required.
- E. Patch shall be equal to rockwool, firestop, caulk or approved "rated" patch.
- F. Where a smoke and/or fire-resistance classification is indicated on architectural drawings or otherwise, provide the following as applicable.

- G. Fire stop pillows, putty and/or sealant with minimum UL classification for 3 hour fire and cold side temperature ratings for all penetrations.
- H. Access door assembly with panel door, frame, hinge, and latch from manufacturer listed in the UL "Building Materials Directory" for rating required; Provide UL Label on each fire-rated access door.
- I. Wall and Floor Opening Fire Stopping for Open Cable Tray or J-Hook Paths
- J. Provide Fire Stop Pillows equal to Nelson FSP #AA500 PLW or #AA501 PLW or by Fire Protection Services, Inc.; 3M Fire Protection Products as required, UL Classified for 3 hour fire and cold side temperature ratings, quickly removable and reusable, non-toxic and requiring no special tools.
- K. Wall & Floor Opening Fire Stopping for Work Likely to Require Ongoing Moves, Adds and Changes
- L. All Work shall comply with manufacturer's written installation instructions.
 - 1. **Seal all holes to ensure a flame/gas/smoke resistant seal.**
 - 2. **Do not permit UL firestop systems to hamper the performance of fire dampers in ductwork.**

3.12 INSTALLING THROUGH-PENETRATION FIRESTOPS

- A. General:
 - 1. **Comply with the "System Performance Requirements" Article in Part 1 and the through-penetration firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.**
- B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:
 - 1. **Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.**
 - 2. **Apply materials so they contact and adhere to substrates formed by openings and penetrating items.**

3.13 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

- A. General:
 - 1. **Comply with the "System Performance Requirements" Article in Part 1, with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.**
- B. Install joint fillers to provide support of sealants during application and at the position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.
- C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint width at optimum sealant movement capability. Install sealants at the same time joint fillers are installed.
- D. Tool nonsag sealants immediately after sealant application and before skinning or curing begins. Form smooth, uniform beads of configuration indicated or as required to produce fire-resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do

not use tooling agents that discolor sealants or adjacent surfaces or that are not approved by the sealant manufacturer.

3.14 FIELD QUALITY CONTROL

- A. Do not proceed to enclose firestopping with other construction until examinations are completed.
- B. Where deficiencies are found, repair or replace firestopping at no additional expense to the Owner so that Work complies with requirements.

3.15 CLEANING

- A. Remove excess fill materials and sealants adjacent to openings and joints as Work progresses. Use methods and cleaning materials approved by manufacturers of firestopping products and products in which openings and joints occur. Return all surfaces to their original condition.
- B. During and after the curing period, protect firestopping from contact with contaminating substances and from damage resulting from construction operations or other causes so that they are without deterioration or damage or at time of Substantial Completion.
 - 1. **If damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to produce firestopping complying with specified requirements.**

END OF SECTION 27 05 50

SECTION 27 05 53 - IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

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. Supplementary to Division 1, Refer to Division 27 Section(s) for additive information where applicable.

1.2 SUMMARY

- A. Section Includes:
 - 1. Labeling of Communications Systems
 - 2. Labeling of Life Safety and Security Systems
 - a) This Section is a "Common Work Results" Section that includes information that is applicable and "Related" to all Division 27 Sections.
 - 3. System includes but is not limited to:
 - a) Labels
- B. Related Sections
 - 1. All Division 27 Sections
- C. Related Drawings
 - 1. Technology (T-Series) Drawings

1.3 REFERENCES

- A. "TELECOMMUNICATIONS DISTRIBUTION METHODS MANUAL" published by the Building Industry Consulting Services International (BISCI).

1.4 SYSTEM DESCRIPTION / DESCRIPTION OF WORK

- A. Furnish and install labeling for all Communication products, including but not limited to:
 - 1. Patch panels
 - 2. Device plates
 - 3. Cabling
 - 4. Equipment racks
 - 5. Building Distribution Frame <BDF>/Entrance Facility <EF>
 - 6. Equipment room(s) <ERxxxx>
 - 7. Telecommunications room(s) <TRxxx>
 - 8. Structured cabling, including horizontal and backbone cabling
 - 9. Communications cabling cross-connects
 - 10. Communications backboards
- B. Labeling system shall be an ANSI/TIA/EIA-606 compliant system - The Administrative Standard for the Telecommunications Infrastructure of Commercial Building Identification System.
 - 1. See Drawings for graphical representation.

1.5 SUBMITTALS

- A. General

1. Product Data and Shop Drawing submittals for work of this section shall be SUBMITTED TOGETHER, complete, as a single submittal. Product Data and Shop Drawings are not to be submitted separately.
2. Samples shall be submitted with or immediately following submission of Product Data submittals.
- B. Product Data
 1. Manufacture datasheets for all labels
- C. Shop Drawings
 1. Labeling system diagram, detailed.
- D. Quality Assurance
 1. RCDD Certificate for the Contractor's staff member(s) with ultimate responsibility for ensuring Contractor compliance with work of this section.
 2. BISCO Technician Certificate for the technicians performing work of this section
- E. Closeout Submittals
 1. A diagram of the labeling scheme used on the Project.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Brady
- B. Panduit
- C. Hellerman/Tyton
- D. Brother

2.2 GENERAL

1. This section is designed to provide the Contractor with a minimum standard of quality and functionality for the products used for telecommunications infrastructure.
2. This standard will be considered in force for the original response as well as for any additions or changes to this Project. Due to this, there may be items listed in the Products section that are not required under the scope of this contract.
3. Products required by the Drawings but not listed in Part 2, will be evaluated as a performance specification based on the information provided on the Drawings.

2.3 LABELS

- A. Labels
 1. Labels shall have a white background and black print.
 2. Provide alphanumeric, clearly typewritten labels at all designated points as follows:
 - a) Horizontal Cables
 - 1) 4 pair UTP cables
 - i) Standard of quality shall be Brady PTL-31-642
 - 2) 4 pair STP cables
 - i) Standard of quality shall be Brady PTL-21-642
 - 3) RG-6 Coaxial
 - i) Standard of quality shall be Brady PTL-31-642
 - b) Telecommunications outlet port
 - 1) Standard of quality shall be Panduit PLL-46-Y2-1
 - c) Telecommunications outlet faceplate:
 - 1) Standard of quality shall be Panduit JLEFPS-1
 - d) Patch panel ports
 - 1) Standard of quality shall be Panduit JLCPL-1

- e) Patch Panels
 - 1) Standard of quality shall be Brady PTL-20-422
- f) Backbone cables
 - 1) 100 pair Copper cables
 - i) Standard of quality shall be Brady PTL-34-642
 - 2) Fiber Optic Cables
 - i) Standard of quality shall be Brady PTL-21-642
 - 3) Cable Bundles
 - i) Standard of quality shall be Brady PTL-12-109
 - 4) 110 style blocks
 - i) Standard of quality shall be Panduit DSL-110
 - ii) Use with Panduit P110LH
 - 5) Telecommunications Backboards
 - i) Standard of quality shall be Brady PTL-37-422
 - 6) Racks and Cabinets
 - i) Standard of quality shall be Brady PTL-42-422

PART 3 EXECUTION

3.1 GENERAL

- A. This section is designed to provide the vendor with a standard of quality and functionality for the installation of technology systems infrastructure. Not all procedures will be necessary for the installation of this Project. However, this standard will be considered in force for the original response as well as for any additions or changes to this Project.
- B. Contractor SHALL work with Owners Telecommunications representative to gain approval of labeling plan BEFORE any cable labeling is started.
- C. Jacks in patch panels shall be installed with room numbers in sequential numerical order and in floor order.

3.2 INSTALLATION

- A. Labels
 - 1. Apply all labels shall be installed parallel to the dominate visual lines of the product being labeled.
 - 2. Labels shall be clearly legible and appropriately sized for the application.
 - 3. Provide alphanumeric, clearly typewritten labels at all designated points as follows:
 - a) See for graphical representation of labeling scheme.
 - b) Horizontal cabling:
 - 1) Cabling to ER/TR from outlets and devices
 - i) ER/TR # - Outlet Room Number - Patch Panel #/Port #.
 - ii) Example: ER01-211-B22 where Equipment Room is identified as ER01, the cable travels to room 211 and the cable is landed on patch panel B position 22 (of 48) in the ER.
 - iii) Locate label on cable jacket between 3 and 6 inches of each end of the cable.
 - 2) Cabling between horizontal outlets/devices
 - i) Label local input cables.
 - ii) Locate label on cable jacket between 3 and 6 inches of each end of the cable.
 - iii) Label each cable as to its signal type, purpose, and destination. Add a numeric suffix to uniquely identify multiple cables of duplicate signal type, purpose or destination.
 - c) Telecommunications outlet ports and faceplates:
 - 1) ER/TR# - Outlet Room Number – Patch panel #/ Jack #.

- 2) Example: ER01-211 faceplate number and B22 through B25 jack numbers for a 4 port faceplate where Equipment Room is identified as ER01, the cable is landed on patch panel B position 22 through 25 (of 48) in the ER and travels to room 211.
- 3) Locate the faceplate label, excluding the jack designation at the top of the faceplate. Locate the individual jack designation numbers immediately above each jack on the faceplate.
- 4) Label local input terminations as follows: F Connector – Camera, RCA yellow – Local Video, RCA white – L Audio, RCA red – R Audio, BNC – Local Video, Horizontal UTP – Local Control.
- d) Patch panels and patch panel ports:
 - 1) Label each patch panel A-Z, top-to-bottom
 - i) Locate label on the front upper left corner of all patch panels
 - 2) Locate on the front of all patch panels, directly above or below (as indicated by the manufacturer) each jack position (1 through 24) in the patch panel; place the room number corresponding to the room number used on the faceplate for each port.
 - 3) Labeling shall be in numerical order and correspond to the telecommunications outlet faceplate scheme.
- e) Backbone cabling:
 - 1) Service designation – ER#/TR#.
 - 2) Service designation – CB = Copper Backbone, FB = Fiber Backbone, VB = Video Backbone. Example: CB – ER01/TR02.
 - 3) Locate label on cable jacket within 6 inches of each end of the cable and at key pull points along pathway.
- f) Cross-connect blocks, 110 style
 - 1) Locate on the front of all patch panels directly above or below (as indicated by the manufacturer) each position in the block.
 - 2) Labeling shall be in numerical order and correspond to the telecommunications outlet faceplate scheme or opposite end labeling dependant on use.
 - 3) Label the upper left corner of each block designating the service of that particular block. Do not terminate mixed services on the same block.
- g) Cross-connect blocks, 66 style
 - 1) Locate on the front of all patch panels directly above or below (as indicated by the manufacturer) each position in the block.
 - 2) Labeling shall be in numerical order and correspond to the telecommunications outlet faceplate scheme or opposite end labeling dependant on use.
 - 3) Label the upper left corner of each block designating the service of that particular block. Do not terminate mixed services on the same block.
- h) Communications Backboards (TBB)
 - 1) Backboard # with the prefix TBB, followed by the numeric backboard number in the room, followed by the suffix identifying the room in which the backboard is located. Example: TBB-01-ER-xxx.
 - 2) Label each 4'x8' sheet and each partial sheet, in numerical order left-to-right as facing the front of the backboards.
- i) Equipment Racks
 - 1) Device ID. Example: ER01 – 02.
 - 2) Label each cabinet/rack in numerical order left-to-right as facing front of cabinet/rack bays.
- j) Telephone Patch Cables
 - 1) Labeled with the same unique identifier at both ends of the assembly.

3.3 TRAINING

- A. Conduct a walk through of the project site and demonstrate the presence and location of all key labeling elements used.
- B. Furnish handouts to all owner personnel attending training that clearly depicts the labeling schema used on the project.

END OF SECTION 27 05 53

ISU Science Rooms 018, 022, 138
Indiana State University
D&A#26057

IDENTIFICATION FOR
COMMUNICATIONS SYSTEMS
27 05 53 - 6
R.E. Dimond & Associates, Inc.

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SECTION 27 08 10 - VERIFICATION TESTING OF STRUCTURED CABLING

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. Supplementary to Division 1, Refer to Division 27 Section(s) for additive information where applicable.

1.2 SUMMARY

- A. Section Includes:
 - 1. The work covered by this Specification Section includes any and all requirements for this type work required for proper Commissioning of work specified in each related Division 27 Specification Section and/or as shown on the Drawings.
 - 2. Provide all labor, materials, tools, field-test instruments and equipment required for the complete testing of the work called for in the Contract Documents.
 - a) This Section is a "Common Work Results" Section that includes information that is applicable and "Related" to all Division 27 Sections.
- B. Related Sections
 - 1. All Division 27 Sections
- C. Related Drawings
 - 1. Technology (T-Series) Drawings

1.3 REFERENCES

- A. All testing procedures and field-test instruments shall comply with applicable requirements of:
 - 1. ANSI Z136.2, ANS For Safe Use Of Optical Fiber Communication Systems Utilizing Laser Diode And LED Sources
 - 2. ANSI/EIA/TIA-455-50B, Light Launch Conditions For Long-Length Graded-Index Optical Fiber Spectral Attenuation Measurements
 - 3. ANSI/TIA/EIA-455-59A, Measurement of Fiber Point Discontinuities Using an OTDR.
 - 4. ANSI/TIA/EIA-455-133A, Measurement of Fiber or Cable Length Using an OTDR.
 - 5. ANSI/TIA/EIA-455-61A, Measurement of Fiber or Cable Attenuation Using an OTDR.
 - 6. ANSI/TIA/EIA-526-7, Optical Power Loss Measurements of Installed Singlemode Fiber Cable Plant.
 - 7. ANSI/TIA/EIA-526-14-A, Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant.
 - 8. ANSI/TIA/EIA-568-C.1, Commercial Building Telecommunications Cabling Standard,
 - 9. TIA/EIA TSB-140, Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems.
- B. ANSI/TIA/EIA-568-C.2 – Balanced Twisted Pair Telecommunications Cabling and Components Standard
- C. ANSI/TIA/EIA-568-C.3 – Optical Fiber Cabling Components Standard
- D. ANSI/TIA/EIA-568-C.4 – Standard on Coaxial Cabling Components
- E. "TELECOMMUNICATIONS DISTRIBUTION METHODS MANUAL" published by the Building Industry Consulting Services International (BISCI).

1.4 SYSTEM DESCRIPTION / DESCRIPTION OF WORK

A. General

1. Testing shall be carried out in accordance with this document.
2. Testing shall be performed on each cabling link (connector to connector).
3. Testing shall not include any active devices or passive devices within the link other than cable, connectors, and splices.
 - a) Link attenuation does not include such devices as optical bypass switches, couplers, repeaters, or optical amplifiers.
4. Contractor shall maintain and provide to ISU a Microsoft Excel spreadsheet in electronic format of all connections installed with the following fields filled out. **NO DATA PORTS WILL BE ACTIVATED UNTIL THIS SHEET IS PROVIDED FULLY FILLED OUT TO OWNER:**
 - a) Room Number
 - b) Jack Label
 - c) Wire label
 - d) IDF Room Number
 - e) Rack Label for patch panel
 - f) Patch Panel label
 - g) Patch panel port
 - h) Cable Length
 - i) Data switch rack label (if connected to data switch)
 - j) Data switch label (if connected to data switch)
 - k) Data switch port number (if connected to data switch)

B. Copper (Twisted Pair) Testing

1. Copper Cat 6A Installation: field test requirements upon completion of the installation
 - a) General Requirements (Category 6A)
 - 1) Every cabling link in the installation shall be tested in accordance with the field test specifications defined in ANSI/TIA/EIA-568B-2.10 "*Transmission Performance Specifications for 4-pair 100Ω Category 6A Cabling*". This document will be referred to as the "TIA Cat 6A Standard."
 - 2) The installed twisted-pair horizontal links shall be tested from the MDF/IDF (ER/TR) in the telecommunications room to the telecommunication wall outlet in the work area against the "*Permanent Link*" performance limits specification as defined in the TIA Cat 6A Standard.
 - 3) One hundred percent of the installed cabling links must be tested and must pass the requirements of the standards mentioned above and as further detailed in Part 3. Any failing link must be diagnosed and corrected. The corrective action shall be followed with a new test to prove that the corrected link meets the performance requirements. The final and passing result of the tests for all links shall be provided in the test results documentation (below).
 - b) Qualifications
 - 1) Trained technicians who have successfully attended an appropriate training program and have obtained a certificate as proof thereof shall execute the tests. Appropriate training programs include but are not limited to installation certification programs provided by BiCSI or the ACP (Association of Cabling Professionals).
 - c) Coordination/Verification:
 - 1) **A representative of the Owner shall be invited to witness field testing. The representative shall be notified of the start date of the testing phase five business days before testing commences.**
 - 2) A representative of the Owner may elect to select a random sample of 5% of the installed links. The representative (or his authorized delegate) shall test

these randomly selected links and the results are to be stored in accordance with the prescriptions in Section A.3. The results obtained shall be compared to the data provided by the installation contractor. If more than 2% of the sample results differ in terms of the pass/fail determination, the installation contractor under supervision of the end-user representative **shall repeat 100% testing and the cost shall be borne by the installation contractor.**

C. FIBER OPTIC Testing

1. GENERAL

- a) The testing Tier shall be as indicated on the Detail Drawings.
 - 1) Testing Tiers requirements are as described below.
 - 2) If not otherwise noted:
 - i) All fiber optic Intra-Building Links shall be tested as Tier 1.
 - ii) All fiber optic Inter-Building Links shall be tested as Tier 2.
- b) Every fiber optic cabling link in the installation shall be tested in accordance with the field test specifications defined by the Telecommunications Industry Association (TIA) standards ANSI/TIA/EIA-568-C.1, "*Commercial Building Telecommunications Cabling Standard, Part 1, General Requirements*," and TIA/EIA TSB140, "*Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems*."
- c) ANSI/TIA/EIA-568-B.1, defines the passive cabling network, to include cable, connectors, and splices (if present), between two optical fiber patch panels (connecting hardware). The test does not, however, include the performance of the connector at the interface with the test equipment.
- d) 100% of the installed cabling links must be tested and must pass the requirements as specified within this document. Any failing link must be diagnosed and corrected. The corrective action shall be followed with a new test to prove that the corrected link meets the performance requirements. The final and passing result of the tests for all links shall be provided in the test results documentation in accordance Part 3.
- e) The Pass or Fail condition for the link-under-test is determined by the results of the required individual tests in Part 3.
- f) A Pass or Fail result for each parameter is determined by comparing the measured values with the specified test limits for that parameter.

2. Qualifications

- a) Trained technicians who have successfully attended an appropriate training program, which includes testing with an OLTS and an OTDR and have obtained a certificate as proof thereof shall execute the tests. These certificates may have been issued by any of the following organizations or an equivalent organization.
 - 1) Manufacturer of the fiber optic cable and/or the fiber optic connectors.
 - 2) Manufacturer of the test equipment used for the field certification.
 - 3) Training organizations (e.g., BICSI, A Telecommunications Association headquarters in Tampa, Florida; ACP [Association of Cabling Professionals™] Cabling Business Institute located in Dallas, Texas)

3. Coordination/Verification

- a) The Owner or the Owner's representative shall be invited to witness and/or review field-testing.
 - 1) **The Owner or the Owner's representative shall be notified of the start date of the testing phase five (5) business days before testing commences.**
 - 2) The Owner or the Owner's representative will select a random sample of 5% of the installed links. The Owner or the Owner's representative shall test these randomly selected links and the results are to be stored in accordance

with Part 3 of this document. The results obtained shall be compared to the data provided by the installation contractor. If more than 2% of the sample results differ in terms of the pass/fail determination, ***the installation contractor under supervision of the representative shall repeat 100% testing at no cost to the Owner.***

- 3) All tests shall be documented including OLTS dual wavelength attenuation measurements for multimode and singlemode links and channels and OTDR traces and event tables for multimode and singlemode links and channels.
4. Acceptance of test results.

- a) Unless otherwise specified by the Owner or the Owners representative, each cabling link shall be in compliance with the following test limits:

- 1) Optical loss testing

- i) Backbone (multimode and singlemode) link

- (A) The link attenuation shall be calculated by the following formulas as specified in ANSI/TIA/EIA-568-B.1.

- (1) Link Attenuation (dB) = Cable_Attn (dB) + Connector_Attn (dB) + Splice_Attn (dB)
- (2) Cable_Attn (dB) = Attenuation_Coefficient (dB/km) * Length (Km)
- (3) Connector_Attn (dB) = number_of_connector_pairs * connector_loss (dB)
- (4) Maximum allowable connector_loss = 0.75 dB
- (5) Splice_Attn (dB) = number_of_splices * splice_loss (dB)
- (6) Maximum allowable splice_loss = 0.3 dB
- (7) The values for the Attenuation_Coefficient (dB/km) are listed in the table below:

Type of Optical Fiber	Wavelength (nm)	Attenuation coefficient (dB/km)	Wavelength (nm)	Attenuation coefficient (dB/km)
Multimode 62.5/125 µm	850	3.5	1300	1.5
Multimode 50/125 µm	850	3.5	1300	1.5
Single-mode (Inside plant)	1310	1.0	1550	1.0
Single-mode (Outside plant)	1310	0.5	1550	0.5

- ii) Horizontal (multimode) link

- (A) The acceptable link attenuation for a multimode horizontal optical fiber cabling system is based on the maximum 90 m (295 ft) distance.
- (B) The horizontal link may be tested using a fixed upper limit for attenuation of 2.0 dB. This value is based on the loss of two (2) connector pairs, one pair at the telecommunications outlet/connector and one pair at the horizontal cross-connect, plus 90 m (295 ft) of optical fiber cable.
- (C) A horizontal link in an Open Office Cabling network with a consolidation point may be tested using a fixed upper limit for attenuation of 2.75 dB.

- iii) Centralized (multimode) link

- (A) The acceptable link attenuation for a multimode centralized optical fiber cabling system is based on the maximum 300 m (984 ft) distance.
- (B) The centralized link may be tested using a fixed upper limit for attenuation of 3.3 dB. This value is based on the loss of three (3) connector pairs, one pair at the telecommunications

- outlet/connector, one pair at the consolidation point and one pair at the horizontal cross-connect, plus 300 m (984 ft) of optical fiber cable.
- (C) A horizontal link in an Open Office Cabling network with a consolidation point may be tested using a fixed upper limit for attenuation of 4.1 dB.
- 2) OTDR testing
 - i) Reflective events (connections) shall not exceed 0.75 dB.
 - ii) Non-reflective events (splices) shall not exceed 0.3 dB.
 - 3) Magnified endface inspection
 - i) Fiber connections shall be visually inspected for endface quality.
 - ii) Scratched, pitted or dirty connectors shall be diagnosed and corrected.
 - b) All installed cabling links and channels shall be field-tested and pass the test requirements and analysis as described in Part 3. Any link or channel that fails these requirements shall be diagnosed and corrected. Any corrective action that must take place shall be documented and followed with a new test to prove that the corrected link or channel meets performance requirements. The final and passing result of the tests for all links and channels shall be provided in the test results documentation in accordance with Part 3.
 - c) Acceptance of the test results shall be given in writing after the project is fully completed and tested in accordance with Contract Documents and to the satisfaction of the Owner.

1.5 SUBMITTALS

A. General

- 1. Product Data and Shop Drawing submittals for work of this section shall be SUBMITTED TOGETHER, complete, as a single submittal. Product Data and Shop Drawings are not to be submitted separately.
- 2. Samples shall be submitted with or immediately following submission of Product Data submittals.

B. Equipment Data

- 1. Manufacture datasheets for all twisted pair test equipment
- 2. Manufacturers datasheets for fiber optic field-test instruments including optical loss test sets (OLTS; power meter and source), optical time domain reflectometer (OTDR) and inspection scope as applicable.

C. Quality Assurance / Control Submittals

- 1. RCDD Certification for the staff member responsible for this project.
- 2. Resume of the last 10 projects of the RCDD responsible for this project
- 3. BICSI Technician's certificate for each lead Technician(s) on the project

D. Closeout Submittal

- 1. Copper (Twisted Pair) Test Result Documentation
 - a) The test result information for each link shall be recorded in the memory of the field tester upon completion of the test.
 - b) The test result records saved by the tester shall be transferred into a Windows™-based database utility that allows for the maintenance, inspection and archiving of these test records. A guarantee must be made that these results are transferred to the PC unaltered, i.e., "as saved in the tester" at the end of each test. The popular 'csv' format (comma separated value format) does not provide adequate protection and shall not be acceptable unless specified by the end user.
 - c) The database for the completed job, including twisted-pair copper cabling links if applicable, shall be stored and delivered on USB flash drive. This USB flash drive

shall include the software tools required to view, inspect, and print any selection of test reports.

- d) Circuit IDs reported by the test instrument shall match the specified label ID.
 - e) A copy of the test results shall be provided that lists all the links that have been tested with the following summary information. The copy may be delivered on paper or electronically as specified by the end user.
 - 1) The identification of the link in accordance with the naming convention defined in the overall system documentation
 - 2) The overall Pass/Fail evaluation of the link-under-test
 - 3) The date and time the test results were saved in the memory of the tester
 - f) General Information to be provided in the electronic data base containing the test result information for each link:
 - 1) The identification of the customer site as specified by the end-user
 - 2) The overall Pass/Fail evaluation of the link-under-test
 - 3) The name of the standard selected to execute the stored test results
 - 4) The value of the NVP of the cable installed; used for length calculations
 - 5) The date and time the test results were saved in the memory of the tester
 - 6) The brand name, model and serial number of the tester
 - 7) The revision of the tester software and the revision of the test standards database in the tester
 - g) The detailed test results data to be provided in the electronic database for each tested link must contain the information as set forth in Part 3.
2. Fiber Optic Test Result Documentation
- a) The OLTS and OTDR test result information for each link shall be recorded in the memory of the field tester upon completion of the test.
 - b) The test result records saved by the tester shall be transferred into a Windows™-based database utility that allows for the maintenance, inspection and archiving of these test records. A guarantee must be made that these results are transferred to the PC unaltered, i.e., "as saved in the tester" at the end of each test. The popular 'csv' format (comma separated value format) does not provide adequate protection and shall not be acceptable unless specified by the end user.
 - c) The database for the completed job, including twisted-pair copper cabling links if applicable, shall be stored and delivered on USB flash drive. This USB flash drive shall include the software tools required to view, inspect, and print any selection of test reports.
 - d) Circuit IDs reported by the test instrument shall match the specified label ID.
 - e) A copy of the test results shall be provided that lists all the links that have been tested with the following summary information. The copy may be delivered on paper or electronically as specified by the end user.
 - 1) The identification of the link in accordance with the naming convention defined in the overall system documentation
 - 2) The overall Pass/Fail evaluation of the link-under-test
 - 3) The date and time the test results were saved in the memory of the tester
 - f) General Information to be provided in the electronic data base containing the test result information for each link:
 - 1) The identification of the customer site as specified by the end-user
 - 2) The overall Pass/Fail evaluation of the link-under-test
 - 3) The name of the standard selected to execute the stored test results
 - 4) The value of the 'index of refraction' used for length calculations
 - 5) The date and time the test results were saved in the memory of the tester
 - 6) The brand name, model and serial number of the tester
 - 7) The revision of the tester software and the revision of the test standards database in the tester

- g) The detailed test results data to be provided in the electronic database for each tested optical fiber must contain the following information
 - 1) The identification of the link/fiber in accordance with the naming convention defined in the overall system documentation
 - 2) Tier 1:
 - (A) The insertion loss (attenuation) measured at each wavelength, the test limit calculated for the corresponding wavelength and the margin (difference between the measured attenuation and the test limit value).
 - (B) The link length shall be reported for each optical fiber for which the test limit was calculated based on the formulas above.
 - 3) Tier 2:
 - i) All Tier 1 test results.
 - ii) The overall OTDR loss (attenuation) and length.
 - iii) The OTDR event loss at each wavelength and event location.
 - iv) The OTDR trace at each wavelength.
 - 4) Tier 3:
 - i) All Tier 1 and 2 test results.
 - ii) A picture of the magnified connector endface.
 - iii) The pass status based upon visual inspection.

PART 2 PRODUCTS

A. Copper (Twisted Pair) Test Equipment

1. Category 6A Compliance

- a) The test equipment (tester) shall comply with the accuracy requirements for level III field testers as defined in the TIA Cat 6A Document. The tester including the appropriate interface adapter must meet the specified accuracy requirements. The accuracy requirements for the permanent link test configuration (baseline accuracy *plus* adapter contribution) are specified in Table B.2.10 of the TIA Cat 6A Standard.
 - b) The test plug shall fall within the values specified in E.3.2.2 Modular test plug NEXT loss requirements of the TIA Cat 6A Standard.
 - c) The tester shall be within the calibration period recommended by the vendor in order to achieve the vendor-specified measurement accuracy.
 - d) The tester interface adapters must be of high quality and the cable shall not show any twisting or kinking resulting from coiling and storing of the tester interface adapters. In order to deliver optimum accuracy, preference is given to a permanent link interface adapter for the tester that can be calibrated to extend the reference plane of the Return Loss measurement to the permanent link interface. The contractor shall provide proof that the interface has been calibrated within the period recommended by the vendor. To ensure that normal handling on the job does not cause measurable Return Loss change, the adapter cord cable shall not be of twisted-pair construction.
 - e) The Pass or Fail condition for the link-under-test is determined by the results of the required individual tests (detailed in Part 3). Any Fail or Fail* result yields a Fail for the link-under-test. In order to achieve an overall Pass condition, the results for each individual test parameter must Pass or Pass*.
 - f) A Pass or Fail result for each parameter is determined by comparing the measured values with the specified test limits for that parameter. The test result of a parameter shall be marked with an asterisk (*) when the result is closer to the test limit than the accuracy of the field tester. The field tester manufacturer must provide documentation as an aid to interpret results marked with asterisks.
2. Utilize the appropriate test equipment as manufactured by Datacom Technologies, Fluke, MicroTest, Scope, WaveTek, WireScope or approved equal. Print test results from the

test unit used. Documentation shall include meter catalog number, serial number, manufacturer, cable identifier, Equipment Room/Telecommunications Room identifier, cable type, NVP settings, meter readings, test date, calibration information, and operator responsible for tests.

B. Fiber Optic Test Equipment

1. The test equipment shall be within the calibration period recommended by the manufacturer.
2. Fiber optic test jumpers and adapters shall be of high quality and shall not show excessive wear.
3. Optical Loss Test Set (OLTS)
 - a) An OLTS is comprised of two components: an optical light source and an optical power meter. After making a reference measurement, the source and meter are located at opposite ends of the fiber under test. A source and meter may be contained within the same package to enable bi-directional testing without swapping end test equipment.
 - b) Multimode optical fiber light source
 - 1) Provide dual LED light sources with central wavelengths of 850nm (± 30 nm) and 1300nm (± 20 nm).
 - 2) Output power of -20dB minimum.
 - 3) Shall meet the requirements of ANSI/TIA/EIA-526-14A. The light source shall meet the launch requirements of ANSI/EIA/TIA-455-50B, Method A. This launch condition can be achieved either within the field test equipment or by use of an external mandrel wrap (as described in clause 11 of ANSI/TIA/EIA-568-B.1) with a Category 1 light source.
 - c) Singlemode optical fiber light source
 - 1) Provide dual laser light sources with central wavelengths of 1310nm (± 20 nm) and 1550nm (± 20 nm).
 - 2) Output power of -10dB minimum.
 - 3) Shall meet the requirements of ANSI/EIA/TIA-526-7.
 - d) Power Meter
 - 1) Provide 850nm, 1300nm, 1310nm and 1500nm wavelength test capability
 - 2) Shall meet the requirements of ANSI/EIA/TIA-526-14A and ANSI/EIA/TIA-526-7.
 - 3) Power measurement uncertainty of ± 0.25 dB.
 - 4) Store reference power measurement.
 - 5) Save at least 100 results in internal memory.
 - 6) PC interface (serial or USB)
 - e) Optional requirements that lead to faster, more efficient testing
 - 1) Dual-wavelength single-adapter light source
 - 2) Dual-fiber automated testing
 - 3) Fiber length measurement using time-of-flight technology
 - 4) Automated loss budget calculation and pass/fail analysis
 - f) Optical Time Domain Reflectometer (OTDR)
 - 1) Shall have a bright, color transmissive LCD display with backlight.
 - 2) Shall have rechargeable Li-Ion battery for 8 hours of normal operation.
 - 3) Weight with battery and module of not more than 4.5lb and volume of not more 200in³.
 - 4) Internal non-volatile memory and removable memory device with at least 16MB capacity for results storage.
 - 5) Serial and USB ports to transfer data to a PC.
 - 6) Multimode OTDR
 - i) Wavelengths of 850nm (± 20 nm) and 1300nm (± 20 nm).

- ii) Event deadzones of 1m maximum at 850nm and 2m maximum at 1300nm.
 - iii) Attenuation deadzones of 6m maximum at 850nm and 15m maximum at 1300nm.
 - iv) Distance range at least 2000m.
 - v) Dynamic range at least 10dB at 850nm and 1300nm.
- g) Optional requirements
 - 1) Integrated OLTS
 - 2) Integrated optical power meter
 - 3) Integrated video microscope
- 4. Fiber Microscope
 - a) Magnification of 250X or 400X for endface inspection
 - b) Optional requirements
 - 1) Video camera and display showing magnified endface image
 - 2) Camera probe tips permitting inspection through adapters
 - 3) Capability to save image
 - c) Standard of Quality Shall be Westover Scientific

PART 3 EXECUTION

3.1 GENERAL

- A. All tests performed on optical fiber cabling that use a laser or LED in a test set shall be carried out with safety precautions in accordance with ANSI Z136.2.
- B. All outlets, cables, patch panels and associated components shall be fully assembled and labeled prior to field-testing. Any testing performed on incomplete systems shall be redone on completion of the work.

3.2 COPPER (TWISTED PAIR) TESTING

- A. General
 - 1. Field-test instruments shall have the latest software and firmware installed.
 - 2. Link test results from the Test Equipment shall be recorded in the test instrument upon completion of each test for subsequent uploading to a PC in which the administrative documentation (reports) may be generated.
 - 3. Testing shall be performed on each cabling segment (panel to connector or connector to connector).
 - 4. Testing of the cabling shall be performed using high-quality test cords of the same Category and manufacturer as the cabling under test.
- B. Performance Test Parameters (Category 6A)
 - 1. The test parameters for Cat 6A are defined in TIA Cat 6A standard, which refers to the ANSI/TIA/EIA-568B-2.10 standard. Test results shall at a minimum show alien attenuation crosstalk ratio far-end (AACRF), alien far-end crosstalk (AFEXT), alien near-end crosstalk (ANEXT), power sum alien attenuation crosstalk ratio far-end (PSAACRF), power sum alien far-end crosstalk (PSAFEXT), and power sum alien near-end crosstalk (PSANEXT).

3.3 OPTICAL FIBER CABLE TESTING

- A. General
 - 1. Field-test instruments shall have the latest software and firmware installed.
 - 2. Link and channel test results from the OLTS and OTDR shall be recorded in the test instrument upon completion of each test for subsequent uploading to a PC in which the administrative documentation (reports) may be generated.

3. Fiber endfaces shall be inspected at 250X or 400X magnification. 250X magnification is suitable for inspecting multimode and singlemode fibers. 400X magnification may be used for detailed examination of singlemode fibers. Scratched, pitted or dirty connectors shall be diagnosed and corrected.
 - a) It is preferable that the endface images be recorded in the memory of the test instrument for subsequent uploading to a PC and reporting.
 4. Testing shall be performed on each cabling segment (connector to connector).
 5. Testing shall be performed on each cabling channel (equipment to equipment) that is planned for use per the owner's instructions.
 6. Testing of the cabling shall be performed using high-quality test cords of the same fiber type as the cabling under test. The test cords for OLTS testing shall be between 1 m and 5 m in length. The test cords for OTDR testing shall be approximately 100 m for the launch cable and at least 25 m for the receive cable.
- B. Performance Test Parameters
1. Three tiers of certification are available that vary in thoroughness of infrastructure analysis.
 - a) Tier 1: optical loss testing
 - b) Tier 2: optical loss and OTDR testing
 - c) Tier 3: optical loss and OTDR testing and magnified endface inspection
 2. Tier 3 certification is recommended unless otherwise specified by the end-user.
 3. Optical loss testing (Tiers 1, 2 and 3)
 - a) Backbone link: The backbone link shall be tested bi-directionally at both operating wavelengths to account for attenuation deltas associated with wavelength. Because backbone length and the potential number of splices vary depending upon site conditions, the link attenuation equation (Section C.3.iv) shall be used to determine limit (acceptance) values.
 - 1) Multimode backbone links shall be tested at 850 nm and 1300 nm in accordance with ANSI/EIA/TIA-526-14A, Method B, One Reference Jumper or the equivalent method.
 - 2) Singlemode backbone links shall be tested at 1310 nm and 1550 nm in accordance with ANSI/TIA/EIA-526-7, Method A.1, One Reference Jumper or the equivalent method.
 - 3) The link attenuation shall be calculated by the following formulas as specified in ANSI/TIA/EIA standard 568-B
 - 4) Link Attenuation (dB) = Cable_Attn (dB)+ Connector_Attn (dB) + Splice_Attn (dB)
 - i) Cable_Attn (dB) = Attenuation_Coefficient (dB/km) * Length (Km)
 - ii) Connector_Attn (dB) = number_of_connector_pairs * connector_loss (dB)
 - iii) Maximum allowable connector_loss = 0.75 dB
 - iv) Splice_Attn (dB) = number_of_splices (S) * splice_loss (dB)
 - v) Maximum allowable splice_loss = 0.3 dB
 - vi) The values for the Attenuation_Coefficient (dB/km) are listed in the table below:

Type of Optical Fiber	Wavelength (nm)	Attenuation coefficient (dB/km)	Wavelength (nm)	Attenuation coefficient (dB/km))
Multimode 62.5/125 µm	850	3.5	1300	1.5
Multimode 50/125 µm	850	3.5	1300	1.5

Single-mode (Inside plant)	1310	1.0	1550	1.0
Single-mode (Outside plant)	1310	0.5	1550	0.5

- 5) Link attenuation does not include any active devices or passive devices other than cable, connectors, and splices, i.e. link attenuation does not include such devices as optical bypass switches, couplers, repeaters, or optical amplifiers.
- 6) The above link test limits attenuation are based on the use of the One Reference Jumper Method specified by ANSI/TIA/EIA-526-14A, Method B and ANSI/TIA/EIA-526-7, Method A.1; or the equivalent method. The user shall follow the procedures established by these standards or application notes to accurately conduct performance testing.
- b) Horizontal (multimode) link: The acceptable link attenuation for a multimode horizontal optical fiber cabling system is based on the maximum 90 m (295 ft) distance. The horizontal optical fiber cabling link segments need to be tested at only one (1) wavelength. Because of the short length of cabling, attenuation deltas due to wavelength are insignificant. The horizontal link should be tested at 850 nm or 1300 nm in one direction in accordance with ANSI/EIA/TIA-526-14A, Method B, One Reference Jumper method.
 - 1) The horizontal link may be tested using a fixed upper limit for attenuation of 2.0 dB. This value is based on the loss of two (2) connector pairs, one pair at the telecommunications outlet/connector and one pair at the horizontal cross-connect, plus 90 m (295 ft) of optical fiber cable.
 - 2) A horizontal link in an Open Office Cabling network with a consolidation point may be tested using a fixed upper limit for attenuation of 2.75 dB.
- c) Centralized (multimode) link: The acceptable link attenuation for a multimode centralized optical fiber cabling system is based on the maximum 300 m (984 ft) distance. The centralized optical fiber cabling link segments need to be tested at only (1) wavelength. Because of the short length of cabling, attenuation deltas due to wavelength are insignificant. The horizontal link should be tested at 850 nm or 1300 nm in one direction in accordance with ANSI/EIA/TIA-526-14A, Method B, One Reference Jumper method. Testing at 850 nm is recommended unless otherwise specified by the end user.
 - 1) The centralized link may be tested using a fixed upper limit for attenuation of 3.3 dB. This value is based on the loss of three (3) connector pairs, one pair at the telecommunications outlet/connector, one pair at the consolidation point and one pair at the horizontal cross-connect, plus 300 m (984 ft) of optical fiber cable.
 - 2) A horizontal link in an Open Office Cabling network with a consolidation point may be tested using a fixed upper limit for attenuation of 4.1 dB.
- d) Optional requirements:
 - 1) Each horizontal and centralized link shall be tested bi-directionally since the direction of the signal transmission often cannot be predicted at the time of installation. This is especially true for non-polarized connectors.
 - 2) Each horizontal and centralized link shall be tested at both 850nm and 1300nm to confirm no attenuation differences due to wavelength even over short links.
4. OTDR Testing (Tiers 2 and 3).
 - a) Backbone, horizontal and centralized links shall be tested at the appropriate operating wavelengths for anomalies and to ensure uniformity of cable attenuation and connector insertion loss.
 - 1) Backbone multimode: 850nm and 1300nm
 - 2) Backbone singlemode: 1310nm and 1550nm

- 3) Horizontal multimode: 850nm or 1300nm
 - 4) Centralized multimode: 850nm or 1300nm (850nm recommended unless otherwise specified by the end user)
 - b) Each fiber link and channel shall be tested in one direction.
 - c) A launch cable shall be installed between the OTDR and the first link connection. The launch cable shall be approximately 100m (328ft) in length and of the same fiber type as the link under test.
 - d) A receive cable shall be installed after the last link connection. The receive cable shall be at least 25m (82ft) in length and of the same fiber type as the link under test.
 - e) Reflective events (connections) exceeding 0.75 dB shall be identified, recorded and remedied to be less than 0.75 dB.
 - f) Non-reflective events exceeding 0.3 dB shall be identified recorded and remedied to be less than 0.3 dB. . Non-reflective events shall only be accepted for splices along the cabling. There shall be no losses acceptable for cable bends.
 - g) Optional requirements
 - 1) Bi-directional link testing.
 - 2) Segment attenuation coefficient if segment length > 1000m (3280ft). The segment attenuation coefficient shall not exceed 3.5 dB/km at 850nm and 1.5 dB at 1300 dB. Fibers exceeding these attenuation coefficients shall be replaced.
- 5. Magnified Endface Inspection (Tier 3)
 - a) Fiber connections shall be visually inspected for endface quality. High loss and reflectance can result from improperly terminated, poorly polished or dirty connectors.
 - b) Fibers shall be inspected at 250X or 400X magnification. 250X magnification is suitable for inspecting multimode and singlemode fibers. 400X magnification may be used for detailed examination of singlemode fibers.
 - c) Scratched, pitted or dirty connectors shall be diagnosed and corrected.
 - d) Optional requirements
 - 1) The endface image shall be saved and included in the test documentation package.
- 6. Length Measurement
 - a) The length of each fiber shall be recorded.
 - b) It is preferable that the optical length be measured using an OLTS or OTDR.
- 7. Polarity Testing
 - a) Paired duplex fibers in multi-fiber cables shall be tested to verify polarity in accordance with subclause 10.3 of ANSI/TIA/EIA-568-B.1. The polarity of the paired duplex fibers shall be verified using an OLTS.
- C. Performance Test Parameters (OSP Cable)
 - 1. Campus Backbone OSP Fiber Optic cable testing.
 - a) Fiber optic cabling: Test all fiber optic cabling completely in accordance with ANSI/TIA/EIA-568-A, Annex H.
 - 1) All fibers shall be proof tested by the manufacturer at a minimum load of 6000 kPa. All fibers shall be 100 percent attenuation tested by the manufacturer for compliance with the specified performance requirements. Provide manufacturer's test results and performance certification before installation.
 - 2) Perform 100 percent attenuation test on all fiber optic cabling on the reel after receipt and before installation. Submit results to Owner for comparison against manufacturer's certified test results.

- 3) If any test results fail to meet the manufacturer's certified test results or are non-compliant with this Section, the cable shall be rejected.
- 4) Test and document all fiber optic cables from both ends on each terminated strand with a properly calibrated Optical Time Domain Reflectometer (OTDR) as manufactured by Siecor or approved equal. Documentation shall include OTDR catalog number, serial number, manufacturer, strand identifier, meter readings, test date, calibration information, and operator responsible for tests. All OTDR testing shall be fully compliant with ANSI/EIA/TIA-455-8.
- 5) Provide 100 meters of like fiber to project OTDR cable examination beyond the "dead zone."
- 6) Test and record all fiber losses and submit to Owner for approval. Provide all test information on printouts and on electronic files. Perform test as segments of the fiber installation are completed and as directed by the Owner

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SECTION 27 15 13 - COMMUNICATIONS COPPER HORIZONTAL CABLING

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. Supplementary to Division 1, Refer to Division 27 Section(s) for additive information where applicable.

1.2 SUMMARY

- A. Section Includes:
 - 1. Supply and installation of a complete and working Horizontal Cabling Systems for
 - a) Voice / Telephone
 - b) Data / Network
 - 1) Including Data provisions for Other Systems (i.e. Video Surveillance, Access Control, Control Data, Intrusion Detection, etc.).
 - 2. System includes but is not limited to:
 - a) Horizontal cabling.
 - b) Station outlets including frames, connector modules, and cover plates.
 - c) Patch panels
- B. Related Sections
 - 1. All Division 27 Sections
 - 2. Common Work Results
 - a) Division 27 – “Operation and Maintenance of Structured Cabling and Enclosures”
 - b) Division 27 – “Basic Materials and Methods”
 - c) Division 27 – “Grounding and Bonding for Communications Systems”
 - d) Division 27 - “Pathways for Communications Systems”.
 - e) Division 27 – “Firestopping for Communications Systems”
 - f) Division 27 – “Identification for Communications Systems”
 - g) Division 27 – “Commissioning of Structured Cabling”
 - 3. Interrelated Sections
 - a) Division 27 – “Communications Cabinets, Racks, Frames and Enclosures”
 - b) Division 27 – “Communications Cable Management and Ladder Rack”
- C. Related Drawings
 - 1. Technology (T-Series) Drawings

1.3 REFERENCES

- A. ANSI/TIA/EIA-568-C.0 – Generic Telecommunications Cabling for Customer Premises.
- B. ANSI/TIA/EIA-568-C.1 – Commercial Building Telecommunications Cabling Standard
- C. ANSI/TIA/EIA-568-C.2 – Balanced Twisted Pair Telecommunications Cabling and Components Standard
- D. ANSI/TIA/EIA-568-C.4 – Standard on Coaxial Cabling Components
- E. ANSI/TIA/EIA-569-B – Commercial Building Standard for Telecommunications Pathways and Spaces.
- F. ANSI/TIA/EIA-606-A – The Administrative Standard for the Telecommunications Infrastructure of Commercial Building.
- G. “TELECOMMUNICATIONS DISTRIBUTION METHODS MANUAL” published by the Building Industry Consulting Services International (BISCI).

1.4 SYSTEM DESCRIPTION / DESCRIPTION OF WORK

- A. The system shall be a 4 pair UTP copper Horizontal cabling system.
1. Provide, test, and label all cables and terminations devices as described below and as shown on the plans.
 2. The system shall be an ANSI/TIA/EIA 568-B Category 6A compliant Unshielded Twisted Pair (UTP) horizontal cabling system.
 3. The Horizontal voice cabling systems shall be a Category 6A compliant system.
 4. The Horizontal data cabling system shall be a Category 6A compliant system.
 5. System shall meet or exceed the requirements for the PanGen System Warranty 25-year warranty and shall include the 25-year PanGen System Warranty. Contractor shall provide PanGen System Warranty documentation at project close out. **Or**, cabling manufacturer and/or contractor shall provide a total system warranty equal to or better than the PanGen System Warranty 25-year warranty. System Warranty documentation shall be provided to Owner Telecommunications department at project close out.
 6. See related Drawings for specific Project requirements.
 7. The system shall consist of total connectivity for a complete and permanent installed communications link.
 8. Refer to detail drawings for terminations standards and positioning of termination devices. Provide, test, and label all cables and terminations devices as described below and as shown on the plans.
 9. The cable distance between the termination point with a Communications Room(s) and the station outlet(s) shall be no greater than 90 meters (295 ft).
 10. The total channel distance shall not exceed 100 meters (328 feet) distance between equipment in the Communications room and station equipment, including all patch cables and station attachment cables
 11. All system cables shall be continuous between points of termination, without splices.
 12. All system cables shall be UL/NEC rated for the location, manner and site conditions in which the cables are installed. This includes, but is not limited to:
 - a) Use of the cable rated for the application
 - b) Not exceeding fill capacities of raceways
 - c) All cable used shall be in compliance with Local, State, and Federal laws (at minimum the NFPA published "National Electric Code") as to acceptability for placement in the designed pathway. This includes, but is not limited to, cable fill capacities of raceways and plenum vs. non-plenum construction. **ONLY Plenum station cable shall be installed on the Indiana State University campus.** The Contractor shall provide and install the appropriate cable for the appropriate conditions.

1.5 SUBMITTALS

- A. General
1. Product Data and Shop Drawing submittals for work of this section shall be SUBMITTED TOGETHER, complete, as a single submittal. Product Data and Shop Drawings are not to be submitted separately.
 2. Samples shall be submitted with or immediately following submission of Product Data submittals.
- B. Items to be submitted for approval prior to commencement of work:
1. Product Data
 - a) Manufacture datasheets for all cable
 - b) Manufacture datasheets for all connectors

- 1) Data sheets shall include
 - i) Manufacturer name
 - ii) Manufacturer model number (as it appears on manufacturer's product data sheet)
 - iii) Manufacturer product description
 - iv) Paragraph number of this section where the product is specified.
 - v) Picture or Drawing of item
- C. Quality Assurance / Control Submittals
 1. RCDD Certification for the staff member responsible for this project.
 2. Resume of the last 10 projects of the RCDD responsible for this project
 3. BICSI Technician's certificate for each lead Technician(s) on the project
- D. Closeout Submittal
 1. Communication Room Rack Layouts, drawing to scaled, depicting devices and rack space occupied by each installed component.
 2. A diagram of the labeling scheme used on the Project.
 3. Additional closeout documentation as required in Division 1 and Division 27 "General Requirements for Communications".
 4. Contractor shall provide PanGen System Warranty documentation at project close out. **Or**, cabling manufacturer and/or contractor shall provide a total system warranty equal to or better than the PanGen System Warranty 25-year warranty.

1.6 WARRANTY

- A. Additional requirements: All cabling and connectivity products manufacturers, including patch cords, shall have in place an agreement recognizing each other for complete execution of warranty as specified. All performance and applications warranties shall be channel rated.
 1. The cable manufacturer and the connectivity products manufacturer shall have a partnership agreement established in order to provide the required warranty.
 2. Required warranty:
 - a) The ANSI/TIA/EIA 568-B Proposed Category 6A compliant cable system shall include as a minimum a 25-year PanGen System Warranty. **Or**, cabling manufacturer and/or contractor shall provide a total system warranty equal to or better than the PanGen System Warranty 25-year warranty.

PART 2 PRODUCTS

2.1 PRODUCT STANDARDS

- A. General
 1. This section is designed to provide the Contractor with a minimum standard of quality and functionality for the products used for telecommunications infrastructure.
 2. This standard will be considered in force for the original response as well as for any additions or changes to this Project. Due to this, there may be items listed in the Products section that are not required under the scope of this contract.
 3. Products required by the Drawings but not enumerated will be evaluated as a performance specification based on the information provided on the Drawings.

2.2 CABLES

- A. General
 1. All cables on this Project shall be color-coded. ***See Detail drawings for color code.

2. CMP (OFNP) and CMR (OFNR) references below are as required by the NEC published by the National Fire Protection Association.
 - a) Cables not specifically identified otherwise, shall be provided with CMP classification.
 - b) Exceptions:
 - 1) Proper cable classification is ultimately determined by building construction; reductions in classification for cables, not clarified or altered by addendum to the specifications, shall require a contract cost deduction through a change order.
- B. Twisted Pair Cables
 1. Electrical Requirements:
 - a) All Twisted Pair cable is required to have the appropriate Category classification as defined by EIA/TIA/ANSI 568C. The compliance to these electrical characteristics must be third party verified by the manufacturer. Part 1 of this specification Section will define the appropriate Category for each cable.
 - b) Recognized Categories:
 - 1) Category 1-2, Category 3, Category 5e, Category 6, Category 6A
 - 2) All requirements and testing parameters as set forth by EIA/TIA 568C.
 2. Construction
 - a) All Twisted pair cable will be properly constructed for the environmental conditions and to meet all applicable codes.
 - b) The following basic construction types are recognized for this Project:
 - 1) Premise Distribution 4 pair Cables - Category 6A
 - i) Fully ANSI/EI/TIA 568C.1 Category 6A compliant
 - ii) Cable shall have 2 individual insulated 24 AWG solid copper conductors formed into a twisted pair.
 - iii) Cable must be constructed of four individually insulated Unshielded Twisted Pairs (UTP)
 - iv) The cable construction must be available in plenum (CMP) and non-plenum riser (CMR) rated constructions.
 - v) This cable construction is used in indoor pathways primarily as horizontal cabling but may also be used as backbone cable.
 - vi) Standard of quality shall be as manufactured by Panduit Cable PUP6AM04BU-UG .
 - (A) Additional approved manufacturer(s):
 - (B) General Cable 7132849
 - (C) CommScope 2091B BLU C6A 4/23 U/UTP W1000 | 760107201
 - (D) Belden 10GXW13
 - (E) Mohawk M59146

2.3 TERMINATION HARDWARE

- A. General
 1. Suggested layout of termination hardware is indicated on the Drawings. Contractor shall coordinate layout of termination hardware with the Owner's Representative before installation.
 2. Provide one single manufacturer for all twisted-pair termination hardware used together in a permanent link or whenever a Category Certification is required.
 3. Termination devices on this Project shall be color-coded. ****See Detail Drawings for details.
 4. Terminate all UTP cabling utilizing the T568B wiring configuration.

5. The manufacturer of the cable and the manufacturer of the connectivity products shall have a partnership agreement established in order to provide the required warranty. See Warranty requirements above and in related Section 27 00 01.00. Contractor shall provide Owner warranty documentation at project close out.

All devices shall be UL listed as required by the NEC published by the National Fire Protection Association.

6. All RJ-45 twisted pair termination devices are required to have the appropriate Category classification as defined by EIA/TIA/ANSI 568B. The compliance to these electrical characteristics must be third party verified by the manufacturer. Part 1 of this specification Section will define the appropriate Category for each cable.

a) Recognized Categories:

- 1) Category 1-2, Category 3, Category 5e, Category 6, Category 6A.
- 2) All requirements and testing parameters as set forth by the latest update to EIA/TIA 568B.

B. Station Outlet

1. The following basic termination devices are available and recognized for this Project.

a) Flush Faceplate – Single Gang

- 1) Sloped faceplate Frame
- 2) Four position minimum on each faceplate
- 3) Electrical Ivory color unless otherwise specified
- 4) May be mounted on an outlet box, bracket, or raceway.
- 5) Must use module inserts below.
- 6) Standard of quality shall be Panduit CFPSL4xxY

b) Quad Jack Frame

- 1) Four position minimum on each frame
- 2) Electrical Ivory color unless otherwise specified
- 3) May be mounted on an outlet box, bracket, or raceway.
- 4) Will require a faceplate with standard duplex electrical outlet cut-out
- 5) Standard of quality shall be Panduit CFG4xx

c) Faceplate Blank Insert

- 1) Provide blanks for all un-used positions in faceplates, surface boxes, or jack frames.
- 2) Color to match outlet faceplate as described above; Electrical Ivory color unless otherwise specified
- 3) Standard of quality shall be Panduit CMBxx-X

d) Wall-Phone Jack

- 1) Stainless Steel faceplate with mounting posts for keyhole slot telephone mounting
- 2) May be mounted on an outlet box, bracket, or raceway.
- 3) Standard of quality shall be Panduit KWP6PY.

e) Category 6A jack insert RJ-45

- 1) Fully compliant ANSI/TIA/EIA 568B Category 6A RJ45 modular jack.
- 2) Color shall be Blue for all locations identified as being voice locations. Color shall be Electrical Ivory for all locations identified as data locations. Coordinate with Owner's Representative or Architect/Engineer.
- 3) Standard of quality shall be Panduit CJ6X88TGxx

C. Communications Room Equipment Rack(s)

1. The following basic termination devices are available and recognized for this Project.

a) UTP Cat 6A Patch Panel 24 port

- 1) Panel shall be black steel with PCB connection between interfaces
- 2) Shall provide 24 ports in 1.75" of rack space (1 RU).
- 3) Must have labeling areas on front and rear

- 4) Fully compliant ANSI/TIA/EIA 568B Category 6A
- 5) RJ45 jack interface on front and 110 style IDC connections on rear
- 6) Mountable in EIA standard 19" rack/cabinet rails.
- 7) Standard of quality shall be Panduit CPPL24WBLY 24-Port Modular Patch Panel with Labels fully loaded with Panduit CJ6X88TGBL Category 6A Jack Modules.

PART 3 EXECUTION

3.1 GENERAL

- A. This section is designed to provide the vendor with a standard of quality and functionality for the installation of technology systems infrastructure. Not all procedures will be necessary for the installation of this Project. However, this standard will be considered in force for the original response as well as for any additions or changes to this Project.

3.2 INSTALLATION

- A. Coordination
 1. Review and coordinate proper pathways prior to installation.
- B. General
 1. Cable routing shall follow building structure lines and shall be installed with adequate length to reach to any location within the equipment racks with at least 5 feet of service loop at each end.
 2. At point of final terminations, excess cable and the service loop shall be stored and dressed neatly.
 - a) At the station end of the cable the service loop shall be stored above the ceiling line at an accessible point and support with an approved device designed for that purpose.
 - b) Within a Communications Room the service loop shall dressed and stored within the ladder rack.
 3. Strain relief techniques shall be applied to all cables to lessen the risk of physical cable damage and to provide proper aesthetic value.
 4. Route all cabling and pathways parallel to building surfaces and at 90 degrees angles to the rafters and trusses.
 5. Cable runs shall be continuous and without splices.
 6. Wiring shall be free from grounds, shorts, opens, and reversals. Strain relief shall be provided at all connection points.
- C. Protection
 1. Maintain protection of all cabling throughout the entire duration of the project. Cabling shall not be left hanging or coiled where it potentially obstructs the Work of other trades. Cabling shall be bundled, supported, and protected up out of the way of other trades any time it is determined necessary to ensure the safety or personnel and protection of the cable.
 2. Do not terminate cables designated for different services onto the same patch panel unless otherwise clearly indicated on the drawings. Coordinate with Owner before any terminations are made.
 3. No not exceed minimum bend radius or pulling tension specifications set forth by the product manufacturer.
 4. Cable Separation and Organization
 - a) Horizontal cables of all service types (i.e. Voice, Data, Control, RF, etc....) shall be organized and kept segregated within cable trays, ladder rack, wire management and other pathways to the degree physically possible.

- b) Cables of different services shall not be intertwined.
 - c) Terminate all cabling on specified termination hardware in numerical order and on specified outlets.
- D. Labeling
 - 1. Every cable shall have a label applied to the jacket at each end.
 - 2. Each terminating device and port shall have a unique identifier.
 - 3. Label all cabling and terminations as specified and indicated on related drawings.
- E. Use of Raceways
 - 1. Install cabling within conduit and in surface raceway where specified in this or related sections and as indicated on the drawings.
 - 2. Cabling shall be installed in a concealed manner. Cables may be visible only in the following areas;
 - a) Equipment Rooms
 - b) Telecommunications Rooms
 - c) Building spaces equipped with cable trays, but without finished ceilings to conceal the cables.
 - 3. Install cabling in Cable Tray / and Ladder rack where specified and/or indicated on the drawings.
 - 4. Support cables using approved products and methods whenever conduit, surface raceway and cable tray are not specified. Cable supports shall be attached directly to building structure.
- F. Cabling on backboards and in Equipment racks
 - 1. Neatly dress, support, and securely attach all cabling.
- G. Termination
 - 1. Terminate each end of every cable provided.
 - 2. Terminate all UTP cabling utilizing the T568B wiring configuration.
 - 3. Terminate each cable from a station outlet in numerical order on adjacent ports on the specified termination hardware within the appropriate Communications Room.
 - 4. Terminate cables using the tools and connectors specified and as recommended by the cable/connector manufacturer.
- H. Separation from Sources of Interference
 - 1. Route cables at least 1.2m (4 foot) from motors or transformers; 30 cm (1 foot) from conduit and cables used for AC power distribution; 12 cm (5 inches) from fluorescent lighting fixtures.
- I. Cable Supports
 - 1. Where cabling is not supported by cable tray or conduit, provide necessary cable support as specified. Provide nylon cable tie at the support to contain cabling within the support. Do not bundle cable between supports. Provide cable support as specified at intervals not to exceed 5 feet. Do not secure cabling to the support. Do not use cable supports with round surfaces (i.e. bridal rings).
- J. Horizontal cabling
 - 1. The length of patch cords and cross connect jumpers installed in the Telecommunications Room shall be 5 m (15 ft) total or less.
 - 2. The length of patch cords and cross connect jumpers installed in the Equipment Room shall be 5 m (15 ft) total or less.
 - 3. Locate telecommunications outlets so that the cable assembly required to reach work area equipment will be no more than 5 m (15 ft) long.

4. Provide service loops on all cables at the station end of 2 feet (coiled above the ceiling and with a minimum of 6 inches at the telecommunications outlet coiled in the box or raceway).
5. Provide service loop at the Equipment Room/Telecommunications Room end of 5 feet coiled above the ceiling or neatly bundled in ladder rack above the cabinet/rack.
6. Install telecommunications outlets securely at work area locations.
7. Any necessary electrical components (e.g., impedance-matching devices) at outlets shall be located outside the faceplate via a standard plug connection.
8. Provide surface raceway on all walls where existing pathway has not been provided and cables cannot be concealed inside the wall cavity. Do not conceal cabling inside of block walls. Install surface raceway "level" straight and securely anchored to walls with screws, bolts, or anchors as appropriate.
9. Provide a 6-inch service loop on each horizontal UTP cable that breaks out from the harness for termination and do not violate the minimum bend radius of the cable.

3.3 TESTING

- A. All cables shall be fully tested and verified compliant with these specifications.
 1. See: "Commissioning of Structured Cabling" for UTP Horizontal performance testing parameters and procedures.
- B. The Owner reserves the right to have a representative present during any or all testing procedures. Verification testing of copper and fiber will be performed at or near Project completion by the Consultant for quality assurance.
- C. Upon verification testing, if the Consultant finds the test results do not match the Contractor's results, the Consultant or a third party may at the Owner's request retest all of the cabling and submit those results to the Owner and deduct the verification testing costs from the Contractor's Contract amount.

END OF SECTION 27 15 13

SECTION 27 16 00 - COMMUNICATIONS CONNECTING CORDS, DEVICES, AND ADAPTERS

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. Supplementary to Division 1, Refer to Division 27 Section(s) for additive information where applicable.

1.2 SUMMARY

- A. Section Includes:
 - 1. Cable Assemblies, Devices, and Adapters for Communications
 - a) Voice / Telephone
 - b) Data / Network
 - 2. General requirements are as follows:
 - a) Provide cable assemblies and devices with electrical/optical properties to match the designed infrastructure.
 - 3. Special requirements are as noted on Drawings.
 - 4. All Work shall fully comply with these specifications and related Drawings and all manufacturers recommended installation practices.
- B. Products Supplied But Not Installed Under This Section
 - 1. None
- C. Products Installed But Not Supplied Under This Section
 - 1. None
- D. Related Sections
 - 1. All Division 27 Sections
- E. Related Drawings
 - 1. Technology (T-Series) Drawings

1.3 SYSTEM DESCRIPTION

- A. Provide the following cable assemblies (cords), Devices, and adapters: **(only provide if specifically requested by Owner)**
 - 1. Telephone Patch Cables
 - a) Category 6A cables, 3-5 feet in length as required for the Equipment Room/Telecommunications Room end.
 - b) Confirm Color for telephone cables
 - c) Labeled with the same unique identifier at both ends of the assembly.
 - d) Provide a quantity of 1 for each horizontal telephone cable installed.
- B. Labels:
 - 1. Provide alphanumeric, clearly typewritten labels at all designated points as follows:
 - 2. See Detail Drawings for graphical representation of labeling scheme.

1.4 SUBMITTALS

- A. General
 - 1. Product Data and Shop Drawing submittals for work of this section shall be SUBMITTED TOGETHER, complete, as a single submittal. Product Data and Shop Drawings are not to be submitted separately.

2. Samples shall be submitted with or immediately following submission of Product Data submittals.
- B. Items to be submitted for approval prior to commencement of work:
 1. Product Data
 - a) Manufacture datasheets for all cable assemblies
 - b) Manufacture datasheets for all devices
 - c) Manufacture datasheets for all adapters
 - 1) Data sheets shall include
 - i) Manufacturer name
 - ii) Manufacturer model number (as it appears on manufacturer's product data sheet)
 - iii) Manufacturer product description
 - iv) Paragraph number of this section where the product is specified.
 - v) Picture or Drawing of item
 - C. Closeout Submittal
 1. Cable color code utilized for patching.
 2. Labeling scheme utilized for cable assemblies.

PART 2 PRODUCTS

2.1 PRODUCT STANDARDS

- A. General
 1. As required in Division 27 Section 27 00 01 "General Requirements for Communications"
 2. This section is designed to provide the Contractor with a minimum standard of quality and functionality for the products used for telecommunications infrastructure.
 3. This standard will be considered in force for the original response as well as for any additions or changes to this Project. Due to this, there may be items listed in the Products section that are not required under the scope of this contract.
 4. Products required by the Drawings but not listed in Part 2, will be evaluated as a performance specification based on the information provided on the Drawings.

2.2 CABLES

- A. Copper Cable Assemblies (Twisted Pair)
 1. Category 6A Copper patch cables
 - a) Copper patch cables shall be ANSI/TIA/EIA 568A Proposed Category 6A compliant with eight position RJ45 modular plugs on each end. Use T568B wiring. Apply an identifying label to each end of the cable assembly (same identifier on each end of the cable and a unique identifier for each patch cable on the Project regardless of installed location).
 - b) Color Coding:

1) Critical Building Systems	Red
2) Voice Over IP	Orange
3) Classroom	Black
4) Administrative	Yellow
5) Cross-Over connections	Blue
6) Straight-Through uplinks	Green
7) Network Management	Purple
8) IP Video	White
9) Work Area (Attachment)	Gray
 - c) UTP Cable Assemblies Category 6A, coordinate with Owner prior to purchasing cables. In most cases data patch cables will be six inch.

- 1) Standard of quality shall be Panduit
 - i) 6 inch with labels added
 - ii) 3 foot with labels added
 - iii) 5 foot with labels added
 - iv) 7 foot with labels added
 - v) 10 foot with labels added
 - vi) 14 foot with labels added
 - vii) 20 foot with labels added
- 2) Additional Approved Manufacturers:

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

- A. This section is designed to provide the vendor with a standard of quality and functionality for the installation of technology systems infrastructure. Not all procedures will be necessary for the installation of this Project. However, this standard will be considered in force for the original response as well as for any additions or changes to this Project.

3.2 INSTALLATION PRACTICES

- A. Standards: The minimum criteria for proper installation can be found in the *TELECOMMUNICATIONS DISTRIBUTION METHODS MANUAL* published by the Building Industry Consulting Services International. The vendor must refer to this publication for cable installation practices. This Specification may take exception to optional statements within this manual. Treat any conflict per this Specification under discrepancies or Conflicts.
- B. The following items should be considered to be minimum standards for this Project:
 1. The vendor is responsible for receiving, handling, storing, and protecting all materials used on this Project until the Project is signed as complete.
- C. General Requirements:
 1. Throughout the entire installation the Contractor must maintain complete protection of all cabling. Cabling shall not be left hanging or coiled where it potentially obstructs the Work of other trades. Cabling shall be bundled, supported, and protected up out of the way of other trades any time it is determined by the Architect/Engineer to be necessary.

3.3 LABELING

- A. Provide labeling as specified in Part I.
- B. Label all items listed in quantities required by the drawings and specifications.
- C. Apply all labels straight and legible.

END OF SECTION 27 16 00

ISU Science Rooms 018, 022, 138
Indiana State University
D&A#26057

COMMUNICATIONS CONNECTING
CORDS, DEVICES AND ADAPTERS
27 16 00 - 4
R.E. Dimond & Associates, Inc.

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SECTION 27 41 10 - AUDIO AND VIDEO SYSTEMS CABLING

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. Supplementary to Division 1, Refer to Division 27 Section 27 00 10 - "General Requirements for Communications" for additional information and work that is applicable to this section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Analog and digital video cable
 - 2. Analog and digital audio cable
 - 3. Remote control cabling
 - 4. Low voltage power cable
 - 5. Communications cabling
 - 6. Connectors and related materials used in the termination of cables used in the establishment of low-voltage interconnectivity between audio and video systems equipment and devices.
- B. Related Sections
 - 1. All Division 27 Sections
 - 2. Common Work Results
 - a) Division 27 – "Operation and Maintenance of Structured Cabling and Enclosures"
 - b) Division 27 – "Basic Materials and Methods"
 - c) Division 27 - "Pathways for Communications Systems".
 - d) Division 27 – "Firestopping for Communications Systems"
 - e) Division 27 – "Identification for Communications Systems"
 - f) Division 27 – "Commissioning of Structured Cabling"
 - 3. Interrelated Sections
 - a) Division 27 – "Communications Coaxial Horizontal Cabling"
 - b) Division 27 – "Communications Coaxial Backbone Cabling"
 - c) Division 27 – "RF Broadband Video Distribution Systems"
- C. Related Drawings
 - 1. All Technology Drawings (T-series)

1.3 DEFINITIONS

- A. Devices: As used with this section, devices shall refer to product(s) that are assembled to the front, side, rear, top or bottom of a custom plate/panel. Sample "devices" include, but are not limited to connectors, switches, lamp assemblies, meters, faders, and potentiometers.
- B. Components: As used with this section only, components shall refer to passive and active electronic parts used as part of an assembly that are otherwise considered plates, panels, hardware or devices.
- C. RGB: Red, Green, Blue
- D. RGBS: Red, Green, Blue, Sync
- E. RGBHV: Red, Green, Blue, Horizontal Sync, Vertical Sync
- F. Y-C: Chrominance, Luminance
- G. S-Video: Chrominance, Luminance

- H. DCR = Direct Current Resistance
- I. DVI = Digital Video Interface
- J. HDMI = High Definition Media Interface
- K. SDI = Serial Digital Interface
- L. HDSDI = High Definition Serial Digital Interface

1.4 REFERENCES

- A. National Electric Code
- B. NFPA

1.5 SYSTEM DESCRIPTION / DESCRIPTION OF WORK

- A. Intra-Classroom AV Structured Cabling System
 - 1. Classrooms shall be equipped with fully connectorized plates installed at various locations in the room that enable passage of signals from one plate location to another through the use cabling installed within building cavities and/or dedicated pathways. See drawings for locations and details of plates and interconnect requirements.
 - 2. Work of this section includes, but is not limited to:
 - a) Supply and installation of all multi-service specialty plates as specified herein and/or shown on the drawings. These plates include, but are not necessarily limited to:
 - 1) Local Input connection plates ("LI")
 - 2) Projector Locations ("PR")
 - b) Supply and installation of video distribution amplifiers for use at the various "LI" plate locations.
 - c) Supply and installation of select AV related cables as specified and necessary for the owner to connect to the plates provided under this section.
 - d) Land cables installed under other sections that share space on the multi-service plates provided in this section.
 - e) Fully test each and every interconnection path between plates.
- B. Furnish custom manufactured plate and panel assemblies wherever a related section does not specify the use of a standard pre-manufactured assembly. These specifications apply to all like products not specified by brand and model.
- C. Review all drawings, including system diagrams, details, plans and others to ascertain quantities and configurations
- D. Pre-wire plate/panel assemblies
 - 1. Pre-wiring of passive and active electronic components physically attached to or otherwise defined as part of the plate/panel assembly.
 - 2. Supply and installation of connectors and pigtails used for interconnectivity of assembly to work specified elsewhere.
- E. Work Excluded
 - 1. Plate/panel assemblies expressly specified by manufacturer and model number within other Division 27 specifications.

1.6 SUBMITTALS

- A. Only one contractor (the Division 27 Prime Contract holder) shall furnish the submittals for this section. The submittal shall be inclusive of all materials to be furnished under this section.
- B. Provide datasheets of all models of cable and connectors to be supplied.
- C. Assemblies only from pre-approved manufacturers shall be deemed acceptable. Contractor fabricated products shall not be permitted.

- D. All assembly products furnished under this section shall be from a single manufacturer.
- E. Shop Drawings
 - 1. Scaled engineering level datasheets for each plate/panel assembly.
 - a) Drawing scale shall be 1/2-inch = 1-inch or 1-inch = 1-inch
 - b) Paper size: 8-1/2-inches by 11 inches or 11-inches by 17-inches as appropriate for the assembly
 - c) Each datasheet shall clearly indicate all of the following:
 - 1) The manufacturer of the assembly.
 - 2) Plate/panel material, finish, and color.
 - 3) Plate/panel dimensions.
 - 4) Mounting hole quantity, sizing and spacing.
 - i) Not required when using "standard" electrical "gang" plate sizes and standard EIA rack mount panels.
 - 5) Properties of all Text nomenclature.
 - i) Font
 - ii) Font Sizes
 - iii) Colors
 - iv) Line widths
 - 6) Properties of all non-text nomenclature
 - 7) Detailed list of devices used within the assembly.
 - 2. Schematic diagram of all assemblies
 - a) Wiring for those assemblies that have interconnections between devices and components, and for assemblies that feature consolidated connectivity points (screw terminals, pigtails, in-line connectors).
 - b) Device ID uniquely identifying the plate/panel keying it to a specific location at the project site, and on the system.
- F. Quality Assurance
 - 1. Samples of plates and panels shall be furnished for review upon the request of the designer.

1.7 QUALITY ASSURANCE

- A. Wire, cable, connectors, supplied and installed, shall not exceed the rated capacities and general operating ranges and conditions published by the product's manufacturer and within the limitations and guidelines
- B. Wire, cables and connectors supplied shall be used only for the purposes of carrying signals of the type(s) for which they are specified and/or approved by the Designer.
- C. Products shall be supplied and installed in accordance with applicable codes.
- D. Pre-approved alternate manufacturers and model numbers notwithstanding, all product supplied of a given type shall be of the same make and model. For example: All non-plenum rated microphone cable supplied for permanent install use be the same make and model across all sections and systems that are relate to this section. This applies to all wire, cable, connectors and other materials furnished under this section.
- E. Where this Contractor chooses to have its sub-contractor(s) furnish its own cabling, it is the responsibility of this Contractor to coordinate the uniform supply of product across all contractors to meet the intent of this section. Should there be technical merit to deviate from this the Contractor shall obtain approval in writing from the designer prior to procuring and installing product.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Wire/cable

1. West Penn Wire and Cable
2. Belden
3. Commscope
4. Cables To Go (Rapid Run)
- B. Connectivity
 1. Panel Crafters (Liberty Wire and Cable)
 - a) Internet: www.panelcrafters.com, www.libertycable.com
 - b) Phone: (800) 530-8998
 2. Pro-Co Sound
 - a) Internet: www.procosound.com
 - b) Phone: (800) 253-7360
 3. Rapco
 - a) Internet: www.rapco.com
 - b) Phone: (800) 325-0266
 4. RCI Custom Products
 - a) Internet: www.rcicustom.com
 - b) Phone: (240) 912-0130
 5. Whirlwind
 - a) Internet: www.whirlwindusa.com
 - b) Phone: (585) 663-8820
 6. Wireworks Corporation
 - a) Internet: www.whirlwindusa.com
 - b) Phone: (908) 686-7400
 7. Cables To Go (Rapid Run)
 - a) Internet www.rapidrun.com
 - b) Phone (800) 222-5911

2.2 GENERAL

- A. Contractor shall use these specifications in conjunction with the information provided on the drawings, in related specification sections and from supplied equipment manufacturers to determine the quality, performance and quantity of materials to be furnished.
- B. Wherever there is a conflict between these specifications and the drawings; between different drawings; between parts of these specifications; and between these specifications, the drawings and/or the specific manufacturer recommendations, the Contractor shall presume that the higher quality, higher quantity, and more stringent (the most costly) requirement shall apply. Where the contractor has sought and has received the approval from the Designer (prior to procuring materials or furnishing work) the potentially less stringent requirement(s) may be considered. A credit of appropriate value will be considered a requirement for the approval of any less stringent solution not approved prior to bid.
- C. Where specific manufacture/brands and models are listed in these specifications and/or on the drawings, the Contractor shall presume that these products set the reference Standard-of-quality.
- D. All furnished cable of a given type shall be of the same manufacture make, model and color, unless otherwise specified and/or approved by the Designer in advance of installation.

2.3 CABLES

- A. General
 1. All cables shall be UL listed, and NEC type accepted for the location, application and method of installation in which they are to be used.

2. All cables shall meet NEC 300-volt rating, unless otherwise noted higher.
3. This specification lists multiple types of products within many product categories, each product with different physical and/or performance characteristics. It is incumbent upon the Contractor to furnish the correct type of cable for the application based upon the criteria established throughout these specifications, including but not limited to System Performance criteria enumerated in related sections.
4. Where applicable codes require the use of a cable not specifically listed in these specifications, the contractor shall furnish product meeting the applicable code requirements. Furnished cables shall meet all other requirements of the application(s) in which they are used. Contractor shall utilize the specifications of similar products, where present, as a performance guideline when choosing unlisted code-compliant products. Where similar types of products are not listed, contractor shall choose the requisite code-compliant cable model to provide based upon the recommendations of the manufacturer whose product(s) are being interconnected.
5. Where code requirements dictate use of a plenum rated cable, and a non-plenum rated version of the cable is listed, contractor shall furnish the listed cable with an appropriately sized code-compliant conduit in which to encase the furnished cable as it is installed.

2.4 WIRE, CABLE AND CONNECTORS

A. General

1. Plenum cable is required on this project for all cable.
2. Model numbers listed indicate the standard of quality and electrical performance for cables used on this project.
3. The following cable manufactures are approved for use on this project: West Penn, Belden, Liberty
4. Where below-grade/below-floor cables will be subject to continuous contact with water, Contractor shall provide cable rated for such use by the manufacture.
5. Not all cable and connectors required for installation may be specified. Contractor shall supply connectors and cables of such type appropriate to the application where otherwise not enumerated. Contractor responsible for all providing all cable necessary to provide a complete and working system.
6. All cable provided shall meet all applicable codes governing the project site. Where multiple model numbers are listed for a given cable type, Contractor shall use the version meeting applicable codes. Where a cable of a higher rating is required by code, Contractor shall provide a cable of equal electrical/optical performance with the appropriate UL/NEC rating.

B. HDMI "Runner" Cable Assembly

1. Pre-connectorized cable assembly (pull-able)
2. Standard of Quality shall be Cables to Go (RapidRun) 40861 (35') or 40862 (50').
 - a) Additional approved manufacturers: Extron, Liberty Wire and Cable

C. Composite Video Coax Cable

1. Miniature coaxial construction
2. 25AWG bare copper center conductor
3. 75-ohm nominal impedance
4. Bare copper braided shield with 95% coverage
5. Nominal capacitance conductor to shield 16.2pf/ft
6. 82% velocity of propagation
7. Standard of quality shall be West Penn 25825 CMP; CMR equivalent West Penn 825.
 - a) Additional approved manufacturers: Belden, Liberty Wire and Cable.

D. Audio Cable

1. Two 22AWG insulated pairs.
2. One 24 AWG drain wires.
3. 100% overall shield coverage with aluminum polyester foil
4. 10.5 ohms per 1000'
5. Standard of quality shall be West Penn 25510 CMP; CMR equivalent West Penn 510.
 - a) Additional approved manufacturers Belden, Liberty Wire and Cable

2.5 CONNECTIVITY

A. General:

1. All plates furnished under this section shall be constructed of 1/8" thick clear anodized aluminum. All plates shall feature soft beveled edges.
2. Plates with provisions for décora-style jack frames shall include back panel relief milling to accommodate the jack frame.
3. Nomenclature shall be engraved and black backfilled.
4. All plates shall be furnished by a single manufacture to ensure consistent appearance throughout the project.
5. All plates to be provided with countersunk through holes for standard electrical device plate mounting screws.

B. Faceplates

1. Flush Faceplate – Double Gang Stainless Steel
 - a) Double gang
 - b) Two "Decora Style" openings
 - c) 302 grade Stainless Steel
 - d) May be mounted on an outlet box, bracket, or raceway.
 - e) Must use Decora Style Module Frames below.
 - f) Standard of quality shall be Leviton 84409-40
 - 1) Additional approved manufacturers:
2. "Decora" style jack frame
 - a) Four position minimum on each frame
 - b) May be mounted on an outlet box, bracket, or raceway.
 - c) Will require a faceplate with "Decora" cut-out
 - d) Standard of quality shall be Panduit CFG4xx
3. Faceplate Blank Insert
 - a) Provide blanks for all un-used positions in faceplates, surface boxes, or jack frames.
 - b) Color to match outlet faceplate as described above
 - c) Standard of quality shall be Panduit CMBxx-X
4. Category 6A jack insert RJ-45
 - a) Fully compliant ANSI/TIA/EIA 568C Category 6A RJ45 modular jack.
 - b) See Drawings for color-coding requirements.
 - c) Standard of quality shall be Panduit CJ6X88TGxx
5. F style bulkhead Insert
 - a) Female to Female 75-ohm bulkhead connector.
 - b) Color to match outlet faceplate as described above; Electrical Ivory color unless otherwise specified
 - c) Standard of quality shall be Panduit CMFxx
6. HDMI Active wallplate

- a) Decora style opening
- b) Pre-connectorized pigtail
- c) Standard of Quality shall be Cables to Go (RapidRun) 40855
 - 1) Additional approved manufacturers: Extron, Liberty Wire and Cable
- 7. RCA Feed-through Style Insert
 - a) Female to Female RCA bulkhead connector
 - b) Color to match outlet faceplate as described above; Electrical Ivory color unless otherwise specified
 - c) Standard of quality shall be Panduit CMRPyxx where y is replaced with R for red, Y for yellow, and W for white
- 8. 3.5mm Stereo Jack Insert (Audio)
 - a) 3.5mm bayonet stereo audio jack, solder type
 - b) Color to match outlet faceplate as described above; Electrical Ivory color unless otherwise specified
 - c) This insert will be used with audio cable; two pair per insert.
 - d) Standard of quality shall be Panduit CM35MSSxx

2.6 DISCREET CONNECTORS

- A. HDMI Pigtail Cable Assembly
 - 1. Pre-connectorized cable assembly with HDMI device interface; attaches to (pull-able) "runner" cable.
 - 2. Standard of Quality shall be Cables to Go (RapidRun) 40868 (6').
 - a) Additional approved manufacturers: Extron, Liberty Wire and Cable
- B. Connectors
 - 1. General
 - a) All connector types shall be approved by the Designer for their intended use.
 - b) Where a connector type is not enumerated within this section, but instead is depicted on the drawings or otherwise required by the system, the following manufacturers are approved for use: Neutrik, Switchcraft, Canare, and AMP.
 - c) Where a specific connector-type is listed within this specification only the listed model(s) shall be deemed acceptable.
 - d) For consistency in appearance and performance all connectors of a given type shall be from a single manufacturer, model and series (as applicable).
 - 2. Audio/Video Connectors
 - a) 3.5mm Mini Phone Tip-Sleeve (TS) and Tip-Ring-Sleeve (TRS) Type
 - 1) Switchcraft "Tini-Jax" Series
 - 2) Supply with accessory insulating Switchcraft S1564 swedged fiber washer and S2207 insulating shoulder washer.
 - b) RCA Phono
 - 1) Switchcraft 3501FR.
 - 2) Solder based connections.
 - 3) Supply with accessory S1028 insulating flat washer and S1029 insulating shoulder washers.
 - i) Provide white insulators to designate "Left" audio channels.
 - ii) Provide white insulators to designate "Mono" audio channels.
 - iii) Provide red insulators to designate "Right" audio channels.
 - iv) Provide black insulators to for general purpose use.
 - v) Provide yellow insulators to indicate video use.
 - 3. Control Connectors
 - a) Category 6 RJ-45 modular plug for solid cable.

- 1) Each plug will use an insulation displacement pressure termination method with specifically designed installation tool.
- 2) The plug shall be 8 position and 8 conductor.
- 3) The plug shall be specifically designed for 24-gauge solid copper conductors.
- 4) The strain relief of the plug shall be designed for clamping on round cable.
- 5) Standard of quality shall be AMP 5-1375204-x
 - i) Additional approved manufacturers

2.7 MISCELLANEOUS ITEMS

A. Isolation Audio Transformers

1. Where installed unbalanced audio cable lengths would otherwise exceed 20 feet, Contractor shall install isolation and balancing transformers within each audio channel.
2. Approved manufactures: Sescom Transformer, Jensen Transformer

PART 3 EXECUTION

3.1 GENERAL

A. Connection Plates

1. Secure all plates with oval-countersink head Phillips drive machine screws.
2. Terminate and mount all connector plates at locations where shown on plans.
3. Install plates square and plumb.
4. Where décora-style jack frames are used, secure jack frames so they are installed secure and flush to plate, without movement
5. Permanently label all plate connections on the front of the plate. Custom plates shall be fabricated by one of the listed manufacturers and may not be Contractor fabricated without pre-bid approval.

3.2 CABLE SELECTION

- A. Where the drawing(s) or related specification(s) identify the use of specific products, the Contractor shall furnish the products specifically identified.
- B. Where the drawing(s) or related specifications(s) identify the use of a general classification of product, the Contractor shall furnish one or more the products with the referenced classification. Where multiple products are included under the classification, the contractor shall use the criteria or performance guidelines in this specification and in the related specification to determine which product shall be provided.
- C. Where the drawing(s) or other specification sections do not identify a product model, or specific product type, the contractor shall utilize this specification section, equipment manufacturer recommendations, and industry references and standards to determine which products to provide.

3.3 CABLE INSTALLATION

A. Isolation and Balancing transformers:

1. Transformers shall be wired so as to provide a balanced, RF interference and ground-loop free signal transmission audio path between plates.
2. Transformer shall be provided with appropriate length conductors added to them to permit secure connection to connectors.
3. Transformer case shall be insulated from ground using a piece of appropriately sized and applied piece of heat shrinkable tubing.

B. Cable Separation

1. Cables carrying different signals of different nominal operating level shall be kept separated to reduce the risk of undesirable cross-talk interference between cables.

2. As a general rule, for each 25dBV difference in nominal level between cables, Contractor shall provide 6 inches of separation between cables. For example: cables with a 90dBV level difference shall be separated by at least 18 inches (where 0dBV=1Volt).
 3. Contractor shall provide additional separation as determined necessary to prevent or remedy any crosstalk which adversely affects the performance and usability of the system or that exceeds specific crosstalk performance outlined in these specifications.
- C. Cable and Conductor Identification
1. Use color coding of conductors and apply wire and cable marking tape to designate wires and cables so all media are identified in coordination with system wiring diagrams.
 2. All cables shall be labeled at both ends using computer generated type-written permanent self laminating wire labels. Cables should clearly correlate to cabling as shown on the installation and record drawings.
- D. Drain wire and shield preparation
1. Non-insulated conductors (typically the shield and/or shield drain wire) that are an integral part of a multi-conductor cable shall be individually insulated as they exit the jacket of the cable. Apply high-temperature heat shrinkable plastic tubing of the appropriate size over the conductor.
 2. Unless otherwise required for conductor color code coordination contractor shall use Green color heat shrink. White and Clear may be used where necessary to coordinate with other conductors.
- E. Grounding and bonding
1. As a matter of standard practice, the non-signal carrying shield drain wire of audio cables shall be "grounded" at one end only and left floating from ground at the other.
 2. Un-terminated shields and drain wires shall not be cut off. Rather these conductors should be insulated and prepped for termination but then folded back and secured on the cable. These conductors shall remain intact reserved for future use and for selective use in remedying grounding anomalies.

3.4 LABELING

- A. All wires and cables shall be labeled with permanent and unique numeric/alpha -numeric labels.
1. All cables shall be labeled behind the plate
 2. Cables shall be labeled within 3-6 inches from point of termination.
 3. Use computer and laser-printer generated self-laminating labels. Nomenclature shall be bold type and clearly legible.
 4. Record cable labeling on as-built drawings.
 5. Audio, Video and Control cables that originate and end within the same room may use the same may be labeled in a "typical" fashion that is consistent with other rooms wired identically.
 6. Cables that begin in one room and end in another room shall be uniquely labeled
- B. Where not specified or shown on the drawings, the Contractor shall submit it desired labeling scheme for review and approval. Contractor shall make any adjustments to the labeling scheme directed by the Designer. Nomenclature used for labeling may vary by system.

3.5 TERMINATION INSTALLATION

- A. Assembly
1. Devices with through mounting holes shall be secured to plates/panels using threaded machine screws. Pop rivets are not acceptable.
 - a) Phillips drive flat-head countersink screws shall be used where the device manufacturer provides a countersunk through mounting hole. The size of the

- head shall match the size of the countersink. Screw head shall not stand proud of the countersink and no sharp exposed edges of the screw shall exist.
- b) Philips truss head machine screws shall be used for mounting devices without countersunk mounting holes
 - c) Thread-lock compound shall be applied to screw threads used to secure devices to the plate/panel. Low-strength blue Loctite™ or equal shall be used.
- 2. Devices designed to be mounted without the use of through mounting holes shall be secured using the means expressly provided and/or recommended by the device manufacturer.
 - 3. All devices shall be mounted parallel to the edges of the plate/panel.
 - 4. All devices shall be secure and with no movement or rotation other than that which is part of the intended assembly or device design.
- B. Assembly Wiring
- 1. Wiring shall be neatly and professionally attached to all devices. Appropriate strain relief techniques shall be applied to all pigtails to ensure zero mechanical strain on device connections.
 - 2. Different color wires shall be used in the assembly to aid in identification of circuits. Clearly legible and permanent labels shall be affixed to cables and conductors to aid in identification of circuit and signal paths.
- C. Component Mounting
- 1. Components that are part of plate/panel assembly shall be securely, neatly, and professionally attached.
 - 2. Custom mounting brackets and standoffs shall be used where applicable.
- D. Mounting
- 1. Plate/Panels shall be mounted plumb and square and shall be securely attached to substructure and/or back box.

3.6 ACCEPTANCE TESTING

- A. In the presence of the Designer the Contractor shall demonstrate the presence of all specified equipment, cabling and installation methods. The Contractor shall demonstrate the operation of the system and shall be prepared to make any electronic, physical or software related adjustments to the system or any of its components to the satisfaction of the Designer, as required to achieve full compliance with the specifications.
- B. The contractor shall have available at the project site test equipment, cables, tools and personnel necessary to demonstrate full compliance with these specifications. The Contractor shall have presented a copy of the most up-to-date as-built documentation by this time.
- C. This Contractor shall provide all required labor services required by the Designer to completely verify and test the systems in the presence of the Designer.
- D. Rectify deficiencies indicated by tests and completely retest work affected by such deficiencies at Contractor's expense. Verify by the system test that the total system meets the Specifications and complies with applicable standards.
- E. Should the Designer be required to return to the project site to perform acceptance testing more than once, the Contractor shall be responsible for additional costs incurred by Designer, up to a maximum of \$1500 per day, plus travel and expenses.

3.7 DEMONSTRATION AND TRAINING

- A. Contractor shall furnish training of the owner's staff (educators) covering the intent and use of all products furnished on this section. Contractor shall furnish minimum of (24) Hours of training. Contractor shall assume that minimum of (8) independent trips to the project site will be required.

1. Training shall cover the following:

- a) Use and operation of the Smart Boards.
- b) Showing the educators where the specialty plates are within their rooms
- c) Hands on demonstration of hooking up equipment to the specialty plates, including passing of signals through all signal paths and viewing/listening to signals on the location display/audio system.

3.8 CLOSEOUT DOCUMENTATION

- A. Datasheets for each and every cable and custom plate/panel assembly shall be included in the record documents for the project. All information required under Submittals as well as any as-built changes shall be clearly and concisely reflected on these datasheets.
- B. Datasheets shall be assembled into the O&M manual for the specific systems and section to which they apply.

END OF SECTION 27 41 00

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SECTION 27 41 11 - INSTRUCTIONAL CLASSROOM AUDIO AND VIDEO SYSTEMS

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. Supplementary to Division 1, Refer to Division 27 Section 27 00 10 - "General Requirements for Communications" for additional information and work that is applicable to this section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Instructional classroom audio/video systems complete and functional as indicated.
- B. Related Sections
 - 1. All Division 27 Sections
 - 2. Common Work Results
 - a) Division 27 – "Operation and Maintenance of Structured Cabling and Enclosures"
 - b) Division 27 – "Basic Materials and Methods"
 - c) Division 27 - "Pathways for Communications Systems".
 - d) Division 27 – "Firestopping for Communications Systems"
 - e) Division 27 – "Identification for Communications Systems"
 - f) Division 27 – "Commissioning of Structured Cabling"
- C. Related Drawings
 - 1. All Technology Drawings (T-series)

1.3 DEFINITIONS

- A. Devices: As used with this section, devices shall refer to product(s) that are assembled to the front, side, rear, top or bottom of a custom plate/panel. Sample "devices" include, but are not limited to connectors, switches, lamp assemblies, meters, faders, and potentiometers.
- B. Components: As used with this section only, components shall refer to passive and active electronic parts used as part of an assembly that are otherwise considered plates, panels, hardware or devices.
- C. RGB: Red, Green, Blue
- D. RGBS: Red, Green, Blue, Sync
- E. RGBHV: Red, Green, Blue, Horizontal Sync, Vertical Sync
- F. Y-C: Chrominance, Luminance
- G. S-Video: Chrominance, Luminance
- H. DCR = Direct Current Resistance
- I. DVI = Digital Video Interface
- J. HDMI = High Definition Media Interface
- K. SDI = Serial Digital Interface
- L. HDSDI = High Definition Serial Digital Interface

1.4 REFERENCES

- A. National Electric Code
- B. NFPA

1.5 SYSTEM DESCRIPTION / DESCRIPTION OF WORK

A. Classroom audio/video systems complete to include:

1. Television displays
2. Control panels
3. Equipment cabinet
4. Scalers
5. Switchers
6. Cabling system
7. Custom input plates
8. Software complete as indicated
9. Cameras
10. Confidence monitors
11. Touch panels
12. Microphones
13. Speakers

1.6 SUBMITTALS

A. Only one contractor (the Division 27 Prime Contract holder) shall furnish the submittals for this section. The submittal shall be inclusive of all materials to be furnished under this section.

B. Provide datasheets of all models of cable and connectors to be supplied.

C. Assemblies only from pre-approved manufacturers shall be deemed acceptable. Contractor fabricated products shall not be permitted.

D. All assembly products furnished under this section shall be from a single manufacturer.

E. Shop Drawings

1. Scaled engineering level datasheets for each plate/panel assembly.
 - a) Drawing scale shall be 1/2-inch = 1-inch or 1-inch = 1-inch
 - b) Paper size: 8-1/2-inches by 11 inches or 11-inches by 17-inches as appropriate for the assembly
 - c) Each datasheet shall clearly indicate all of the following:
 - 1) The manufacturer of the assembly.
 - 2) Plate/panel material, finish, and color.
 - 3) Plate/panel dimensions.
 - 4) Mounting hole quantity, sizing and spacing.
 - i) Not required when using "standard" electrical "gang" plate sizes and standard EIA rack mount panels.
 - 5) Properties of all Text nomenclature.
 - i) Font
 - ii) Font Sizes
 - iii) Colors
 - iv) Line widths
 - 6) Properties of all non-text nomenclature
 - 7) Detailed list of devices used within the assembly.
 2. Schematic diagram of all assemblies
 - a) Wiring for those assemblies that have interconnections between devices and components, and for assemblies that feature consolidated connectivity points (screw terminals, pigtails, in-line connectors).
 - b) Device ID uniquely identifying the plate/panel keying it to a specific location at the project site, and on the system.

F. Quality Assurance

1. Samples of plates and panels shall be furnished for review upon the request of the designer.

1.7 QUALITY ASSURANCE

- A. Wire, cable, connectors, supplied and installed, shall not exceed the rated capacities and general operating ranges and conditions published by the product's manufacturer and within the limitations and guidelines
- B. Wire, cables and connectors supplied shall be used only for the purposes of carrying signals of the type(s) for which they are specified and/or approved by the Designer.
- C. Products shall be supplied and installed in accordance with applicable codes.
- D. Pre-approved alternate manufacturers and model numbers notwithstanding, all product supplied of a given type shall be of the same make and model. For example: All non-plenum rated microphone cable supplied for permanent install use be the same make and model across all sections and systems that are relate to this section. This applies to all wire, cable, connectors and other materials furnished under this section.
- E. Where this Contractor chooses to have its sub-contractor(s) furnish its own cabling, it is the responsibility of this Contractor to coordinate the uniform supply of product across all contractors to meet the intent of this section. Should there be technical merit to deviate from this the Contractor shall obtain approval in writing from the designer prior to procuring and installing product.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Wire/cable

1. West Penn Wire and Cable
2. Belden
3. Commscope
4. Cables To Go (Rapid Run)

B. Connectivity

1. Panel Crafters (Liberty Wire and Cable)
 - a) Internet: www.panelcrafters.com, www.libertycable.com
 - b) Phone: (800) 530-8998
2. Pro-Co Sound
 - a) Internet: www.procosound.com
 - b) Phone: (800) 253-7360
3. Rapco
 - a) Internet: www.rapco.com
 - b) Phone: (800) 325-0266
4. RCI Custom Products
 - a) Internet: www.rcicustom.com
 - b) Phone: (240) 912-0130
5. Whirlwind
 - a) Internet: www.whirlwindusa.com
 - b) Phone: (585) 663-8820
6. Wireworks Corporation
 - a) Internet: www.whirlwindusa.com
 - b) Phone: (908) 686-7400

7. Cables To Go (Rapid Run)
 - a) Internet www.rapidrun.com
 - b) Phone (800) 222-5911

2.2 GENERAL

- A. Contractor shall use these specifications in conjunction with the information provided on the drawings, in related specification sections and from supplied equipment manufacturers to determine the quality, performance and quantity of materials to be furnished.
- B. Wherever there is a conflict between these specifications and the drawings; between different drawings; between parts of these specifications; and between these specifications, the drawings and/or the specific manufacturer recommendations, the Contractor shall presume that the higher quality, higher quantity, and more stringent (the most costly) requirement shall apply. Where the contractor has sought and has received the approval from the Designer (prior to procuring materials or furnishing work) the potentially less stringent requirement(s) may be considered. A credit of appropriate value will be considered a requirement for the approval of any less stringent solution not approved prior to bid.
- C. Where specific manufacture/brands and models are listed in these specifications and/or on the drawings, the Contractor shall presume that these products set the reference Standard-of-quality.
- D. All furnished cable of a given type shall be of the same manufacture make, model and color, unless otherwise specified and/or approved by the Designer in advance of installation.

2.3 INSTRUCTIONAL AUDIO VIDEO SYSTEMS

A. Science Classroom

1. Classroom equipment to include:
 - a) Provide Shure MXA 910 ceiling mounted microphones. Re-locate and re-use existing from the existing Student Services Bldg.
 - b) Provide Shure MXN-6 ceiling mounted speakers. Re-locate and re-use existing from the existing Student Services Bldg.
 - c) Provide Wavlink WL-UG63PD2-Pro docking station complete.
 - d) Provide Screenbeam 1100 Plus complete.
 - e) Provide Aver TR530 PTZ auto tracking camera complete. Re-locate and re-use existing from the existing Student Services Bldg.
 - f) Provide Aver TR520 non tracking camera complete. Re-locate and re-use existing from the existing Student Services Bldg.
 - g) Provide Extron DTP CrossPoint 86 IPCP MA complete.
 - h) Provide DTP HCM1 4K 230 Rx (one per wall mounted TV for a total of 3).
 - i) Provide Extron TLP Pro 525M complete. Re-locate and re-use existing from the existing Student Services Bldg.
 - j) Provide Aten US3344i 4x4 USB switch complete.
 - k) Provide Aver BU113G2 CamStream 4K HDMI to USB adapter complete. Re-locate and re-use existing from the existing Student Services Bldg.
 - l) Provide Audinate Dante ADP-USB-AU-2X2 USB adapter complete. Re-locate and re-use existing from the existing Student Services Bldg.
 - m) Provide Middle Atlantic Racklink 915R PDU complete.
 - n) Provide Hollyland Mars 4K HDMI transmission system.
 - o) Provide Netgear GS524PP 24-port Gigabit Ethernet PoE network switch.
 - p) Provide Sony EZ20L 43" TV complete. Include Sanus VLT7 mount to secure TV to wall.
 - q) Provide Sony EZ20L 65", 75" and 85" televisions. Re-locate and re-use existing from the existing Student Services Bldg.

- r) Provide Equipment Cabinet to house equipment. Re-locate and re-use existing from the existing Student Services Bldg.
- s) Provide Smart Heavy Duty Mobile Stand for Interactive Displays FS-SBID-200.

PART 3 EXECUTION

3.1 GENERAL

- A. Provide all systems equipment, cabling, terminations, and software complete and functional as indicated and as recommended by the manufacturer. See drawings for more information.
- B. Connection Plates
 - 1. Secure all plates with oval-countersink head Phillips drive machine screws.
 - 2. Terminate and mount all connector plates at locations where shown on plans.
 - 3. Install plates square and plumb.
 - 4. Where décora-style jack frames are used, secure jack frames so they are installed secure and flush to plate, without movement
 - 5. Permanently label all plate connections on the front of the plate. Custom plates shall be fabricated by one of the listed manufacturers and may not be Contractor fabricated without pre-bid approval.

3.2 CABLE SELECTION

- A. Where the drawing(s) or related specification(s) identify the use of specific products, the Contractor shall furnish the products specifically identified.
- B. Where the drawing(s) or related specifications(s) identify the use of a general classification of product, the Contractor shall furnish one or more the products with the referenced classification. Where multiple products are included under the classification, the contractor shall use the criteria or performance guidelines in this specification and in the related specification to determine which product shall be provided.
- C. Where the drawing(s) or other specification sections do not identify a product model, or specific product type, the contractor shall utilize this specification section, equipment manufacturer recommendations, and industry references and standards to determine which products to provide.

3.3 CABLE INSTALLATION

- A. Isolation and Balancing transformers:
 - 1. Transformers shall be wired so as to provide a balanced, RF interference and ground-loop free signal transmission audio path between plates.
 - 2. Transformer shall be provided with appropriate length conductors added to them to permit secure connection to connectors.
 - 3. Transformer case shall be insulated from ground using a piece of appropriately sized and applied piece of heat shrinkable tubing.
- B. Cable Separation
 - 1. Cables carrying different signals of different nominal operating level shall be kept separated to reduce the risk of undesirable cross-talk interference between cables.
 - 2. As a general rule, for each 25dBV difference in nominal level between cables, Contractor shall provide 6 inches of separation between cables. For example: cables with a 90dBV level difference shall be separated by at least 18 inches (where 0dBV=1Volt).
 - 3. Contractor shall provide additional separation as determined necessary to prevent or remedy any crosstalk which adversely affects the performance and usability of the system or that exceeds specific crosstalk performance outlined in these specifications.

C. Cable and Conductor Identification

1. Use color coding of conductors and apply wire and cable marking tape to designate wires and cables so all media are identified in coordination with system wiring diagrams.
2. All cables shall be labeled at both ends using computer generated type-written permanent self laminating wire labels. Cables should clearly correlate to cabling as shown on the installation and record drawings.

D. Drain wire and shield preparation

1. Non-insulated conductors (typically the shield and/or shield drain wire) that are an integral part of a multi-conductor cable shall be individually insulated as they exit the jacket of the cable. Apply high-temperature heat shrinkable plastic tubing of the appropriate size over the conductor.
2. Unless otherwise required for conductor color code coordination contractor shall use Green color heat shrink. White and Clear may be used where necessary to coordinate with other conductors.

E. Grounding and bonding

1. As a matter of standard practice, the non-signal carrying shield drain wire of audio cables shall be "grounded" at one end only and left floating from ground at the other.
2. Un-terminated shields and drain wires shall not be cut off. Rather these conductors should be insulated and prepped for termination but then folded back and secured on the cable. These conductors shall remain intact reserved for future use and for selective use in remedying grounding anomalies.

3.4 LABELING

A. All wires and cables shall be labeled with permanent and unique numeric/alpha -numeric labels.

1. All cables shall be labeled behind the plate
2. Cables shall be labeled within 3-6 inches from point of termination.
3. Use computer and laser-printer generated self-laminating labels. Nomenclature shall be bold type and clearly legible.
4. Record cable labeling on as-built drawings.
5. Audio, Video and Control cables that originate and end within the same room may use the same may be labeled in a "typical" fashion that is consistent with other rooms wired identically.
6. Cables that begin in one room and end in another room shall be uniquely labeled

B. Where not specified or shown on the drawings, the Contractor shall submit it desired labeling scheme for review and approval. Contractor shall make any adjustments to the labeling scheme directed by the Designer. Nomenclature used for labeling may vary by system.

3.5 TERMINATION INSTALLATION

A. Assembly

1. Devices with through mounting holes shall be secured to plates/panels using threaded machine screws. Pop rivets are not acceptable.
 - a) Phillips drive flat-head countersink screws shall be used where the device manufacturer provides a countersunk through mounting hole. The size of the head shall match the size of the countersink. Screw head shall not stand proud of the countersink and no sharp exposed edges of the screw shall exist.

- b) Philips truss head machine screws shall be used for mounting devices without countersunk mounting holes
 - c) Thread-lock compound shall be applied to screw threads used to secure devices to the plate/panel. Low-strength blue Loctite™ or equal shall be used.
 - 2. Devices designed to be mounted without the use of through mounting holes shall be secured using the means expressly provided and/or recommended by the device manufacturer.
 - 3. All devices shall be mounted parallel to the edges of the plate/panel.
 - 4. All devices shall be secure and with no movement or rotation other than that which is part of the intended assembly or device design.
- B. Assembly Wiring
- 1. Wiring shall be neatly and professionally attached to all devices. Appropriate strain relief techniques shall be applied to all pigtails to ensure zero mechanical strain on device connections.
 - 2. Different color wires shall be used in the assembly to aid in identification of circuits. Clearly legible and permanent labels shall be affixed to cables and conductors to aid in identification of circuit and signal paths.
- C. Component Mounting
- 1. Components that are part of plate/panel assembly shall be securely, neatly, and professionally attached.
 - 2. Custom mounting brackets and standoffs shall be used where applicable.
- D. Mounting
- 1. Plate/Panels shall be mounted plumb and square and shall be securely attached to substructure and/or back box.

3.6ACCEPTANCE TESTING

- A. In the presence of the Designer the Contractor shall demonstrate the presence of all specified equipment, cabling and installation methods. The Contractor shall demonstrate the operation of the system and shall be prepared to make any electronic, physical or software related adjustments to the system or any of its components to the satisfaction of the Designer, as required to achieve full compliance with the specifications.
- B. The contractor shall have available at the project site test equipment, cables, tools and personnel necessary to demonstrate full compliance with these specifications. The Contractor shall have presented a copy of the most up-to-date as-built documentation by this time.
- C. This Contractor shall provide all required labor services required by the Designer to completely verify and test the systems in the presence of the Designer.
- D. Rectify deficiencies indicated by tests and completely retest work affected by such deficiencies at Contractor's expense. Verify by the system test that the total system meets the Specifications and complies with applicable standards.
- E. Should the Designer be required to return to the project site to perform acceptance testing more than once, the Contractor shall be responsible for additional costs incurred by Designer, up to a maximum of \$1500 per day, plus travel and expenses.

3.7DEMONSTRATION AND TRAINING

- A. Contractor shall furnish training of the owner's staff (educators) covering the intent and use of all products furnished on this section. Contractor shall furnish minimum of (24) Hours of training. Contractor shall assume that minimum of (8) independent trips to the project site will be required.
 - 1. Training shall cover the following:
 - a) Use and operation of the Smart Boards.

- b) Showing the educators where the specialty plates are within their rooms
- c) Hands on demonstration of hooking up equipment to the specialty plates, including passing of signals through all signal paths and viewing/listening to signals on the location display/audio system.

3.8CLOSEOUT DOCUMENTATION

- A. Datasheets for each and every cable and custom plate/panel assembly shall be included in the record documents for the project. All information required under Submittals as well as any as-built changes shall be clearly and concisely reflected on these datasheets.
- B. Datasheets shall be assembled into the O&M manual for the specific systems and section to which they apply.

END OF SECTION 27 41 00

SECTION 28 05 00 – COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Division 28 Specifications and Drawings.

1.02 SUMMARY

- A. Basic materials, methods and installation guidelines applicable to the work of all Division 28 documents.
- B. The information included in this Section apply too and are additional requirements for all of Division 28 documents.
- C. Thoroughly review entire bid documents, including all drawings and specifications prior to bidding and include all indicated work in bid.

1.03 REQUIREMENTS

- A. Project Coordination
 - 1. Commence coordination immediately upon award of contract. Coordination includes providing and extracting related information to and from other trades for review. Failure to coordinate in a timely manner shall not result in any subsequent additional reimbursement, special allowances or additional construction time being made for any facet of the project. Work fabricated or installed before properly coordinating with all other trades shall be done at the Contractor's own risk.
 - 2. Work in harmony with all building trades, so as not to cause any delays. Sequence, coordinate, and integrate installations of communications materials and equipment with all other applicable trades for efficient flow of the Work. In addition, contact and coordinate/facilitate work of local communications service providers for incoming communications services. Execute connections with local services providers complete as indicated.
 - 3. The drawings indicate the approximate location and arrangement of required work. The drawings shall be followed as closely as possible in coordination and in execution of the work.
 - 4. Participate in coordination efforts and in preparation of coordination drawings prior to fabrication or installation of any equipment, materials, etc. Coordinate actual clearances of all installed equipment.
 - 5. Conflicts in equipment and materials shall be corrected prior to installation. Should there be a conflict with the drawings of other trades, work with the trades to correct the conflict while coordinating the project. If the conflict cannot be resolved, refer the matter to the owner's representative for a final decision as to method or material. Refer to drawings of all other trades for details, dimensions and locations of other work and route their work so as not to conflict with any other branch. Any work installed or equipment placed in position by this contractor creating a conflict shall be readjusted to the satisfaction of the Owner's representative at the expense of this contractor.
 - 6. All products furnished of a given type shall be by a single manufacturer; shall bear the same brand name; shall be of the same finish color and texture; and shall be from the same product model series, unless otherwise noted.

7. Plans are diagrammatic indicating design intent and indicating required size, points of termination and, in some cases, suggested routes of raceways, etc. However, it is not intended that drawings indicate fully coordinated conduit routing, all necessary offsets, etc. Provide all cable assemblies, etc. as straight as possible and symmetrical (perpendicular to or parallel with) with architectural items and in a consistent elevation. Do not provide work installed diagonal to building members.

B. Shop Drawings, Product Data, and Samples

1. All submittals shall be submitted electronically in PDF format unless otherwise directed by the A/E or Owner.
2. Provide complete master material list.
3. Provide the following information for each product:
 - a. The manufacturer's name (Brand) and full model number.
 - b. Product Information Sheets "Datasheets": Include catalog information, sizing, and technical data on each item to be used on the Project.
 - c. Each product datasheet must reference the specific paragraph for which the product is being submitted. Each product must be listed in the exact same order as it appears in the Section for which the products are being submitted.
 - d. Datasheets shall each include a clearly identifiable label applied in upper corner of each sheet that clearly references the specification section and drawing (as applicable) to which it applies. Labels shall be consistently affixed in the same location on all sheets unless the labels will obstruct pertinent technical information.
4. All datasheets shall be original manufacturer datasheets.
5. Where datasheets depict multiple products, versions or options, the Contractor shall highlight (indicate with an arrow) all applicable model(s), version(s) and option(s) applying to the specific product the Contractor will be providing. Exact catalog number must be indicated. The submitted items must be from "approved materials" as specified in each Specification Section.
6. Do not combine with submittals from any other Division.

C. Operation and Maintenance Manuals

- a. Prepare Operations and Maintenance Manuals in accordance with Section 01 77 00 Contract Closeout.
- b. Operations and Maintenance (O&M) manuals shall be provided for each item of equipment. Flash drives shall be file folder indexed for each piece of equipment. O&M submittals shall include but not be limited to the following:
 - a. Installation instructions and schematic drawings.
 - b. Operating and maintenance instructions.
 - c. Complete parts list with manufacturer's model numbers.
 - d. Complete set of approved shop drawings.
 - e. Complete wiring diagrams showing all connections and internal wiring diagrams of all equipment, including module diagrams. Factory typical wiring diagrams are not acceptable.

D. Building Codes:

1. National Electrical Code (NFPA 70)
2. Life Safety Code (NFPA 101)

3. Uniform Building Code (Or adopted State Code)
4. Federal Communications Commission (FCC) Part 68
5. State specific agencies:
 - a. Administrative Building Council
 - b. State Board of Health
 - c. State Fire Marshal
 - d. Local Codes (City, County, etc.)
 - e. Local Utility Company requirements

E. Standards

1. American National Standards Institute/Telecommunications Industry Association – ANSI/TIA 568C Commercial Building Telecommunications Cabling Standard.
2. American National Standards Institute/Telecommunications Industry Association – ANSI/TIA 569D Commercial Building Standard for Telecommunications Pathways and spaces.
3. American National Standards Institute/Telecommunications Industry Association – ANSI/TIA 606B The Administrative Standard for the Telecommunications Infrastructure of Commercial Buildings.
4. American National Standards Institute/Telecommunications Industry Association – ANSI/TIA 607C Commercial Building Grounding and Bonding Requirements for Telecommunications.
5. American National Standards Institute /Building Industry Consulting Services International – ANSI/BICSI 005-2016, Electronic Safety and Security (ESS) System Design and Implementation Best Practices.
6. ASIS – Security Management Standard: Physical Asset Protection (PAP)
7. ASIS – Facilities Physical Security Measures Guideline (FPSM)

F. Permits

1. Contractor shall obtain and pay for all permits or certificates of inspection and approval required for his branch of the work.
2. Permits shall be posted in a prominent place at the building site properly protected from weather and physical damage.

G. Definitions

1. Wherever the word "Install" appears on the drawings or in these Division 28 specifications it shall mean to supply all labor, tools and incidental materials necessary to handle, store, mount, terminate, program, configure and adjust product as necessary to fulfill project requirements.
2. Wherever the word "Provide" appears on plan drawings or in Division 28 specifications, it shall be interpreted to mean that the Contractor shall "Furnish and Install", including all necessary accessories, miscellaneous materials and labor necessary to render the respective system fully operational.
3. Wherever the word "Work" appears in Division 28 specifications or on communication technology drawings, it shall be interpreted to mean any and all labor, materials, accessories, services, etc. necessary to fulfill project requirements.
4. Wherever the word "Furnish" appears on the drawings or in these Division 28 specifications it shall mean to supply the specified labor or specified product, including all associated shipping, storage and warranty expenses.

5. Wherever the words "Site", "Project Site", or "Premises" appears in Division 28 specifications or its related drawings, it shall be interpreted to mean all real estate, buildings and structures where work will be performed and where products will be installed and reside.
6. Wherever the phrase "Standard of Quality" appears in Division 28 specifications or its related drawings, the Contractor shall interpret this to mean that the listed Manufacturer and Catalog number for each item has the physical, functional, and operational attributes to provide the designed functionality.

H. Quality Assurance

1. Contractor shall have a minimum of five (5) years of experience in the installation of Communication Technology system(s) of similar size, type, scope and contract value.
2. The lead technician(s) on the Project shall have a thorough understanding of the following:
 - a. American National Standards Institute/Telecommunications Industry Association/Electronics Industry Association – ANSI/TIA/EIA 568B Commercial Building Telecommunications Cabling Standard.
 - b. American National Standards Institute/Telecommunications Industry Association/Electronics Industry Association – ANSI/TIA/EIA 569A Commercial Building Standard for Telecommunications Pathways and spaces.
 - c. American National Standards Institute/Telecommunications Industry Association – ANSI/TIA/EIA 606 The Administrative Standard for the Telecommunications Infrastructure of Commercial Buildings.
 - d. American National Standards Institute/Telecommunications Industry Association/Electronics Industry Association – ANSI/TIA/EIA 607 Commercial Building Grounding and Bonding Requirements for Telecommunications.
 - e. American National Standards Institute /Building Industry Consulting Services International – ANSI/BICSI 005-2016, Electronic Safety and Security (ESS) System Design and Implementation Best Practices
 - f. ASIS – Security Management Standard: Physical Asset Protection (PAP)
 - g. ASIS – Facilities Physical Security Measures Guideline (FPSM)
3. Contractor shall be a (factory trained) certified installer for all systems provided in Division 28.
 - a. This minimum requirement shall apply to each Division 28 section independently. If Contractor is incapable of meeting the percent of product value requirement for each section, Contractor shall use a Subcontractor that can meet the percent of product value requirement, in whole, for all products and work of that section for which This Contractor is not qualified.
 - b. The specific Contractor or Subcontractor meeting the requirements for a specific section shall be responsible for the supply of the products, supplemental engineering services and submittals as well as performing all technical labor associated with the installation, training and warranty servicing of work of that section.
4. Contractor shall have substantial business operations located within a 100-mile radius of the project site with a full-time employee staff actively engaged in the supply, installation and service of systems and equipment of the type and scope herein specified.
5. Contractor shall have full-time employee service staff based within a 100-mile radius of the project site.
6. Contractor shall provide any additional information requested by the Owner as determined appropriate by the Owner to validate a Contractor's (or its Subcontractor's) ability to perform

and warranty the specified work in the quality, manner and time frame required.

7. Superintendent/Project Manager

- a. This Contractor shall furnish the services of an experienced superintendent/Project Manager who shall be constantly in charge of the work, together with the qualified Foremen and specialists as required to properly install, connect, adjust, start, operate and test the work involved.
- b. The superintendent's/Project Manager's qualifications shall be subject to the review and acceptance by the A/E and Owner. Unless the A/E or Owner grants prior special permission, the same communication Superintendent/Project Manager shall be utilized throughout the duration of the project and be responsible for the complete scope of the Contract.

I. Product Delivery Requirements

1. The Contractor shall not procure, deliver or install any product until after the contractor's submittal has been reviewed by the A/E and Owner and the submittal has been returned to the Contractor's marked "Reviewed No Exceptions Taken", "Reviewed as Noted" or "Rejected Resubmit". Advance procurement, delivery or installation of product prior to the return of submittal is entirely at the Contractor's own risk. Contractor should schedule its work and procurement accordingly.
2. Prior to procurement of any equipment or materials, Contractor shall review the model numbers, compatibility and interoperability of all products.
3. Prior to procurement, Contractor shall, through coordination with other trades and through field measurements and project site inspections, verify that products to be supplied can be physically installed as planned.
4. No claim for additional payment will be considered for the return of any equipment determined incompatible, or procured without adhering to the aforementioned conditions, including claim for reimbursement of manufacturer's "restock" fees.
5. Contractor shall factor all of these conditions into its bid and plan its scheduling and resource needs accordingly to ensure that all work shall be performed according to the Owner's schedule and requirements of this Contract.

J. Product Storage and Handling Requirements

1. The Contractor is responsible for receiving, handling, storing, and protecting all materials used on this Project until Substantial Completion.
2. Pack components in factory-fabricated protective containers.
3. Units shall be delivered in sections of such size as will pass through available openings.
4. Until ready for installation, store products in original factory containers.
5. Products shall be stored in a clean, dry space and as additionally recommended by the product manufacturer.
6. Keep products out of the weather and away from construction traffic and debris, including drywall finish dust.
7. Do not exceed structural capacity of the floor or platform on which the products are stored.
8. Until final acceptance of the system, protect all supplied products from damage resulting from moisture, fumes, dirt, dust and debris or any other source of potential damage.
9. Handle all products with care before, during and after installation so as to prevent damage.
10. Replace any products damaged prior to final acceptance with new replacement products.

11. Replacement shall be at Contractor's expense.
12. Contractor is responsible for the safety and good condition of the materials and equipment installed until final acceptance by the Owner.
13. Save original product shipping containers and related packaging materials for major products until final acceptance.
14. Prior to disposal, check with owner to determine if the owner wishes any of the packaging materials.

K. Examination and Preparation

1. Contractor shall visit the Site to familiarize himself with the local conditions under which the work is to be performed and correlate his observations with the requirements of the Contract Documents. No allowance shall be made for claims for concealed conditions which the Contractor, in exercise or reasonable diligence in observations of the Site and review of the local conditions under which the work is to be performed, learned or should have learned of, unless otherwise specifically agreed by A/E and Owner in writing.
2. Before ordering any materials or doing any work, the Contractor shall verify all measurements and be responsible for correctness of same. No extra charge or compensation will be allowed for duplicate work or material required because of an unverified difference between an actual dimension and the measurement or size indicated in the drawings or specifications. Any discrepancies found shall be submitted in writing to the A/E and Owner for consideration before proceeding with the work.
3. This Contractor must verify all dimensions locating the work and its relation to existing work, all existing conditions and their relation to the work and all man made obstructions and conditions, etc. affecting the completion and proper execution of the work as indicated in the Contract Documents.

L. Installation

1. Provide all required labor, materials, equipment and Contractor's services necessary for complete installation of systems required to comply with the requirements of authorities having jurisdiction, as indicated on Drawings, and as specified.
2. Work shall be functional and complete in every detail, including any and all items required to complete the system, whether or not these items have been enumerated or shown on the Drawings.
3. Special attention shall be given to access to working and controlling parts. Adjustable parts shall be within easy reach. Removable parts shall have space for removal.
4. Each Contractor shall be fully knowledgeable of the details of all Work to be performed by other trades and take necessary steps to integrate and coordinate his Work with other trades.
5. Wherever tables or schedules show quantities of materials, they shall not be used as a final count. These figures serve only as a guide for the Contractor. Each Contractor shall be responsible for furnishing all materials on the Drawings or as specified.
6. The Consultant and Owner's Representative have full power to condemn or reject any Work, materials or equipment not in accordance with these Specifications and Construction Drawings or the manufacturer's specifications or drawings approved by the Owner or Consultant.
7. Work or equipment that is rejected shall be removed and replaced to the satisfaction of the A/E and Owner at the Contractor's expense. Work or equipment that is rejected shall be so stated in writing by the A/E or Owner.

8. Such decisions that the A/E or Owner may make with respect to questions concerning the quality, fitness of materials, equipment, and workmanship shall be binding upon the parties thereto.
9. All Work shall fully comply with these specifications and related Drawings and all manufacturers recommended installation practices.
10. All Work shall be performed with the best practices of the trade for performance, functionality, safety, endurance, and aesthetics.
11. Coordinate ordering and installation of all equipment with long lead times or having a major impact on work by other trades so as not to delay the job or impact the schedule.
12. Where mounting heights are not detailed or dimensioned, install systems, materials and equipment to provide the maximum headroom possible, as appropriate to the application.
13. Set all equipment to accurate line and grade, level all equipment and align all equipment components.
14. Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery of equipment and apparatus furnished into the premises. These items shall be removed from premises when no longer required.
15. No equipment shall be hidden or covered up prior to inspection by the owner's representative. All work that is determined to be unsatisfactory shall be corrected immediately.
16. All work shall be installed level and plumb, parallel and perpendicular to other building systems and components.
17. Install all equipment and materials in strict accordance with manufacturer's written instructions. Bring any conflicts between the manufacturer's written instructions and these specifications to the attention of the A/E for recommendations.
18. Upon completion of installation of equipment and communication circuitry, energize circuitry and demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with re-testing.

M. Cutting and Patching

1. Where demolition of existing surfaces are required by the Work, the same shall be restored to at least as good a condition as they were before.
2. Contractor shall be responsible for painting, patching, repairing and replacing any building surface, furnishing, wall/floor/ceiling covering that is damaged or penetrated in the process of performing work on the project site.
3. Additional work required to repair work performed under this Contract shall be at the expense of This Contractor.
4. The Division 28 contractor shall do all cutting as required for the admission of Division 28 work. Unless directed otherwise in field, provide all related patching and painting to match surrounding methods, materials and colors. Any damage done by this contractor to the building during the progress of this contractor's work shall be made good at this contractor's expense.

N. Site Maintenance

1. During the progress of the work, the Contractor shall clean and leave the premises and all portions of the building in a clean and safe condition. This cleaning shall occur on a daily basis.

O. Final Cleaning

1. Clean all parts of the apparatus and equipment. Exposed parts, which are to be painted, shall be cleaned of cement, plaster and other materials and all oil and grease spots shall be removed. Such surfaces shall be carefully wiped and all corners and cracks scraped out.

P. Closeout Requirements

1. Upon the Designer's receipt of and approval of the Contractor's pre-test submittal, the Contractor shall contract the Designer to schedule acceptance testing. Contractor shall allow not less than 10-business days of advance notice to the Owner.
2. In the presence of the Owner, the Contractor shall demonstrate the presence of all specified products, cabling and installation methods. The Contractor shall demonstrate the operation of the system (and any requested sub-component thereof) and shall be prepared to make any electronic, physical or software related adjustments to the system or any of its sub-components to the satisfaction of the Owner, as required to achieve full compliance with the specifications.
3. The contractor shall have available at the project site all test equipment, cables, tools and personnel necessary to demonstrate full compliance with these specifications as determined necessary by the designer.
4. During the acceptance testing the Contractor shall have a clean and fresh copy of the contractor's most up to date as-built record documentation, printed to scale.
5. This Contractor shall provide all required labor services required to completely verify and test the systems in the presence of the Owner.
6. Verify that each system, as a whole system, meets these Specifications and complies with all applicable standards.
7. Rectify deficiencies indicated by tests and completely retest work affected by such deficiencies at Contractor's expense.

Q. Warranties

1. Specified materials and workmanship provided shall be fully guaranteed by the Contractor for one year from the transfer of title via notice of substantial completion against any defects in materials or workmanship.
2. Extended (additional) warranty(s) may be required and will be identified in the individual Specification Section and will be considered additive to this base Contractor Warranty.
3. Requirements for Manufacturer's Warranties, required by a Specification Section, shall run concurrent to this base Warranty by the Contractor but may exceed the Contractor's Warranty Period.
4. Manufacturer's Warranties shall also begin upon Substantial Completion.
5. The Warranty shall begin upon Substantial Completion.
6. This warranty shall in no manner cover equipment that has been damaged or rendered unserviceable due to negligence, misuse, acts of vandalism, or tampering by the Owner or anyone other than employees or agents of the Contractor.
7. The Contractor's obligation under its warranty is limited to the cost of repair of the warranted item or replacement thereof, at the Contractor's option.
8. Insurance covering said equipment from damage or loss is to be borne by the Contractor until full acceptance of equipment and services.
9. Individual specification sections may have additional warranty requirements for the work in

- that section. The warranty above will cover all materials and work where not covered by an extended warranty listed in the individual specification section.
10. Specified materials and workmanship provided shall be fully guaranteed by the Contractor against any defects in materials or workmanship.
 11. Contractor shall provide a full "System Warranty" which shall cover all materials, labor and related product shipping expenses for a period of five years from the date of Owner acceptance.
 12. Supplied products with manufacturer's warranties of less than the System Warranty term shall be extended by the Contractor for the full specified term.
 13. During this period the Contractor will remedy (at no cost to the owner) any problem with the system, or any of its related components that is the result of defective materials, settings, workmanship, or loss or programming.
 14. Any defective items or work shall be removed and replaced at the Contractor's expense to the satisfaction of the owner's representative and the Owner.
 15. The period of the Contractor warranty(s) for any items herein are not exclusive remedies, and the Owner has recourse to any warranties of additional Scope given by the Contractor to the Owner and all other remedies available by law or in equity.
 16. Additional Warranty requirements may be added by an individual Specification Section.
 17. Scope of these extended (additional) warranty(s) will be identified in the individual Specification Section and will be considered additive to this base Contractor Warranty.
 18. Requirements for Manufacturer's Warranties, required by a Specification Section, shall run concurrent to this base Contractor Warranty by the Contractor.
 19. Manufacturer's Warranties shall also begin on Substantial Completion.

R. Demonstration and Training

1. Each Division 28 section may specify special Training requirements.
2. Training requirements will be for a quantity of hours, allow for multiple trips.
3. If no special requirements are specified in the individual section, provide for 4 hours and 2 trips for basic overview, operation and maintenance information per section.
4. Train Owner's maintenance personnel on the procedures and schedules involved in operating, general troubleshooting, and preventative maintenance of the system.
5. Contractor shall require all attendees to sign-in for each training session. The sign-in form shall summarize the training to be conducted, specification section and subsection being trained on, as well as the starting time and duration of training. Following training, a representative of the owner shall sign the form, acknowledging the same. Contractor shall retain the original copy of these forms and turn over a photocopy of the form to the owner's representative as evidence of training. Training conducted without this official record of training shall not be considered as part of the Contractor's training obligation.
6. Schedule training with the Owner's representative, at least 14 days in advance.

PART 2 - PRODUCTS

2.01 ASSIGNMENT OF MISCELLANEOUS WORK

- A. Excavating and backfilling for telecommunications work shall be by telecommunications contractor.
 1. Properly support banks of excavation with safety sheet pile. Install necessary guards.

Provide adequate pumping equipment and keep excavation free of water.

2. Excavate pipe trenches to proper depth. Where rock is encountered, excavate to 6 inches below pipe and refill to 6 inches above pipe with compacted granular fill. Granular fill shall consist of dune sand, gravel or other suitable material containing not more than 10 percent by weight passing #200 sieve and 100 percent passing 1-inch sieve.
3. Excavation for utilities shall not be backfilled until all required tests are performed and approved by Engineer and the utility company.
4. Whenever underground feeders are run below footings and grade beams, contractor shall backfill the void with poured, steel-reinforced concrete to elevation of bottom of footing or grade beam. Backfill within building lines shall be made with granular fill or compacted backfill material laid in 6-inch layers and tamped to specified compaction after each layer.
5. Backfill under paved area shall be made with granular fill compacted backfill material laid in 12-inch layers and tamped to compaction after each layer.
6. Backfill under open yards or fields shall be made with non-compacted backfill laid in layers not to exceed 24 inches deep. Sand trenches may be allowed to settle naturally and shall be refilled back to grade as required during first year after final acceptance.
7. Contractor shall refill, regrade and refinish any area that becomes unsatisfactory due to settlement within one year after final acceptance.
8. Contractor shall verify all existing grades, inverts, utilities, obstacles and topographical conditions prior to any trenching, excavation or underground installation. In event existing conditions are such as to prevent installation in accordance with Drawings, contractor shall immediately notify Engineer.
9. Provide appropriate plastic marker tape buried directly above underground electric and communication lines continuously along length of lines. Marker tape shall be located 12 inches below finished grade, but no closer than 12 inches above underground lines. Tape shall be a minimum of 6 inches wide.
10. Refer to Division 31 Section "Earth Moving," for additional requirements. In event of conflict between this section and Division 31 Section "Earth Moving," Division 31 Section "Earth Moving" shall apply, unless otherwise indicated by A/E.

B. Provide sleeved penetrations for all cabling access where applicable.

1. Where conduits pass through walls, roofs, ceilings, or floors, contractor shall set sleeves when floors, walls, ceilings or roofs are constructed. If any holes are cut in finished work where sleeves have been omitted, cutting shall be done with a concrete coring machine or other approved means and only with consent of Engineer. All such holes are to be carefully cut and shall not be larger than necessary. These holes are to be entirely covered by escutcheon plates when work is completed. Sleeves shall be made of pipe or rolled sheet steel no lighter than No. 18 gauge.
2. Where conduits pass through sleeves in exterior walls above grade, annular space shall be caulked with oakum and filled inside and out with non-hardening, waterproof sealant finished off flush with both faces of wall.
3. Provide penetration seals for all conduits penetrating the building wall below grade.
 - a. Description: The pipe to wall penetration closures shall be "Link-Seal" or equal, as manufactured by PSI/Thunderline Corporation – Houston, TX. Seals shall be modular type, consisting of synthetic rubber shaped to continuously fill the annular space between the pipe and wall opening. After the seal assembly is positioned in the sleeve, the rubber sealing elements shall provide an absolutely water-tight seal between the pipe and wall opening. The seal shall be constructed as to provide insulation between the pipe and wall, thus reducing changes of cathodic reaction between these two

members.

- b. Wall Opening: Provide "Century-Line" sleeves or equal as manufactured by PSI/Thunderline Corporation – Houston, TX. Contractor shall determine the required inside diameter of each individual wall opening of sleeve before ordering, fabricating or installing. The inside diameter of each wall opening shall be sized as recommended by the manufacturer to fit the pipe and Link-Seal to assure a water-tight joint. Sizing (correct Link-Seal model and number of links per seal) may be obtained through manufacturer's catalog. If pipe O.D is non-standard due to coating, insulation, etc. consult Thunderline's factory for engineering assistance and recommendation before proceeding with wall opening detail.
- c. Holes through Structural members: Holes required for conduit of size 5-inches and smaller shall be cut in field at expense of this contractor. Obtain structural engineer's approval in writing prior to any cutting.
- d. Pitch Pockets: Required for conduit penetrating roof. Seal sleeves and provide flashing.
- e. Painting of telecommunications cabling and components is not permitted. Notify painting contractor that painting of telecommunications cabling and components is not permitted. Protect cabling as necessary to avoid painting.

2.02 MATERIALS AND EQUIPMENT

- A. Equipment shall be new, listed by UL and shall conform to NEMA and ICEA standards.
- B. Materials used for like service shall be by same manufacturer.
- C. All materials and equipment, including any hangers, supports, fastenings or accessory fittings, shall have corrosion protection suitable for atmosphere in which they are installed, whether located indoors or out. Care shall be taken during installation to assure integrity of corrosion protection.
- D. All screws, bolts, nuts, clamps, fittings or other fastening devices shall be made up tight. All bolts, screws, nuts and other threaded devices shall have standard threads and heads so they may be installed and replaced when necessary without special tools.

2.03 PRODUCT AND MATERIAL APPROVAL

- A. A Specification followed by one or more manufacturers is limited to those manufacturers. Names of other manufacturers may be submitted for approval to A/E and Owner a minimum of ten (10) days prior to receiving bids. Approval will be issued by Addendum if granted.
- B. A Specification followed by one or more manufacturers and "or approved equal" is open to all equal products or materials; however, Contractor shall supply one of listed manufacturers at no additional cost if Engineer finds substituted product unsatisfactory.

2.04 CAULKING AND FIRESTOPPING

- A. In addition to the requirements in Division 07 Section "Penetration Firestopping," comply with this Article.
- B. All raceway and sleeve penetrations of fire barriers shall be sealed to achieve fire resistance equivalent to fire separation.
 - 1. Maintain fire rating per ASTM E-814 and UL 1479.
 - 2. This assembly must also maintain a watertight seal between floor or wall and pipe.
- C. For other penetrations through non-rated walls, partitions, floors and ceilings, caulk the space between raceways and raceway sleeves with non-staining, waterproof gun grade compound. Apply caulking compound by the gun method using nozzles of a proper size to fit the width of joint. Prepare the joint for caulking by packing it tightly with a resilient foam or rope yarn.

- D. Products: Subject to compliance with requirements, provide one of the following:
1. Maintain fire rating per ASTM E-814 and UL 1479.
 2. Penetration sealant:
 - a. 3M Brand "Moldable Putty Pads": and "Moldable Putty Stix"
 - b. 3M Brand "Fire Barrier" Caulk, Putty or Penetrating Sealing Systems
 - c. Dow Corning "Fire Stop Foam: and "Fire Stop Sealant" systems
 - d. Insta-Foam Products, Inc. "Insta-Fire Seal Silicone RTV Foam"
 - e. Standard Oil Engineering Materials Company, "Frye Putty"
 - f. Chase technology "Chase Foam #CTC PR-855"
 3. Intumescent Sealant for use at openings and sleeves involving flexible cable.
 - a. 3M Brand "Fire Barrier" caulk or putty, FS-195 Wrap Strip and CS-195 Composite Sheet.
 - b. Dow Corning "Fire Stop Intumescent Wrap Strip"
 - c. Fox Couplings, Inc. "The Fox Cast-in-Place Coupling"
 4. Performance Characteristic: Firestopping materials shall conform to both Flame (F) and Temperature (T) ratings as tested by nationally accepted test agencies per ASTM E814 or UL 1479 fire test.
 - a. °F Rating shall be a minimum of one hour but not less than the fire resistance rating of the assembly being penetrated.
 - b. Conduct the fire test with a minimum positive pressure differential of 0.01 inches of water column.
 5. Quality Assurance: Installer qualifications – a firm specializing in firestopping installation with not less than two years of experience or trained and approved by firestopping manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION OF ELECTRONIC SAFETY AND SECURITY SYSTEMS

A. General

1. All work installed in finished areas shall be concealed.
2. Install systems, materials, and equipment to conform with approved documents.
3. Install equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations.
4. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
5. Verify all dimensions by field measurements. Take measurements and be responsible for exact size and locations of all openings required for the installation of work. Proposed dimensions are reasonably accurate and should govern in setting out work. Where detailed method of installation is not indicated or where variations exist between described work and approved practice, direction of the owner's representative on job shall be followed.
6. Workmanship throughout shall conform to the standards of best practice. Marks, dents or finish scratches will not be permitted on any exposed materials, fixtures or fittings. Inside of panels and equipment boxes shall be left clean.
7. Use caution not to exceed the allowed bend radius for respective cables and not to

compromise the integrity of the cables during installation by pulling cable management devices too tightly, damaging cables, etc. Raceway/Cabling bending radii shall be minimum as directed by cable manufacturer. Use pulling compound or lubricant, where necessary; compound must not deteriorate conductor or insulation.

B. Cable

1. Provide color-coded jackets to identify different systems.
2. Neatly comb out multiple cable bundled runs to remove tangling and crossing of cables within the bundles. Neatly dress all cable work and provide vertical and horizontal cable management (or other approved method) for properly dressing all work at racks, control panels, backboards etc.
3. Provide spacing between cable bundles to help dissipate heat. Do not cinch cables into tight bundles.
4. Nylon cable ties are not permitted. Bundle cables with "Velcro" style cable straps with a minimum of 1-inch width.
5. All cables shall be supported every 5 feet (or less) and within 12" of device boxes, outlets, racks/cabinets and cable tray.
6. Use separate J-Hook cable support systems for cables belonging to different systems and for cables carrying different operating levels.
7. Loosely secure cables at each J-Hook.
8. Cables shall not be directly or indirectly supported by a suspended ceiling or any other surface, support, material or structure not permissible for this use by all applicable codes and standards.
9. Cables carrying signals of different nominal operating level shall be kept separated to reduce the risk of undesirable cross-talk interference between cables.
10. Keep length of parallel runs to a minimum. Cross cables of different nominal levels at 90 degrees.
11. Provide additional separation as necessary to prevent and remedy any crosstalk.
12. Contractor shall take all precautions necessary to keep low-voltage cable away from sources of EMI and RF interference. Where close proximity is absolutely necessary to satisfactory appearance, performance or installation of the Work, provide all necessary shielding necessary to ensure that ingress interference is minimal and has no negative impact of the Work.
13. Provide a minimum of 12 inches cable slack where terminating at a device outlet to facilitate installation and servicing of devices. Longer working lengths shall be provided as appropriate to the application.
14. All termination types shall correctly match the cable and device termination point. Connectors of the appropriate type, size, color and rating shall be used to match with the mating equipment.
15. Tools as recommended by each specific connector manufacturer shall be used in attachment of all connectors.
16. When spade connectors are the required to be used for audio circuits operating at $\leq +8\text{dBv}$ nominal, solder type spade connectors only shall be permitted.
17. No more than two spade connectors shall be permitted under a single terminal. Fewer should be used when recommended by the specific manufacturer's equipment or connector.

18. Wire Nuts

- a. Wire nuts shall not be used in any audio circuit, except when necessary, in the following:
 - 1) 25 Volt Constant-Voltage loudspeaker circuits.
 - 2) 70.7 Volt Constant-Voltage loudspeaker circuits.
- b. Wire nuts shall not be used in any data or voice communications or remote-control circuit.
- c. Wire nuts shall not be used in any circuit which radiates RF energy.
- d. Contractor must advise and gain prior approval of the Owner for any circuit which the Contractor desires to use wire nuts as the means of termination.

19. Drain Wires, Non-insulated Ground Wires and Shields

- a. Drain or non-insulated ground conductors shall be insulated with appropriately sized heat-shrinkable insulated sleeving immediately upon exit from the jacket of the cable. Contractor shall use GREEN colored sleeving unless otherwise necessary to resolve specific color-coding conflicts on a given cable. This methodology shall apply to ALL methods of termination, including inline connectors, device plates, direct equipment terminations etc... Sleeving shall be applied to twisted and braided shields once the internal conductors have been combed out or otherwise removed from the center of the shield.
- b. Wherever a cable contains a non-insulated conductor within a jacketed cable, the conductors, as they exit the manufacturer's jacket, shall have a piece of heat shrinkable sleeving applied equally over the jacket and the exposed insulated conductors. The length of this sleeving shall be 1" for all cable diameters of .250" or less. For cables diameters larger than .250" the length of the sleeving shall be approximately equal to 4 times the diameter of the cable jacket. Note: This added sleeving is recommended but not mandatory when cable termination occurs fully within the confines of a fully insulated and strain relieved connector. Black shall be used unless otherwise necessary for specific cosmetic or cable identification purposes.
- c. A heat-gun of the appropriate temperature, size, type and rating for shrinking the tubing shall be used as recommended by the manufacturer of the sleeving used. Open flame (i.e. matches, cigarette lighters, torches) and direct metal conduction (i.e. soldering iron) methods to shrink the sleeving shall not be permitted. Sleeving which is burnt or otherwise marred shall be removed and replaced.
- d. There shall not be any non-insulated exposed conductors within a device backbox, junction box, or equipment rack/cabinet.

20. Unused Conductors

- a. Unused conductors shall not be "clipped" or removed from any jacketed cable. Conductors which are not required or used at the end of a jacketed cable shall be kept intact. Conductors shall be fully insulated from one and other to prevent shorts which could occur at either end of the cable. Conductor ends shall also be insulated to prevent shorts to other conductive materials which could come in contact with the conductor.
- b. Unused conductors shall be kept the same length as the longest conductor of the cable being used.
- c. Attention shall be paid to the proper preparation of all cables and all conductors of these cables. There shall not be nicks to cable jackets, conductor insulation, or the conductors themselves.
- d. Special attention should be paid to nicked conductors. Should a conductor be nicked during preparation or termination the cable shall be reworked/replaced to remove the nick.

- e. Any voice, data, or coaxial cable that is cut, disconnected, or not terminated at both ends shall be completely removed end to end. Any labels at either end shall be erased. Record drawings shall reflect the removal of these cables.

3.02 ATTACHING TO BUILDING CONSTRUCTION

- A. Attach supports to structural members (beams, joists, etc.) rather than to floor or roof slabs. Do not attach to ceiling support wires.
- B. Where equipment and raceway are suspended from existing concrete or masonry construction, use expansion shields to attach supports to construction. Expansion shield bolt diameter shall be same size as support rod diameter, hereinafter specified. Expansion shields shall be Star Double, Star Gloxin, Star Loxin or approved equal.
- C. Where existing masonry is not suitable to receive and hold expansion shield or where other means of attachment is advantageous, submit alternate method for approval by Engineer.
- D. Equipment to be installed in groups shall not be mounted directly to masonry or concrete walls. Mount 1- by 1-inch structural channel such as Unistrut, to wall and secure equipment to these channels.
- E. Where raceways are suspended from structural steel building framing or supporting members, provide beam clamps for attaching piping device to building member.
- F. Obtain approval from Owner and structural engineer before cutting or welding to structural members, or before hanging heavy equipment.

3.03 ESCUTCHEONS

- A. Provide chrome plated escutcheons on material, leaving and entering walls, floors, ceilings, etc.

3.04 EQUIPMENT INSTALLATION

- A. All equipment must be installed such that maintenance and service may be properly accomplished. If necessary, the Owner, at their option, may require the contractor to demonstrate the service on any piece of equipment to determine sufficient service space exists. If the service space is not adequate, the equipment shall be relocated at no additional cost to the Owner such that sufficient service space is achieved.

3.05 OCCUPATIONAL SAFETY & HEALTH STANDARDS

- A. All work shall comply with current requirements of U.S. Department of Labor-Occupational Safety & Health Administration, entitled Occupational Safety and Health Standards; National Consensus Standards and Established Federal Standards.

3.06 DEMOLITION

- A. In addition to the requirements in Division 02 Section "Selective Demolition," comply with this Article.
 - 1. Scope of Work: Provide demolition required for removal of systems and equipment made obsolete by this Project and as determined by the Architect/Engineer.
 - 2. Work Included:
 - a. Non-destructive removal of systems, materials, and equipment for reuse or salvage as shown on Drawings or requested by Owner.
 - b. Removal of all debris from site and legal disposal of same.
 - c. Removal of all abandoned or obsolete exposed materials and equipment for a clean and finished installation.
 - d. Removal of all abandoned or obsolete raceways, wiring, cabling, or electrical devices of any kind.

B. Conditions

1. Coordination: Adjacent areas need to remain in operation and services to these areas need to be maintained. A schedule will be worked out prior to beginning work and as many criteria for operation as possible will be explained. Contractor cooperation shall be expected in all conditions.
 - a. Phasing: Prior to commencing demolition in any area of the work, notify the Owner and Architect/Engineer five (5) working days in advance to insure that no adjacent occupied areas will be disrupted.
 - b. Demolition phasing must be approved by Architect/Engineer prior to commencement of operations.
 - c. Removal of debris and construction traffic will be limited to specified areas. Confirm all operations with Architect/Engineer prior to commencement of work.
2. Adjacent Materials:
 - a. During the execution of the work, primary consideration shall be given to protecting from damaging the structure, furnishings, finishes, and the like which are not specifically indicated to be removed and disposed.
 - b. Existing items or surfaces to remain which are damaged as a result of this work shall be refinished, repaired, or replaced to the satisfaction of the Architect/Engineer and Owner at no additional cost.

C. Materials

1. Patching: Materials used for patching shall be in conformance with the applicable sections of the Project Manual. Where materials are not specifically described but required for proper completion of the work, they shall be as selected by the Contractor subject to approval of the Architect/Engineer. Materials used and workmanship shall match surrounding areas as much as possible, unless otherwise directed.

D. Demolition

1. Site Inspection
 - a. The Contract Documents do not propose to show all systems, materials, or equipment existing on the project that will require demolition.
 - b. Before commencing the work of this Section, verify with the Architect/Engineer and Owner all systems, materials, and equipment to be removed and those to be preserved.
2. Scheduling
 - a. Schedule all work in a careful manner with all necessary considerations for public and adjacent areas.
 - b. Avoid interference with the use of adjacent areas and passage to and from these areas.
3. Abandoned Materials and Equipment: Items so indicated on Contract Documents to be removed and not indicated or specified to be saved or retained, shall be demolished, removed, demounted, or disconnected in the best possible manner to ensure that no damage will result to other adjacent items or surfaces to remain.
4. Salvage
 - a. During removal of items so indicated, caution shall be used to eliminate damage to any equipment having salvage value.
 - b. All reusable salvaged material shall remain the property of the Owner and be retained for his inspection. Only items so inspected and rejected by the Owner shall be disposed by the Contractor. All other such items shall be turned over and deposited as directed by the Owner.

5. Disposal and Clean Up

- a. Areas in which demolition and salvage work is being done shall be cleaned daily.
- b. Dirt, dust, debris, unsalvageable and reusable items, and the like shall be totally removed from the project site daily. Under no circumstances shall such refuse be allowed to collect for longer periods.
- c. Refuse shall not be allowed to block, or otherwise impair, circulation in corridors, stairs, sidewalks, or other traffic areas.

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SECTION 28 31 12 – ADDRESSABLE FIRE ALARM (RENOVATION OF EXISTING)

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section covers fire alarm system's initiating devices, notification appliances, controls, and supervisory devices.
- B. Work covered by this section includes the furnishing of labor, equipment, and materials for installation of the fire alarm system as indicated on the drawings and specifications.

1.02 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: The equipment and service described in this specification are those supplied and supported by Johnson Controls Fire Protection, LP (Simplex).
- B. No Substitutions allowed; must match the Campus fire alarm network systems.

1.03 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.
- B. The work covered by this section is to be coordinated with related work as specified elsewhere in the specifications. Requirements of the following sections apply:
 - 1. Division 26: applicable sections apply
- C. The system and all associated operations shall be in accordance with the following Guidelines of the following Building Code: UBC IBC
 - 1. NFPA 72, National Fire Alarm Code
 - 2. NFPA 70, National Electrical Code
 - 3. NFPA 101, Life Safety Code
 - 4. NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems
 - 5. Other applicable NFPA standards
 - 6. Local Jurisdictional Adopted Codes and Standards
 - 7. ADA Accessibility Guidelines

1.04 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
 - 1. Product data sheets for system components highlighted to indicate the specific products, features, or functions required to meet this specification. Alternate or as-equal products submitted under this contract must provide a detailed line-by-line comparison of how the submitted product meets, exceeds, or does not comply with this specification.
 - 2. Wiring diagrams from manufacturer.
 - 3. Shop drawings showing system details including location of FACP, all devices, circuiting and details of Tru-Site graphic screens.
 - 4. Product certification signed by the manufacturer of the fire alarm system components certifying that their products comply with indicated requirements.
 - 5. Record of field tests of system.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: A factory authorized installer is to perform the work of this section.

- B. Each and all items of the Fire Alarm System shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by Underwriters Laboratories, Inc. (UL), and shall bear the "UL" label.

- C. Exception: Notification Appliance Devices by COOPER Notification (Wheelock) are acceptable

PART 2 - PRODUCTS

2.01 ADDRESSABLE MANUAL PULL STATIONS

- A. Description: Addressable single- or double-action type, red LEXAN, with molded, raised-letter operating instructions of contrasting color. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common with the control units.
- B. Protective Shield: Where required provide a tamperproof, clear LEXAN shield and red frame that easily fits over manual pull stations. When shield is lifted to gain access to the station, a battery powered piercing warning horn shall be activated. The horn shall be silenced by lowering and realigning the shield. The horn shall provide 85dB at 10 feet and shall be powered by a 9 VDC battery.

2.02 SMOKE SENSORS

- A. General: Comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems." Include the following features:
 - 1. Factory Nameplate: Serial number and type identification.
 - 2. Operating Voltage: 24 VDC, nominal.
 - 3. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore normal operation.
 - 4. Plug-In Arrangement: Sensor and associated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. Base shall provide break-off plastic tab that can be removed to engage the head/base locking mechanism. No special tools shall be required to remove head once it has been locked. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control unit.
 - 5. Each sensor base shall contain an LED that will flash each time it is scanned by the Control Unit (once every 4 seconds). In alarm condition, the sensor base LED shall be on steady.
 - 6. Each sensor base shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.
 - 7. Each sensor shall be scanned by the Control Unit for its type identification to prevent inadvertent substitution of another sensor type. Upon detection of a "wrong device", the control unit shall operate with the installed device at the default alarm settings for that sensor; 2.5% obscuration for photoelectric sensor, 135-deg F and 15-deg F rate-of-rise for the heat sensor, but shall indicate a "Wrong Device" trouble condition.
 - 8. The sensor's electronics shall be immune from false alarms caused by EMI and RFI.
 - 9. Sensors include a communication transmitter and receiver in the mounting base having a unique identification and capability for status reporting to the FACP. Sensor address shall be located in base to eliminate false addressing when replacing sensors.
 - 10. Removal of the sensor head for cleaning shall not require the setting of addresses.
- B. Type: Smoke sensors shall be of the photoelectric or combination photoelectric / heat type.
- C. Bases: Relay output, sounder and isolator bases shall be supported alternatives to the standard base.

D. Duct Smoke Sensor:

1. Photoelectric type, with sampling tube of design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied. Sensor includes relay as required for fan shutdown.
2. Environmental compensation, programmable sensitivity settings, status testing, and monitoring of sensor dirt accumulation for the duct sensor shall be provided by the FACP.
3. The Duct Housing shall provide a supervised relay driver circuit for driving up to 15 relays with a single "Form C" contact rated at 7A@ 28VDC or 10A@ 120VAC. This auxiliary relay output shall be fully programmable. Relay shall be mounted within 3 feet of HVAC control circuit.
4. Duct Housing shall provide a relay control trouble indicator Yellow LED.
5. Compact Duct Housing shall have a transparent cover to monitor for the presence of smoke. Cover shall secure to housing by means of four (4) captive fastening screws.
6. Duct Housing shall provide two (2) Test Ports for measuring airflow and for testing. These ports will allow aerosol injection in order to test the activation of the duct smoke sensor.
7. Duct Housing shall provide a magnetic test area and Red sensor status LED.
8. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housing front cover.
9. Each duct sensor shall have a Remote Test Station with an alarm LED and test switch.

2.03 HEAT SENSORS

- A. Thermal Sensor: Combination fixed-temperature and rate-of-rise unit with plug-in base and alarm indication lamp; 135-deg F fixed-temperature setting except as indicated.
- B. Thermal sensor shall be of the epoxy encapsulated electronic design. It shall be thermistor-based, rate-compensated, self-restoring and shall not be affected by thermal lag.
- C. Sensor fixed temperature sensing shall be independent of rate-of-rise sensing and programmable to operate at 135-deg F or 155-deg F. Sensor rate-of-rise temperature detection shall be selectable at the FACP for either 15-deg F or 20-deg F per minute.
- D. Sensor shall have the capability to be programmed as a utility monitoring device to monitor for temperature extremes in the range from 32-deg F to 155-deg F.

2.04 ADDRESSABLE CIRCUIT INTERFACE MODULES

- A. Individual addressable modules (IAMs)
 1. Both power and communications from a two-wire MAPNET II or IDNet circuit. They provide location specific addressability to a single initiating device (such as single station smoke detector alarm contacts or heat detector contacts) or multiple devices at the same location by monitoring normally open dry contacts and the wiring to an end-of-line resistor.
 - a. Total wiring distance from IAM to supervision resistor(s) of up to 500 ft (152 m)
 - b. Monitored connection is compatible with Simplex® 2081-9044 Overvoltage Protectors for outdoor wiring or electrically noisy applications
 - c. For use in indoor locations up to 158° F (70° C) such as attic spaces or similar applications.
 2. Model 4090-9001 is packaged in a thermoplastic housing and provides screw terminal connections and a status indicating LED. (**ISU Standard choice**)
 - a. Enclosed design minimizes dust infiltration
 - b. Mounts in standard single gang electrical box

- c. Screw terminals for wiring connections
 - d. Visible LED flashes to indicate communications
 - e. Optional covers are available to allow LED to be viewed after installation (requires mounting bracket, ordered separately)
- 3. Model 4090-9051 is an encapsulated package with wire leads. It does not provide a status indicating LED.
- 4. IDNet communications provides current limited monitoring:
 - a. Provides monitoring of tamper switch (supervisory) and waterflow switch (alarm) on same circuit using one point
 - b. Available with IDNet communications only
 - c. Multiple operation modes are available and are selectable at the control panel:
 - a. Contact closure status can be tracked
 - b. Momentary contact closure conditions can be selected at the panel to be latched or tracked.
- B. Individual Addressable Relay Module (Relay IAM)
 - 1. IDNet Relay IAMs allow fire alarm control panels to control a remotely located Form "C" contact using IDNet addressable communications for both data and module power. Typical applications would be for switching local power for control functions such as elevator capture, or control of HVAC components, pressurization fans, dampers, etc. Relay status is also communicated requiring only one device address.
 - a. A single addressable point provides control and status tracking of a Form "C" contact
 - b. Contact Rating
 - 1) Power Limited 2A @ 24VDC resistive
 - 2) Power Limited 1A @ 24VDC inductive
 - 3) Non-power limited 0.5A @ 120VAC resistive
 - c. Low power latching relay design allows IDNet communications to supply both data and module power
 - d. Relay is set to OFF on initial power up and upon loss of IDNet communications
 - e. Enclosed design minimizes dust infiltration
 - f. Mounts in standard 4" (102 mm) square electrical box, optional adapter bracket is available to mount in a 4 11/16" (119 mm) square electrical box
 - g. Screw terminals for wiring connections
 - h. Visible LED flashes to indicate communications
 - i. Optional covers are available to allow LED to be viewed after installation
- C. Dual Contact Relay IAM (Individual Addressable Module)
 - 1. Same as Addressable Relay Module (Relay IAM) , item B above, except with two form C contacts on common relay.

2.05 STANDARD ALARM NOTIFICATION APPLIANCES

- A. Alarm notification appliances by Simplex Grinnell and COOPER Notification (Wheelock) are acceptable. Match existing fire alarm device styles when possible.
- B. Visible/Only: Strobe shall be listed to UL 1971. The V/O shall consist of a xenon flash tube and associated lens/reflector system. The V/O enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings. V/O appliances shall be provided with different minimum flash intensities of 15cd, 75cd and 110cd.

Provide a label inside the strobe lens to indicate the listed candela rating of the specific Visible/Only appliance.

- C. Speaker/Visible: Combination Speaker/Visible (S/V) units combine the speaker and visible functions into a common housing. The S/V shall be listed to UL 1971 and UL 1480.
 - 1. Twisted/shielded wire is required for speaker connections on a standard 25VRMS or 70.7VRMS NAC using and UTP conductors, having a minimum of 3 twists per foot is required for addressable strobe connections.
 - 2. The following taps are available: 0.25W, 0.50W, 1.0W and 2.0W. At the 1.0W tap, the speaker has minimum UL rated sound pressure level of 84dBA at 10 feet.
 - 3. The S/V shall have a frequency response of 400 to 4000 Hz for Fire Alarm and 125 to 12kHz for General Signaling.
 - 4. The S/V installs directly to a 4" square, 1 ½ in. deep electrical box with 1 1/2" extension for Simplex devices and a 4" square 1 ½ in. deep for Wheelock devices.
- D. Speaker: Speaker notification appliances shall be listed to UL 1480.
 - 1. The speaker shall operate on a standard 25VRMS or 70.7VRMS NAC using twisted / shielded wire.
 - 2. The following taps are available: 0.25W, 0.50W, 1.0W and 2.0W. At the 1.0W tap, the speaker has minimum UL rated sound pressure level of 84dBA at 10 feet.
 - 3. The S/V shall have a frequency response of 400 to 4000 Hz for Fire Alarm and 125 to 12kHz for General Signaling.
 - 4. The Speaker installs directly to a 4" square, 1 ½ in. deep electrical box with 1 1/2" extension for Simplex devices and a 4" square 1 ½ in. deep for Wheelock devices.
- E. Notification Appliance Circuit provides synchronization of strobes at a rate of 1Hz. The capability to synchronize multiple notification appliance circuits shall be provided.
- F. Accessories: The contractor shall furnish the necessary accessories.
- G. NAC Power Extender
 - 1. The IDNet NAC Power Extender panel shall be a stand-alone panel capable of powering a minimum of 4 notification appliance circuits. Notification appliance circuits shall be [Class B Style Y][Class A Style Z] rated at 2 amps each. Panel shall provide capability to be expanded to 8 notification appliance circuits.
 - 2. The internal power supply & battery charger shall be capable of charging up 12.7 Ah batteries internally mounted or 18Ah batteries mounted in an external cabinet.
 - 3. The NAC extender panel may be mounted close to the host control panel or can be remotely located. The IDNET Addressable NAC Extender Panel when connected to an addressable panel shall connect to the host panel via an IDNet communications channel. Via the IDNET channel each output NAC can be individually controlled for general alarm or selective area notification.
 - 4. For IDNet connected NAC extender panels up to five panels can be connected on a single [Class A wired] IDNet channel.
 - 5. When connected to a conventional (non-addressable panel) one or two standard notification appliance circuits from the main control panel may be used to activate all the circuits on the NAC power extender panel.
 - 6. Alarms from the host fire panel shall signal the NAC power extender panel to activate. The panel shall monitor itself and each of its NACs for trouble conditions and shall report trouble

conditions to the host panel.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Install system components and all associated devices in accordance with applicable NFPA Standards and manufacturer's recommendations.
- B. Installation personnel shall be supervised by persons who are qualified and experienced in the installation, inspection, and testing of fire alarm systems. Examples of qualified personnel shall include, but not be limited to, the following:
 - 1. Factory trained and certified personnel.
 - 2. National Institute of Certification in Engineering Technologies (NICET) fire alarm level II certified personnel.
 - 3. Personnel licensed or certified by state or local authority.

3.02 WIRING INSTALLATION

- A. System Wiring: Wire and cable shall be a type listed for its intended use by an approval agency acceptable to the Authority Having Jurisdiction (AHJ) and shall be installed in accordance with the appropriate articles from the current approved edition of NFPA 70: National Electric Code (NEC).
- B. Contractor shall obtain from the Fire Alarm System Manufacturer written instruction regarding the appropriate wire/cable to be used for this installation. No deviation from the written instruction shall be made by the Contractor without the prior written approval of the Fire Alarm System Manufacturer.
- C. Paint fire alarm system junction boxes covers red.

3.03 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pre-testing, testing, and adjustment of the system.
- B. Service personnel shall be qualified and experienced in the inspection, testing, and maintenance of fire alarm systems. Examples of qualified personnel shall be permitted to include, but shall not be limited to, individuals with the following qualifications:
 - 1. Factory trained and certified.
 - 2. National Institute for Certification in Engineering Technologies (NICET) fire alarm certified.
 - 3. International Municipal Signal Association (IMSA) fire alarm certified.
 - 4. Certified by a state or local authority.
 - 5. Trained and qualified personnel employed by an organization listed by a national testing laboratory for the servicing of fire alarm systems.
- C. Pre-testing: Determine, through pre-testing, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pre-testing. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved.
- D. Final Test Notice: Provide a 10-day minimum notice in writing when the system is ready for final acceptance testing.
- E. Minimum System Tests: Test the system according to the procedures outlined in NFPA 72.
- F. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies

with applicable standards.

- G. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log.
- H. Final Test, Certificate of Completion, and Certificate of Occupancy:
- I. Test the system as required by the Authority Having Jurisdiction in order to obtain a certificate of occupancy.

3.04 CLEANING AND ADJUSTING

- A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Clean unit internally using methods and materials recommended by manufacturer.
- B. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels and adjusting controls and sensitivities to suit actual occupied conditions. Provide up to three visits to the site for this purpose.

3.05 SPECIAL INSTALLATION INSTRUCTIONS

- A. Existing devices shall be protected during the construction phase for re-use. Contractor to protect all existing fire alarm devices during entire renovation project to prevent dust and debris infiltration. Devices not protected shall be cleaned by the fire alarm system manufacturer's service representative. Any devices damaged beyond repair / cleaning will be replaced with new at no cost to the Owner. Plastic bagging of devices is acceptable.
- B. Coordinate with the Owner for disabling fire alarm devices during construction. Turn over any fire alarm devices not slated for re-use to the Owner.
- C. Include in the Bid all costs associated with reprogramming of the existing fire alarm system and Owner's Tru-Site fire alarm network for this Project.
- D. Wiring to devices above suspended ceilings may be exposed plenum rated cable. Wiring to exposed surface mounted devices or wiring concealed in walls to devices shall be in metal raceway.
- E. New devices shall match existing devices being re-used. If devices are not available to match existing all new devices of that type shall be provided.

END OF SECTION 28 31 12

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