

Project Manual:

3D Visualization Center Science Building Room 158 600 Chestnut Walk Terre Haute, Indiana 47809

Owner/Architect:



**Indiana State
University**

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

MEP Engineer/Designer:



R.E. Dimond
and Associates, Inc.
Consulting Engineers
732 North Capitol Avenue
Indianapolis, IN 46204

PHONE: (317) 634-4672 FAX: (317) 638-8725

Bid Number B0026966

Bid Request**Bid # B0026966****BID REQUEST NOTICE TO BIDDERS**

Sealed proposals are requested for a 3D Visualization Center, Bid Number B0026966 to be located in the ISU Science Building Room 158. Proposals will be received for the above contract at the Office of the Department of Purchasing, Indiana State University, Facilities Management and Purchasing Building, 951 Sycamore Street, Terre Haute, Indiana 47809, until 2:00pm Local Time, November 12, 2019 and then will be opened and read aloud.

Bidding Documents may be downloaded from the ISU Plan Room at <http://www.indstateplanroom.com/> on **October 24, 2019** at no cost. Bidders must register for a free account the first time they access the website. Bid Documents on CD's may be ordered for purchase from Rapid Reproductions, Inc, 129 South 11th Street Terre Haute, IN 47807 (812-238-1681 Toll Free 800-736-7084) at a cost of \$7.50 per CD.

Proposals are to be made on the Bid Form published in the Bid Request. As a mandatory requirement the Proposal shall be accompanied by a certified check; cashier's check or a Bid Bond (AIA A310) for an amount not less than 5% of the total bid price for Base Bid(s) and all add Alternates.

Bidder(s) receiving awards shall be required to provide acceptable surety in the form of a Performance and Labor and Materials Payment Bond for the full amount of the award. Include the cost of all bonds and insurance in the bid amount.

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.

All Bidders must comply with All State and Federal Non-Discrimination laws.

Responsive bidders may not have an active dispute, claim, or litigation with Indiana State University.

Indiana State University reserves the right to accept or reject any Bid and to waive any irregularities in Bidding. Any proposal received after the time fixed herein shall be returned unopened.

No Bid may be withdrawn after the opening of Bids without the consent of Indiana State University for a period of One Hundred Twenty (120) days after the time of opening Bids.

A Pre-bid conference has been scheduled for 1:30pm, Local Time, October 29, 2019, in the Department of Facilities Management Conference Room, 951 Sycamore St, Terre Haute, Indiana 47809.

Representatives of each of the Bidders are strongly urged to attend.

Contract Award shall be to a Single Prime Bidder for all single Base Bid project work or the Contract Award may be to multiple Single Prime Bidders for multiple Bid Package project work. The prime Bidder(s) shall be an experienced and qualified Contractor(s) having successfully completed a minimum of three (3) projects of similar size and scope. The Bid form for this Project requires the Bidder to submit evidence of successful installation of similar projects (minimum of three projects), including customer information, scope, dates, Contract dollar amounts. With their Bid or by the next business day following the Bid the Bidder shall submit their most current audited financial statement and vendor trade credit references as evidence of financial capability to perform the work.

All questions relating to this Project shall be addressed to:

Scott Tillman, ISU Department of Facilities Management

Phone 812-237-8198 E-mail scott.tillman@indstate.edu

INDIANA STATE UNIVERSITY BOARD OF TRUSTEES

By: Diann E. McKee

Senior Vice President for Finance and Administration and University Treasurer
Indiana State University

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Bid Request**Bid # B0026966****FORMS FOR BIDDING**

Submit pages 3-10 of this form, Section 001020 Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion; Section 001040 Diversity Participation Plan; Section 001045 Bidders Certification of Authorized Employment; a certified check, cashier's check or a Bid Bond; your most current audited financial statement **with your Bid**. Failure to submit with your Bid may be cause to disqualify a Bid

BID SUBMITTED BY:

Your Company's Name: _____

Company Address: _____

Company Contact Name: _____

Phone number: _____ Email Address: _____

Signed: _____ Title _____ Date: _____

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 _____

OFFER

Pursuant to and in compliance with Bid Request Form', and other Bidding Documents prepared by the ISU Facilities Management Department or their authorized Agent for the above mentioned project, the undersigned, 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 Science Room 158 to become a 3D Visualization Center per Specifications and Drawings.

_____ Dollars (\$ _____)
(State Amount in Words)

ALTERNATE BID(S)

No Alternate Bids

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.

Bid Request**Bid # B0026966****ALLOWANCE(S)**

Allowance # 1: A \$5,000.00 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.

UNIT PRICE(S)

No Unit Prices Requested

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 herein. 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.

NON-COLLUSION AFFIDAVIT

The Bidder, by its officers and agents or representatives present at the time of filing this 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.

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.

MBE/WBE/VBE BIDDING:

See Section 001030 for requirements for MBE/WBE/VBE Compliance. Section 001040 must be completed by **all Bidder(s)** and submitted with your Bid.

Bid Request

Bid # B0026966**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 #)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 Quote, of all such litigation(s) and name(s) of Institutions and/or Parties involved with complete contact information. Failure to submit information may result in disqualification of your Quote.

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?

Bid Request**Bid # B0026966**

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

INSTRUCTIONS TO BIDDERS**1. GENERAL**

- A. Respondents shall carefully read the Bid Request with regard to preparation of proposals, which includes the forms required to be submitted.
- B. Bid Bond
 - 1) As a mandatory requirement the Bid shall be accompanied by a certified check; cashier's check or an acceptable Bid Bond (AIA A310) for an amount not less than 5% of the total Bid price for the Base Bid(s) and all add Alternates.
 - 2) 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. 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.
- D. The Contractor shall begin Work within seven (7) after Award and shall be substantially completed by February 28, 2020. Final closeout shall be within thirty (30) calendar days thereafter.
- 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. Such Addendum, if any, issued before submission of the Quotes, 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 for a period of One Hundred Twenty (120) calendar days after date and time set for receipt of the Bids.
- I. The Owner reserves the right to accept or reject any bid and to waive any irregularities in bidding.

Bid Request**Bid # B0026966****2. 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 for any Project in excess of \$50,000 a Contract for Construction. Prior to issuance of the Purchase Order the Contractor shall provide to the Director of Purchasing a Performance and Payment Bond (see Section 002020 Supplementary General Conditions 1.02) and the policies of insurance or insurance certificates as required by the Contract Documents (see Section 002020 Supplementary General Conditions 1.03) and listed in the Award Letter.
- 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.
- 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, 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.

3. INDEMNIFICATION

- A. Bidders, in consideration of the privilege of Bidding, shall 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.

4. ALLOWABLE CONTRACTOR MARK-UPS FOR PROJECT CHANGES

- A. When a change in the Work is contemplated which may affect the Contract Sum or duration of the Work, the Architect/Engineer/Owner 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 Proposal,' stipulating the change in cost of Project and/or duration as a result of the proposed change.
- B. The 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.
- C. 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 Item B by the Contractor actually performing the Work. Each succeeding Contractor may mark up their direct labor and material costs as indicated in Item B. 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.
- D. 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."

Bid Request**Bid # B0026966****5. ADDENDA**

- A. All Addenda (if any) for the Project will be will be posted to the ISU Plan Room.
- B. Indicate receipt of Addenda on the Bid Request Form in the spaces provided for acknowledgement. Failure to indicate receipt may be cause to disqualify a Bid.

6. RESPONSIBILITY FOR DOCUMENTS.

- A. The prime Contractor and all their Subcontractors are responsible for all documents provided with this Bid Request.

7. E-VERIFY REQUIREMENTS

- A. 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.
- B. 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.
- C. Bidders shall submit a signed copy of Section 001045 Bidders Certification of Authorized Employment with their Bid to certify compliance with this requirement.

8. SCOPE OF WORK BASE BIDS

- A. Selective demolition
- B. Wall construction
- C. Curtain wall installation
- D. New suspended acoustical ceiling installation
- E. New flooring installation
- F. Mechanical system modifications
- G. FP sprinkler work
- H. Electrical power installations
- I. Lighting installation
- J. Technology installations

9. SCOPE OF WORK ALTERNATE Bids

No Alternate Work

Bid Request**Bid # B0026966****10. SUBCONTRACTOR LIST**

Bidder shall provide the names of all applicable Subcontractors

Description	Subcontractor
Ceiling Work	_____
Flooring Work	_____
Curtain Wall Work	_____
Painting Work	_____
Cabinetry Work	_____
Plumbing Work	_____
HVAC Work	_____
FP Sprinkler Work	_____
Electrical Work	_____
Technology Work	_____

11. SUPPLIER MANUFACTURER LIST

Bidder shall provide the names of all applicable Suppliers and Manufacturers

Product Description	Supplier	Manufacturer
Ceiling Grid	_____	_____
Ceiling Tile	_____	_____
Carpet	_____	_____
Curtain Wall	_____	_____
Lighting	_____	_____
Lighting Controls	_____	_____

12. PRE-CONSTRUCTION MEETING

- A. A pre-construction meeting will be held as soon as possible after Award of the Project at which time the Contractor shall have a proposed schedule of work to complete the work within the allowable time given.

End of BR B0026966

Attachments

Bid Request

000130

Bid # B0026966

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001020

CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND
VOLUNTARY EXCLUSION

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).

Is your organization, or its principals, debarred, suspended, 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, debarred, suspended, 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 001020

001020

CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND
VOLUNTARY EXCLUSION

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001030
MBE/WBE/VBE COMPLIANCE INSTRUCTIONS

PART 1 – CONSTRUCTION SERVICES – INSTRUCTION TO BIDDERS

1.01 MBE/WBE/VBE Participation Plan

- A. Indiana State University is committed to diversity and non-discrimination in all aspects of its operations. This initiative is to ensure that certified MBEs, WBEs, and VBEs are included in all invitations for quotes and bids, and that all prospective bidders are notified of Indiana State University's expectation for diversity, including but not limited to MBE/WBE/VBE participation in procurement contracts for professional services, materials, supplies and equipment, and in contracts for the construction, architectural services, renovation or repair of university facilities and equipment. This expectation extends to all tiers of contractor utilization. Each Prime contractor should actively solicit and include certified minority, women and veteran owned subcontractors in bid submissions if economically feasible.
- B. The Minority, Women's and Veteran's Business Enterprise Participation Plan (form included in specifications) shall be submitted with the bid. This Participation Plan will be considered during the proposal evaluation process.
- C. Indiana State University's annual MBE, WBE, and VBE participation goals parallel those set by the Indiana Department of Administration for its own business diversity efforts. The State MBE/WBE participation goals may be found at www.in.gov/idoa/mwbe/2743.htm and VBE participation goals may be found at www.in.gov/idoa/2862.htm

1.02 Definitions

- A. "Minority-owned Business Enterprise" (MBE) means an individual, partnership, corporation, limited liability company, or joint venture of any kind that is 51% owned and controlled by (1) or more persons who are (a) United States citizens; and (b) members of a racial minority group: African American, American Indians, Hispanics, Asian Americans, or other similar minority group as defined by 13 CFR 124.103 and have been certified by the State of Indiana.
- B. "Women-owned Business Enterprise" (WBE) means an individual, partnership, corporation, limited liability company, or joint venture of any kind that is 51% owned and controlled by (1) or more persons who are (a) United States citizens; and (b) whose gender is female and have been certified by the State of Indiana.
- C. "Veteran-owned Business Enterprise" (VBE) means an Indiana firm with its principal place of business location in Indiana and is currently certified by the Department of Veterans Affairs as a veteran-owned business and have been certified by the State of Indiana or who have been Federally certified.

1.03 Qualifications for Participation

- A. In order to count toward participation goals, the MBEs and WBEs must be certified by the State of Indiana.
- B. VBEs must be certified by the State of Indiana or have been Federally certified.

1.04 Failure to Participate

- A. Failure to submit the Minority, Women's and Veteran's Business Enterprise Participation Plan with the Bid may be cause to reject a Bid.
- B. The Owner retains the right to hold payment, and/or to reject future bids submitted by the successful Contractor in the event that Contractor misrepresents either MBE/WBE/VBE participation in this Project, or its efforts to obtain MBE/WBE/VBE participation in this project, or fails to report MBE/WBE/VBE spend on this project.
- C. The Owner, at its discretion, may waive in part or in whole the minority-owned business enterprise, women-owned business enterprise and/or veteran-owned business enterprise requirement if in the opinion of the Owner it would be impractical, or not in the best interest of the Owner.

001030
MBE/WBE/VBE COMPLIANCE INSTRUCTIONS

1.05 Mandatory Tier II Reporting Requirement for Projects equal to or greater than \$500,000.00

- A. The successful Contractor shall take all necessary and reasonable steps to ensure that MBE/WBE/VBEs have the maximum opportunity to compete for and perform work on this Contract.
- B. MBE/WBE/VBE utilization in the performance of this Contract must be reported with each Application for Payment using the ISU Business Diversity Spend Reporting Form for Construction/Renovation/Facilities Repair Projects (see included: Tier II Spend Report Form.xlsx.)
- C. Compliance with Owner's Mandatory Tier II Reporting Requirement is a condition for the approval of an Applications for Payment.

PART 2 – NOT USED

PART 3 – NOT USED

END OF SECTION 001030

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MBE/WBE/VBE PARTICIPATION PLAN

Project Name _____

Bid Number _____ Bid Date _____

This Form must be completed by all Bidders and submitted with the Bid. **Failure to submit may be cause to reject the Bid.**

Check if Bidder is an MBE, WBE or VBE

Bidders Firm _____ MBE WBE VBE

Address _____

City/State/Zip _____

Phone _____

E-mail _____

The following certified minority, women and/or veteran -owned firms will be participating in the project according to the following schedule. Indicate whether each firm is an MBE, WBE or VBE by selecting the MBE, WBE or VBE box below.

1. _____

<u>FIRM</u>	<input type="checkbox"/> MBE	<input type="checkbox"/> WBE	<input type="checkbox"/> VBE	<u>TRADE</u>	<u>AMOUNT</u>	<u>% OF TOTAL BID</u>
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<u>CONTACT NAME</u>	<u>PHONE</u>	<u>E-MAIL</u>
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2. _____

<u>FIRM</u>	<input type="checkbox"/> MBE	<input type="checkbox"/> WBE	<input type="checkbox"/> VBE	<u>TRADE</u>	<u>AMOUNT</u>	<u>% OF TOTAL BID</u>
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<u>CONTACT NAME</u>	<u>PHONE</u>	<u>E-MAIL</u>
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3. _____

<u>FIRM</u>	<input type="checkbox"/> MBE	<input type="checkbox"/> WBE	<input type="checkbox"/> VBE	<u>TRADE</u>	<u>AMOUNT</u>	<u>% OF TOTAL BID</u>
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<u>CONTACT NAME</u>	<u>PHONE</u>	<u>E-MAIL</u>
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4. _____

<u>FIRM</u>	<input type="checkbox"/> MBE	<input type="checkbox"/> WBE	<input type="checkbox"/> VBE	<u>TRADE</u>	<u>AMOUNT</u>	<u>% OF TOTAL BID</u>
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<u>CONTACT NAME</u>	<u>PHONE</u>	<u>E-MAIL</u>
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If more space is need attach additional sheet

If no MBE, WBE or VBE contractors are listed above please indicate reason(s) why:

Unable to locate any MBEs, WBEs or VBEs.

Unable to secure competitive pricing from any MBEs, WBEs or VBEs.

Other reasons, please describe: _____

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MBE/WBE/VBE PARTICIPATION PLAN

Describe below your efforts to obtain minority, women and veteran's business enterprise participation for this project.

Be sure to attach a copy of all solicitation efforts, e.g., ads that were published or networking events, etc.

List below the MBE/WBE/VBE contractors you individually contacted to request a quote for this project. If all work is to be self-performed and your Firm is not MBE, WBE or VBE list N/A in top left line below.

MBE, WBE, VBE Firms Contacted

Check all that apply:

1.	<hr/> <div style="text-align: center;">FIRM CONTACTED</div>	<hr/> <div style="text-align: center;">TRADE</div>	<div style="text-align: center;">MBE</div>	<div style="text-align: center;">WBE</div>	<div style="text-align: center;">VBE</div>	<div style="text-align: center;">Not Low</div>	<div style="text-align: center;">No reply</div>
	<hr/> <div style="text-align: center;">CONTACT NAME</div>	<hr/> <div style="text-align: center;">PHONE</div>	<hr/> <div style="text-align: center;">E-MAIL</div>				
2.	<hr/> <div style="text-align: center;">FIRM CONTACTED</div>	<hr/> <div style="text-align: center;">TRADE</div>	<div style="text-align: center;">MBE</div>	<div style="text-align: center;">WBE</div>	<div style="text-align: center;">VBE</div>	<div style="text-align: center;">Not Low</div>	<div style="text-align: center;">No reply</div>
	<hr/> <div style="text-align: center;">CONTACT NAME</div>	<hr/> <div style="text-align: center;">PHONE</div>	<hr/> <div style="text-align: center;">E-MAIL</div>				
3.	<hr/> <div style="text-align: center;">FIRM CONTACTED</div>	<hr/> <div style="text-align: center;">TRADE</div>	<div style="text-align: center;">MBE</div>	<div style="text-align: center;">WBE</div>	<div style="text-align: center;">VBE</div>	<div style="text-align: center;">Not Low</div>	<div style="text-align: center;">No reply</div>
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If more space is need attach additional sheet

By my signature, I certify that the above statements are true and accurate, all as of the date below. I also understand that any changes to this plan must be approved by Indiana State University and documented by Construction Change Directive.

Agent of Bidder _____

Date _____

END OF SECTION 001040

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 002011 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 001045

001045

BIDDER'S CERTIFICATION OF AUTHORIZED EMPLOYMENT

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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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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.



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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 003000 of the Contract Documents. In the event of conflict between 10.3 and Section 003000, Section 003000 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 002020 for additional requirements. In the event of conflict between Section 002020 and this Paragraph 11, requirements of Section 002020 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 002020 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:

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“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 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.”

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- 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.)”

“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.

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- 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

“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.

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- 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 002011

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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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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 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 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.

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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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.
- C. Nothing contained in the Contract shall create any contractual relationship between any Subcontractor and the Owner, and no Subcontractor will be recognized as a party to the Contract.

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- 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 001010 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.
- 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

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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 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.

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SUPPLEMENTARY GENERAL CONDITIONS

- 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.

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,

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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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SUPPLEMENTARY GENERAL CONDITIONS

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 002020

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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 Section 011510 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 of Section 011510 as long as records are kept as defined in 011510.
- 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 CAMPUS TOBACCO POLICY

- A. Effective IN 2011 the following became the ISU smoking policy:
 - 1. The sale of tobacco products is prohibited on university-owned, operated, or leased property.
 - 2. The use of smoking tobacco products is prohibited on university-owned, operated, or leased property.
 - 3. The use of smoking tobacco products is permitted in privately owned vehicles and in designated smoking areas on campus.
 - 4. Any exceptions for the use of smoking tobacco products on university-owned, operated, or leased property must be approved by the President or Provost.

ISU SPECIAL REQUIREMENTS AND INFORMATION

5. Enforcement of this policy will depend on the cooperation of all faculty, staff, and students not only to comply with the policy, but also to encourage others to comply, in order to promote a healthy environment in which to work, study and live.
6. Observation of violation of the policy should be reported to Public Safety at 812-237-5555. Follow up for violations of the policy should be referred to the appropriate administrative office for review and action for faculty through the office of Academic Affairs, for staff through Human Resources and to the Dean of Students for students.

B. Amendments to this policy for Contractors

1. Delete item 5 in its entirety and replace with the following:
 "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".
2. Delete item 6 in its entirety and replace with the following:
 "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".
3. Add the following item 7:
 "For major construction or renovation Projects (as determined solely by the Owner) the Owner shall designate a Contractor's smoking area near or within the boundaries of the job-site; unless the Prime Contractor(s) chooses to declare the entire Project job-site as non-smoking. Under no circumstances shall smoking be permitted within a building under construction or renovation.

- C. Additionally on construction sites on university-owned, operated, or leased property the use of smokeless tobacco products is prohibited.

1.07 PARKING REGULATIONS

- A. 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. 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. Contact the Owners Project Manager to request parking permits.

1.08 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.

ISU SPECIAL REQUIREMENTS AND INFORMATION

- 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.

1.09 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.

ISU SPECIAL REQUIREMENTS AND INFORMATION

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
 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.

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- 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.
- 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"

1.10 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.

1.11 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.

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- 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.

- 1st violation Notice of Violation Warning Placed in Employing Firm's Work Record File
- 2nd violation \$100.00
- 3rd 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.**

1.12 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.
- 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 3:30pm on the day before work is scheduled the Contractor shall contact either Pat Teeters at 812-237-8187 (Office) or 812-230-6141 (Cellular) 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 Pat Teeters (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 3:30pm 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 – \$100.00 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.

1.13 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.

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ISU SPECIAL REQUIREMENTS AND INFORMATION

1.14 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:

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.
2. Contractor shall send five (5) copies for each Application for Payment.
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%.

ISU SPECIAL REQUIREMENTS AND INFORMATION

- 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 002011 Amendments to General Conditions.
- 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.
 - 2. Contact the ISU Office of the Controller to set up this account.
 - 3. 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 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.

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ISU SPECIAL REQUIREMENTS AND INFORMATION

1.15 CONTRACTOR'S BID

- A. Contractor shall submit Bid for Base Bid and any Alternate Bids as listed in Section 002000.

1.16 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: Scott Tillman

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

- B. 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.

1.17 SITE LOCATION(S)

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

1.18 PROJECT CONTACT

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

Scott Tillman
Department of Facilities Management
951 Sycamore Street
Terre Haute, IN 47809
Office 812-237-8198 Mobile 812-878-4251 E-mail scott.tillman@indstate.edu

- B. MEP & Voice/Data questions also copy via e-mail:

Dale Warner
R.E. Dimond and Associates, E-mail dale.warner@redimond.com

PART 2 – NOT USED

PART 3 – NOT USED

END OF SECTION 003000

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ISU SPECIAL REQUIREMENTS AND INFORMATION

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015010
TEMPORARY FACILITIES - RENOVATION PROJECTS

PART 1 – GENERAL

1.01 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.

1.02 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.

1.03 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.

015010
TEMPORARY FACILITIES - RENOVATION PROJECTS

1.04 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.

1.05 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.

1.06 RESTROOM FACILITIES

- A. The Contractor shall be permitted to utilize the Owner's restroom facilities in lieu of providing temporary toilets. The Contractor shall exercise reasonable care so as not cause excess soiling or damage to the restroom facilities.
- B. Any Contractor abuse of the Owner's restrooms shall be just cause for the Owner to revoke the use of the restrooms for the duration of the Project.

1.07 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.

1.08 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.

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TEMPORARY FACILITIES - RENOVATION PROJECTS

1.09 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. They shall provide barriers, markers, or other provisions, or all, at all conditions, such as items protruding from the work, which might cause injury to persons. 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.

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.

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 CONSTRUCTION AREA ENCLOSURES/BARRIERS

- A. The Prime Contractor shall provide all temporary enclosures/barriers required to secure the construction area from the rest of the building.
- B. The enclosure/barrier shall be constructed in a manner to prevent unauthorized personnel from entering the construction area during non-hours of construction.
- C. The enclosure/barrier shall be constructed in a manner to limit the migration of construction dust and debris into adjacent non-construction areas.
- D. A lockable entrance assembly shall be installed in the designated point(s) of entry. The Prime Contractor shall supply their own locking mechanism for this entrance assembly. Furnish the Owner's representative(s) with a key for this locking mechanism for the duration of the Project.

PART 2 – NOT USED

PART 3 – NOT USED

END OF SECTION 015010

015010
TEMPORARY FACILITIES - RENOVATION PROJECTS

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CONTRACT CLOSEOUT

PART 1 – GENERAL

1.01 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 DVD indexed by Division 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 fully executed AIA Document G704, 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.

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CONTRACT CLOSEOUT

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.

1.02 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.
 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.

1.03 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 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.

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CONTRACT CLOSEOUT

1.04 FINAL CLOSEOUT

- A. Final Closeout date shall be as listed in Section 001010 1.01
- B. At Final Closeout the Contractor shall submit to the Owner, via the Architect/Engineer if applicable:
 - 1. One (1) hard copy of the reviewed and accepted O&M Manual in 3-ring binder(s)
 - 2. 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
 - 3. 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 017700

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CONTRACT CLOSEOUT

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024114
SELECTIVE DEMOLITION

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Removal of designated building equipment and fixtures.
- B. Removal of designated construction.
- C. Disposal or storage of removed materials.
- D. Identification of utilities.
- E. Refer to items as indicated.

1.02 SUBMITTALS FOR CLOSEOUT

- A. Project Record Documents: Accurately record actual locations of capped utilities and subsurface obstructions.

1.03 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.

1.04 SCHEDULING

- A. Perform work between the hours of 7 a.m. and 4 p.m.

1.05 PROJECT CONDITIONS

- A. Conduct demolition to minimize interference with adjacent and occupied building areas.
- B. Cease operations immediately if structure appears to be in danger and notify Architect/Engineer. Do not resume operations until directed.
- C. Maintain protected egress and access to the Work.

PART 2 – NOT USED

PART 3 – EXECUTION

3.01 PREPARATION

- A. Provide, erect, and maintain temporary insulated partitions at required locations.
- B. Erect and maintain weatherproof closures for exterior openings.
- C. Erect and maintain temporary partitions to prevent spread of dust, odors, and noise to permit continued Owner occupancy.
- D. Protect existing materials which are not to be demolished.
- E. Prevent movement of structure; provide bracing and shoring.
- F. Notify affected utility companies before starting work and comply with their requirements.

024114
SELECTIVE DEMOLITION

- G. Mark location and termination of utilities.
- H. Provide appropriate temporary signage including signage for exit or building egress.

3.02 DEMOLITION

- A. Disconnect, remove, cap, and identify designated utilities within demolition areas.
- B. Demolish in an orderly and careful manner. Protect existing supporting structural members.
- C. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.
- D. Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.
- E. Remove temporary Work.

3.03 PROTECTION OF SALVAGED ITEMS

- A. Remove, store and protect the materials and equipment scheduled to be re-used.

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END OF SECTION 024114

054100
METAL STUDS FOR INTERIOR WALLS

PART 1 – GENERAL

1.01 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect metal studs before, during and after installation and to protect the installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 – PRODUCTS

2.01 METAL STUDS

- A. Standards: All metal studs and accessories shall meet or exceed the minimum requirements of Federal Specifications QQS-698 and QQS-775d, class d, for the items and use intended.
- B. Materials:
 - 1. All metal studs and accessories, unless otherwise specifically approved by the Architects, shall be galvanized steel.
 - 2. Studs and runners shall be channel-type, roll-formed 20 gauge (standard) size.
 - 3. All furring channels shall be 25 gauge.
 - 4. Steel runners and hangers shall be sizes as indicated on the Drawings.
 - 5. Bridging requirements are to be designed by the supplier. Maximum spacing of bridging is to be 5'-0" o.c. All bridging is to be attached with gauge angles and screws. Minimum attachment to be 18 gauge short angle and (4) TEK screws.

2.02 OTHER MATERIALS

- A. All other materials, not specifically described but required for a complete and proper installation of metal studs, shall be new, first quality of their respective kinds, in strict accordance with the recommendations of the manufacturer of the metal studs used, and subject to approval of the Architect/Engineer.

PART 3 – EXECUTION

3.01 SURFACE CONDITIONS

- A. Inspection:
 - 1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
 - 2. Verify that metal studs may be installed in strict accordance with the original design and the manufacturer's recommendations.

3.02 INSTALLATION

- A. Erect framing and panels plumb, level and square in strict accordance with the approved shop drawings.
- B. Handling and lifting of prefabricated panels shall be done in a manner which will not cause distortion in any manner.
- C. Track shall be securely anchored to the supporting structure as shown on erection drawings. Concrete anchors shall be installed after full compressive strength has been achieved.
- D. At track butt joints, abutting pieces of track shall be securely anchored to a common structural element, or they shall be butt-welded or spliced together.

METAL STUDS FOR INTERIOR WALLS

- E. Studs shall be plumb, aligned and securely attached to the flange or webs of both upper and lower tracks.
- F. Jack studs or cripples shall be installed below window sills, above window and door heads, at free standing stair rails and elsewhere to furnish support, and shall be securely attached to supporting members.
- G. Wall stud bridging shall be attached in a manner to prevent stud rotation. Bridging rows shall be spaced according to the manufacturer's recommendations.
- H. Framed wall openings shall include headers and supporting studs as shown on the plans.
- I. Temporary bracing shall be provided until erection is complete.
- J. Provisions for structure vertical movement shall be provided at the top of each panel section and where indicated on the plans using a vertical slide clip or other means in accordance with the manufacturer's recommendations. Allow for a minimum of 1/2" structure deflection.
- K. Provide double studs at wall openings, door and window jambs and not more than 1 1/2" each side of openings and wall intersections.
- L. Coordinate erection of studs with requirements of door frame supports and attachments.

END OF SECTION 054100

072116
BATT INSULATION

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Work Included: Provide all materials, labor, and equipment necessary to install fibrous insulation as required by the intent of the Contract Documents.

1.02 PRODUCT DELIVERY AND STORAGE

- A. Containers shall be factory marked to identify material, type, grade, and manufacturer.
- B. Protect the materials of this Section from exposure to the elements. Do not store on the ground.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Fibrous Insulation
 - 1. Material: Fiberglass
 - 2. Type: Batt or rolls - foil or reinforced paper faced vapor barrier on all exterior planes.
 - 3. Thickness: Shall be equal to the nominal thickness of the cavity in which it is placed, unless noted otherwise in the Contract Documents
 - 4. Standards: Federal Specification HH-I-521F & ASTM C665.
- B. Fibrous Insulation
 - 1. Material: Mineral Fiber
 - 2. Type: Batt-creased, unfaced, 3.0 pcf
 - 3. Thickness: 3"
- C. Standards:
 - 1. Thermafiber SAFB by USG Acoustical Products Company and Pyro-Fiber Sound Control Blanket by Johns Manville Company

PART 3 – EXECUTION

3.01 INSPECTION

- A. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
- B. In the event of a discrepancy, immediately notify the Architect. Do not proceed with the installation until all discrepancies have been resolved.

3.02 INSTALLATION

- A. Install insulation in continuous unbroken plane as indicated on the drawings.
- B. Lap and seal all joints between batts or rolls and at ends of rolls or batts.
- C. Stuff all holes, cracks or recesses with insulation.
- D. Fit insulation tightly around all penetrations (pipes, conduits, joists, etc.) of the insulation plane.
- E. For vertical installation, staple, glue, or wire insulation in place.
- F. Except as otherwise specifically directed by the Architect, install all insulation in accordance with the manufacturer's recommendations.
- G. Kraft faced vapor barriers shall not be installed within any wall of fire-rated construction.

END OF SECTION 072116

072116
BATT INSULATION

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081113
HOLLOW METAL DOORS AND FRAMES

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. Furnish all labor, materials, services, equipment and apparatus whether necessary or incidental to complete installation of all hollow metal doors and frames required for the project as shown on the Drawings and specified herein.
- B. Non-rated steel doors

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 00 - Bidding and Contract Requirements, including the General Conditions of the Contract
- B. Division 01 - General Requirements
- C. Section 061000 - Rough Carpentry
- D. Section 079200 - Joint Sealants
- E. Section 081416 - Flush Wood Doors
- F. Section 087100 - Finish Hardware
- G. Section 088100 - Glass and Glazing
- H. Section 092116 - Gypsum Wallboard Systems
- I. Section 099123 - Painting and Finishing

1.03 SITE INSPECTION

- A. This Contractor shall visit the site and become thoroughly familiar with all conditions. Refer to Division 1 for site examination requirements and procedures.

1.04 REFERENCE STANDARDS

- A. ANSI/S.D.I. 100 - RECOMMENDED SPECIFICATIONS STANDARD STEEL DOORS AND FRAMES, Steel Door Institute.
- B. ANSI A115 - STANDARD SPECIFICATION FOR DOOR AND FRAME PREPARATION FOR HARDWARE, American National Standards Institute.
- C. Thermal rated assemblies ASTM C236-89 or ASTM C976-90

1.05 SUBMITTALS

- A. Manufacturer's written certification that materials meet Specification requirements
- B. Submit under provisions of Section 013200
- C. Shop Drawings: Indicate door elevations, internal reinforcement, closure method, and cutouts for glazing, and finish.
- D. Product Data: Indicate door configurations, location of cut-outs for hardware reinforcement.
- E. Manufacturer's installation instructions: indicate special installation instructions.
- F. Manufacturer's certificate: Certify that products meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

- A. Installer: Company specializing in hollow metal door and frame work of comparable scope with a minimum of three (3) years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products to site under provisions of Section 01600.
- B. Accept doors on site in manufacturer's packaging. Inspect for damage.

081113
HOLLOW METAL DOORS AND FRAMES

- C. Break seal on-site to permit ventilation.

1.08 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.

1.09 COORDINATION

- A. Coordinate the work with door opening construction, door frame and door hardware installation.

PART 2 - PRODUCTS

2.01 MATERIALS - INTERIOR DOORS - GENERAL

- A. Sheet Steel: Commercial quality carbon steel, cold-rolled, annealed, and free from scale, pitting, rust or other defects - ASTM A366
 - 1. Gauges:
 - a. Interior frames - 18 gauge, mitered corners.
 - b. Interior doors - (Non-rated): SDI-100 Grade II, 18 gauge, heavy duty 1-3/4" (44mm) (Level B), Model 3 - Seamless .
 - c. Reinforcement for hardware - in accordance with Steel Door Institute Standard (S.D.I.) 100, Table IV.
 - d. Glass Moldings - 20 gauge.
- B. Primer:
 - 1. For non-galvanized steel, primer shall be manufacturer's standard rust-resistant metallic or phenol-resin primer.
 - 2. For galvanized steel, primer shall be zinc dust oxide primer, such as Porter No. 299 Zinc-dust Primer.
 - 3. Air dried.
- C. Core Filler Material:
 - 1. Non-insulated doors - manufacturer's standard cardboard honeycomb.
 - 2. Core material shall completely fill the inside of the door and be laminated to both inside faces of the panels.
- D. Acceptable manufacturers:
 - 1. Steelcraft of Masco Industries
 - 2. Republic Builders Products
 - 3. Ceco Corporation.
 - 4. Curries of L.B. Foster Co.
 - 5. Fenestra Corporation
 - 6. Emerson Engineering Company, Inc.

PART 3 – EXECUTION

3.01 FABRICATION

- A. Frames shall be set up, arc welded and ground smooth and shall have spreaders attached. Provide frame anchors of the proper type for adjoining construction. No less than three (3) wall anchors per jamb or frames to 7'-4" high, four (4) anchors per jamb for frames over 7'-4" high.

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HOLLOW METAL DOORS AND FRAMES

- B. Doors shall be full flush type, with seams finished so as to be invisible.
 - 1. Close top and bottom edges of door with steel channel, minimum 18 gauge, extending full width of door, and spot welded to both faces.
 - 2. Provide bevel on swing side.
 - 3. Provide adequate bracing.
 - 4. Fabricate doors with hardware reinforcement welded in place.
- C. Provide for hardware specified in Section 087100 - Finish Hardware. Provide reinforcing for hardware in accordance with ANSI A115.
- D. Provide UL labels of non-rusting metal attached with pop rivets on both doors and frames where indicated. Unless otherwise scheduled, "B label" shall be "1-1/2 hour B label".
- E. Provide screw-on glazing stops with mitered corners. Locate stops on non-security side of opening.
- F. Finishing:
 - 1. Thoroughly clean all contaminants from surface by washing with clean solvent and wiping with clean cloths.
 - 2. Treat non-galvanized items with phosphate pretreatment.
 - 3. All doors and frames shall receive a factory applied primer.
 - 4. All concealed parts of frames to be installed in masonry walls shall be coated with bituminous paint.
- G. Furnish galvanized steel shims as required to maintain 1/8" clearance between frame and door and between pairs of doors.
- H. Where indicated, provide inserted type sightproof stationary metal louvers.
- I. For openings which are to be equipped with electric door locks, modify standard frame and door construction as is necessary to accommodate the electric locks.
- J. Steel sheet: Galvanized to ASTM A525 G60.

3.02 INSTALLATION

- A. Anchor work securely to adjacent construction.
- B. Set frames accurately, plumb and square. Brace until attached to adjacent construction.
- C. Install doors in accordance with ANSI/SDI-100 and DHI.
- D. Do not use cardboard or other unspecified material for shims.
- E. Install metal doors and frames in accordance with the following standards published by the Steel Door Institute: Frames, SDI 105; Hardware, SDI 107; Doors, SDI 100.
- F. Frames installed in existing masonry walls shall be grouted in on both sides to provide a sealed installation. Grout used shall meet rating of the door and frame assembly.
- G. Coordinate installation of doors with installation of frames and hardware specified in Section 087100.

3.03 DISPOSAL

- A. All waste materials shall be properly and legally recycled or disposed of off the site by the Contractor. Burning on the site will not be allowed.

3.04 EXAMINATION

- A. Verify substrate conditions.

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HOLLOW METAL DOORS AND FRAMES

- B. Verify that opening sizes and tolerances are acceptable. ERECTION TOLERANCES
- C. Maximum Diagonal Distortion: 1/16 inch (1.5 mm) measured with straight edge, corner to corner.

3.05 ADJUSTING

- A. Adjust work under provisions of Section 017700.
- B. Adjust door for smooth and balanced door movement.

END OF SECTION 081113

081429
FLUSH WOOD VENEER DOORS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Interior Flush Wood Veneer Doors
 - 1. 5-ply flush bonded particle-core doors.
 - 2. Flush fire-rated wood doors.
 - 3. Lead-lined doors.
 - 4. Sound-retardant doors.
 - 5. Profiled doors.

1.02 RELATED SECTIONS

- A. Section 081113 – Metal Frames.
- B. Section 087100 – Door Hardware.
- C. Section 088100 – Glazing.
- D. Section 089119 – Door Louvers.

1.03 REFERENCES

- A. ANSI A208.1 – Particleboard.
- B. ASTM E 90 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- C. ASTM E 413 – Classification for Rating Sound Insulation.
- D. AWI Section 1300 – Architectural Flush Doors.
- E. UBC 7-2-1997/UL 10C – Positive Pressure Fire Tests of Door Assemblies.
- F. WDMA Finish System TR-6, transparent – Catalyzed Polyurethane.
- G. WDMA I.S.1-A – Architectural Wood Flush Doors.

1.04 SUBMITTALS

- A. Comply with Section 013200 – Submittal Procedures.
- B. Product Data: Submit manufacturer's product data, including door construction description and WDMA I.S.1-A and AWI classifications.
- C. Schedules: Submit manufacturer's schedules, including door dimensions, cutouts, species, finish, and hardware. Reference individual door numbers as indicated on the Drawings.
- D. Samples: Submit manufacturer's door finish samples, showing range of color variation.
- E. Test Reports: Submit manufacturer's test results of STC ratings from testing performed by independent testing agency for sound-retardant doors.
- F. Manufacturer's Certification: Submit manufacturer's certification that doors comply with specified requirements and are suitable for intended application.
- G. Cleaning Instructions: Submit manufacturer's cleaning instructions for doors.
- H. Warranty: Submit manufacturer's standard warranty.

1.05 QUALITY ASSURANCE

- A. Tolerances for Warp, Telegraphing, Squareness, and Prefitting Dimensions: WDMA I.S.1-A.

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- B. Identifying Label: Each door shall bear identifying label indicating:
 - 1. Door manufacturer.
 - 2. Order number.
 - 3. Door number.
 - 4. Fire rating, if applicable.
- C. Fire-Rated Doors: Labeled by Intertek/Warnock Hersey.
 - 1. Construction Details and Hardware Application: Approved by labeling agency.
- D. Positive Pressure Opening Assemblies: UBC 7-2-1997/UL 10C.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Delivery:
 - 1. Deliver doors to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
 - 2. Package doors individually in polybags.
- B. Storage:
 - 1. Store doors in accordance with manufacturer's instructions.
 - 2. Store doors in clean, dry area indoors, protected from damage and direct sunlight.
 - 3. Store doors flat on level surface.
 - 4. Do not store doors directly on concrete.
 - 5. Keep doors completely covered. Use covering which allows air circulation and does not permit light to penetrate.
 - 6. Store doors between 50 and 90 degrees F (10 and 32 degrees C) and 25 to 55 percent relative humidity.
- C. Handling:
 - 1. Handle doors in accordance with manufacturer's instructions.
 - 2. Protect doors and finish during handling and installation to prevent damage.
 - 3. Handle doors with clean hands or clean gloves.
 - 4. Lift and carry doors. Do not drag doors across other doors or surfaces.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Do not subject doors to extreme conditions or changes in temperature or relative humidity in accordance with WDMA I.S.1-A.

1.08 WARRANTY

- A. Warrant solid core, interior doors for life of installation against warpage, delamination, and defects in materials and workmanship.
- B. Defects noted during warranty period shall be corrected at no cost to Owner. Corrective work shall include labor and material for repair, replacement, refinishing, and rehanging as required.

PART 2 – PRODUCTS

2.01 MANUFACTURER

- A. VT Industries, Inc.
- B. Algoma Hardwoods
- C. Eggers

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- D. Oshkosh
- E. Others must submit for approval

2.02 GENERAL

- A. Glass Mouldings:
 - 1. Non-rated Flush Doors: VT Industries Style VT1.
 - 2. Fire-Rated Doors: VT Industries Style 110, steel vision frame, beige finish.
- B. Glazing: As specified in Section 08800
- C. Door Louvers: As specified in Section 10220

2.03 5-PLY FLUSH BONDED PARTICLE-CORE DOORS

- A. 5-Ply Flush Bonded Particle-Core Doors:
 - 1. Compliance: WDMA I.S.1-A.
 - a. Quality Grade: Premium grade, extra heavy duty.
 - b. Type: PC-5ME.
 - 2. 7-Ply and Non-Bonded Core Construction: Not acceptable.
 - 3. Door Thickness: 1-3/4 inches.
 - 4. Stiles:
 - a. Inner Stiles: 1-3/8 inches wide, before prefitting.
 - b. Structural Composite Lumber (SCL) With Outer Stile: Same species as face veneer.
 - c. Outer Stile: Apply after beveling and before face application.
 - 5. Rails:
 - a. Structural composite lumber (SCL).
 - b. Minimum Width Before Prefitting: 1-3/8 inches.
 - 6. Core:
 - a. Material: Particleboard
 - b. Particleboard Compliance: ANSI A208.1, Grade 1-LD-2
 - 7. Door Assembly:
 - a. Glue stiles and rails to core.
 - b. Sand entire assembly flat as a unit to ensure minimal telegraphing of core components through face veneers.
 - 8. Composite Crossbands:
 - a. Apply to core before application of matching hardware stiles.
 - b. Exposed Crossbanding: Not allowed along stile edges.
 - 9. Veneers:
 - a. Apply to crossbanded core in hot press using Type I, exterior, water-resistant adhesive.
 - b. 5-ply construction.
 - 10. Face Veneers:
 - a. Plain Sliced Red Oak (ISU Standard)
 - b. Others as selected by the Architect/Owner
 - c. Minimum Thickness Before Sanding: 1/42 inch.

2.04 FLUSH FIRE-RATED WOOD DOORS

- A. Flush Fire-Rated Wood Doors:
 - 1. Compliance: WDMA I.S.1-A.
 - a. Quality Grade: Premium.
 - b. Type: FD-5.
 - 2. Door Thickness: 1-3/4 inches.

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3. Outer Stiles: Same species as face veneer.
4. Inner Stiles:
 - a. Noncombustible material, 60- and 90-minute rated
 - b. Warranted for use with standard-weight mortise butt hinges and No. 12, 1-1/4-inch steel threaded-to-head screws.
5. Rails:
 - a. Noncombustible material, 60- and 90-minute rated
 - b. Width: Manufacturer's standard width.
6. Core:
 - a. Non-combustible mineral board
 - b. Weight: 30.8 pcf to 34.7 pcf
 - c. Does not contain asbestos or added urea formaldehyde.
7. Composite Crossbands:
 - a. Apply to core before application of matching hardware stiles.
 - b. Exposed Crossbanding: Not allowed along stile edges.
8. Face Veneers:
 - a. Plain Sliced Red Oak (ISU Standard)
 - b. Others as selected by the Architect/Owner
 - c. Minimum Thickness Before Sanding: 1/42 inch.
9. Positive Pressure:
 - a. Where UBC 7-2-1997/UL 10C standards for positive pressure apply, doors shall be constructed in accordance with Category A guidelines as published by Intertek/Warnock Hersey.
 - b. Smoke Gasketing: Apply smoke gasketing around frame perimeter to meet S-rating.
 - c. Intertek/Warnock Hersey Category B Guidelines: Edge sealing systems not allowed on frames.

2.05 SOUND-RETARDANT DOORS

- A. Sound-Retardant Doors:
 1. Compliance: WDMA I.S.1-A.
 - a. Quality Grade: Premium.
 2. Testing Methods: ASTM E 90 and E 413.
 3. Door Thickness: 1-3/4 inches.
 4. STC Rating: 45
 5. Core: Sound absorbent material encapsulated by stiles, rails, crossbands, and face veneers.
 6. Perimeter Gasketing and Drop Seals: To achieve STC ratings.
 7. Face Veneers and Vertical Stile Edges: Compatible with non-rated fire-rated doors.
 8. Acoustical Lite Kit if required shall be provided.

2.06 FABRICATION

- A. Prefit Doors:
 1. Prefit and bevel doors at factory to fit openings.
 2. Prefit Tolerances: WDMA I.S.1-A and AWI Section 1300.
- B. Factory-machine doors for mortised hardware, including pilot holes for hinge screws and lock fronts.

2.07 FINISHES

- A. Doors shall receive factory finishing.

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- B. Factory Finishing: WDMA System TR-6, catalyzed polyurethane, premium grade. WDMA finish Types 2 and 3 are not acceptable.
 - 1. Stain coat. (if specified) Stain Color to be selected
 - 2. Sealer: 3 coats.
 - 3. Sanding: 320-grit sandpaper.
 - 4. Topcoat: 2 coats.
- C. Top and Bottom Rails: Factory sealed with wood sealer.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine locations to receive doors. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not begin installation until unacceptable conditions are corrected.
- B. Ensure frames are solidly anchored, allowing no deflection when doors are installed.
- C. Ensure frames are plumb, level, square, and within tolerance.

3.02 PREPARATION

- A. Allow doors to become acclimated to building temperature and relative humidity for a minimum of 24 hours before installation.

3.03 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions.
- B. Install doors at locations indicated on the Door Schedule or Drawings.
- C. Install doors plumb, level, square, true to line, without warp or rack.
- D. Seal exposed surfaces with a minimum of 2 coats of polyurethane within 4 days of fitting each door.
- E. Install door hardware as specified in Section 08710.

3.04 ADJUSTING

- A. Adjust doors to swing freely, without binding in frame.
- B. Adjust hardware to operate properly.
- C. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
- D. Remove and replace damaged doors that cannot be successfully repaired, as determined by Architect.

3.05 CLEANING

- A. Clean doors promptly after installation in accordance with manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that could damage finish.

3.06 PROTECTION

- A. Protect installed doors from damage during construction.
- B. Place polybags over doors after adjusting and cleaning.

END OF SECTION 081429

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FLUSH WOOD VENEER DOORS

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ALUMINUM CURTAIN WALL

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Work Included: Provide materials, labor and equipment necessary to install the work of this Section in accordance with the intent of the Contract Documents. Items to this Section shall include but are not necessarily limited to the following:
 - 1. Aluminum Window/Curtain Wall Frames (Type B as shown on the Drawings)
 - 2. Anchors and attachments as required to secure any of the work in this Section.
 - 3. Break metal enclosures between glazed openings as shown on the Drawings.
- B. Related Work Specified Elsewhere:
 - 1. Section 079200 Sealants
 - 2. Section 088000 Glazing
 - 3. Section 085200 Aluminum Windows

1.02 INDUSTRY STANDARDS

- A. Publications of the following institutes and associations are referred to in this section.
 - 1. American National Standards Institute, A.N.S.I.
 - 2. Architectural Aluminum Manufacturer's Association, A.A.M.A.
 - 3. American Society of Testing Materials, A.S.T.M.

1.03 SUBMITTALS

- A. Shop drawings showing construction of all parts, metal thicknesses, installation and erection details including connections, anchorage, fastening, and sealing methods.
 - 1. Include sections of typical members, dimensioned elevations, frame sizes, spacing of anchors and fasteners, and details of accessories.
- B. Manufacturer's recommended installation and maintenance procedures.
- C. Test Reports: Reports of source quality control tests.
- D. Certificates: Manufacturer's certificate that materials meet specification requirements.

1.04 QUALITY ASSURANCE

- A. The design and specifications are based on the 1600 S.S.G. Curtainwall, as manufactured by the Kawneer Company, Inc. It is not the intent of these specifications to restrict the products of this Section to one manufacturer. Equals must be approved in writing prior to bidding by the Architect.
- B. Equal:
 - 1. Wausau
 - 2. Marmet
 - 3. P.P.G.

1.05 GUARANTEE

- A. Window Wall System shall be guaranteed against failure of materials or workmanship to include excessive leakage or air infiltration, excessive deflections, faulty operation of sash, deterioration of finish or metal in excess of normal weathering, and defects in hardware and weather stripping for two (2) years.

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ALUMINUM CURTAIN WALL

1.06 FIELD MEASUREMENTS

- A. Obtain all necessary field measurements and accurately fit this work with the work of others.

1.07 PRODUCT PERFORMANCE

- A. Submit a list of at least five (5) completed projects of similar nature and scope to the Architect listing name, locations and Architect.
- B. Air infiltration shall be tested in accordance with ASTM E 283 and shall not exceed .06 CFM per square foot of fixed area.
- C. Water infiltration shall be tested in accordance with ASTM E 331. No water penetration shall occur at a test pressure of 6.24 p.s.f.
- D. Structural Performance shall not exceed a maximum deflection of 1/175 of the span under a windload of 30 p.s.f. in accordance with ASTM E330 and based on a safety factor for allowable stress of 1.65.
- E. Thermal Barrier: There shall be a thermal separation between the exterior and interior metal surfaces.
- F. Test requirements are minimum and any tests failing to meet the minimum requirements will be cause to reject the proposed window wall systems.

PART 2 – PRODUCTS

2.01 MATERIALS AND CONSTRUCTION

- A. General:
 - 1. Sections shall be extruded from 6063 alloy and temper (ASTM B221 alloy G.S.10A-T5) or equivalent. Vertical and horizontal sections shall be provided with closed cell sponge insulating strips, forming a .125 inch thermal break between interior and exterior components.
 - 2. All curtain wall sections shall be of overall dimensions, wall thicknesses and basic configurations as shown on architectural details. Tubular verticals and horizontals are to be positioned to the interior of building structure, and screw fastened pressure plates with covers to the exterior.
- B. Joinery: Vertical sections shall run thru and be flush with horizontal sections at interior and exterior faces. All frame intersections shall be coped or square cut. Curtain wall sections shall be completely factory fabricated and delivered to job site unassembled. The curtain wall field erector shall mechanically affix joinery with stainless steel and aluminum connection angles, and shall seal to assure watertightness.
- C. Glazing: Curtain wall sections shall be designed for gasket glazing. All glazing pockets shall have a width of .312 inches plus glass or panel thickness, at a depth of 1.000 inch (when sections detailed have a 2.500 inch face). Glass or panels shall be retained in main sections by screw attached pressure plates at exterior face (allowing for installation or replacement from the exterior).
- D. Gaskets: Glass and panels shall be retained in curtain wall sections by closed cell sponge, arrowed neoprene gaskets inserted in gasket holds of main window sections. Dense, arrowed, neoprene gaskets shall be inserted in gasket holds of exterior pressure plates. All gaskets shall be reusable for replacement glazing and shall be colored black.
- E. Anchorage: Window units shall be secured to the building structure with allowances made for installation sequence, building movement, thermal movement of aluminum, and standard window opening construction tolerances. All materials employed shall be aluminum or noncorrosive materials compatible with aluminum; fasteners shall be stainless steel or

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cadmium plated steel, all steel clips and/or steel anchors, if used, shall be zinc plated. Perimeter anchors shall be aluminum or steel, providing the steel is properly isolated from the aluminum. All fasteners, expansion channels, clips and anchors, utilized as subject project requires, must be of adequate alloy, size and spacing to assure the structural integrity of window units.

- F. Breakmetal enclosures shall be of 090" aluminum. The enclosures shall be formed, then anodized in the finish indicated in 2.04 A. of this Specification. Submit appropriate detailing in shop drawing submittal for Architect review.

2.02 FINISH

- A. Window Units: All exposed aluminum surfaces shall receive a clear finish by caustic etch and anodic treatment to obtain an Architectural Class II coating conforming to Aluminum Association Standard AA-M12C22A42/44. Color shall be Permanodic #40 Dark Bronze. All finishes shall match the approved color sample in the Architect's office.
- B. Hardware: All exposed metallic hardware shall receive a protective clear lacquer to reveal the natural metal as specified for hardware.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Aluminum Wall System shall be erected by an experienced erector, approved by the Manufacturer and Architect.
- B. Comply with manufacturer's instructions for installation.
- C. Set system plumb, level, and true-to-line, without warp or rack of frames.
- D. Anchor system solidly to surrounding construction to prevent distortion or misalignment.
- E. Perimeter sealant work specified in Section 079200.
- F. Glazing work specified in Section 088100.

3.02 FIELD REQUIREMENTS

- A. Obtain all necessary field measurements and accurately fit this work with the work of others.

3.03 DISSIMILAR MATERIALS

- A. All aluminum materials which will be placed in contact with concrete, masonry, mortar, plaster or dissimilar metals shall be back painted with a heavy coat of alkali-resistant bituminous paint.

END OF SECTION 084411

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ALUMINUM CURTAIN WALL

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FINISH HARDWARE

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes: Finish hardware except as otherwise specified or specifically omitted herein.
- B. Related Sections:
 - 1. Section 062000 - Finish Carpentry: Installation of finish hardware.
 - 2. Section 081113 – Hollow Metal Doors and Frames.
 - 3. Section 081416 - Wood Doors.
 - 4. Section 081429 - Veneer Wood Doors
- C. Specific Omissions: Hardware for the following is specified or indicated elsewhere.
 - 1. Windows
 - 2. Cabinets of all kinds, including open wall shelving and locks.
 - 3. Signs, except as noted.
 - 4. Toilet accessories of all kinds including grab bars.
 - 5. Installation.
 - 6. Rough hardware.
 - 7. Folding partitions, except cylinders where detailed.
 - 8. Sliding aluminum doors.
 - 9. Angle sill threshold.
 - 10. Corner guards.

1.02 SUBSTITUTIONS & SUBMITTALS

- A. Requests for substitutions must be made in writing 10 days prior to bid date to allow architect to issue an addendum. If proposing a substitute, submit that product data attached to one showing specified item and indicate savings to be made. No other substitutions will be allowed.
 - 1. Items listed with no substitute manufactures have been requested by Owner to match existing.

1.03 SUBMITTALS

- A. Submit in electronic format (PDF) the hardware schedule at earliest possible date prior to delivery of hardware. Organize schedule into "Hardware Sets" with an index of doors and heading, indicating complete designations of every item required for each door or opening. Include the following information:
 - 1. Type, style, function, size, quantity and finish of each hardware item.
 - 2. Name, part number and manufacturer of each item.
 - 3. Location of hardware set cross referenced to indications on drawings both on floor plans and in door schedule.
 - 4. Explanation of all abbreviations, symbols, and codes contained in schedule.
 - 5. Mounting locations for hardware.
 - 6. Door and frame sizes and materials.
 - 7. Submit manufacture's technical data and installation instructions for the electronic hardware.
 - 8. Provide samples of hardware for Owner review.
 - 9. Catalog cuts.
- B. Templates: Where required, furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware.

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FINISH HARDWARE

1.04 QUALITY ASSURANCE

A. Qualifications:

1. Obtain each kind of hardware (latch and locksets, exit devices, hinges, and closers) from only one manufacturer, although several may be indicated as offering products complying with requirements.
2. Hardware supplier shall be a direct factory contract supplier who has in his employment a certified architectural hardware consultant (AHC) who is available at all reasonable times during the course of the Work, and for project hardware consultation to the Owner, Architect, and Contractor.

B. Schedule Designations: Except as otherwise indicated, the use of one manufacturer's numeric designation system in schedules does not imply that another manufacturer's products will not be acceptable, unless they are not equal in design, size, weight, finish function, or other quality of significance. See 1.02 A for substitutions.

C. Exit Doors: Openable at all times from the inside without the use of a key or any special knowledge or effort.

D. Fire-rated openings: Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80. This requirement takes precedence over other requirements for such hardware. Provide only such hardware which has been tested and listed by UL for the type and size of door required, and complies with the requirements of the door and the door frame labels. Latching hardware, door closers, ball bearing hinges, and seals are required whether or not listed in the Hardware schedule.

1. Where panic exit devices are required on fire-rated doors, provide supplementary marking on door UL label on exit device indicating "Fire Exit Hardware."

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Acceptance at the Site: Individually package each unit of finish hardware complete with proper fastening and appurtenances, clearly marked on the outside to indicate contents and specific locations in the Work.
- B. Deliver packaged hardware items at the times and to the locations (shop or field) for installation, as directed by the Contractor.

1.06 PROJECT CONDITIONS

- A. Coordination: Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing security and similar requirements indicated, as necessary for the proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents.
- B. Upon request, check the Shop Drawings for doors and entrances to confirm that adequate provisions will be made for the proper installation of hardware.

1.07 PRE-INSTALLATION MEETING

- A. Schedule a hardware pre-installation meeting on site and discuss the installation of all types of hardware on the Project.
- B. Meeting attendees shall be notified seven (7) days in advance and shall include the Architect, Contractor Hardware Installers, all Manufacturers Representative, any other effected sub-contractor or supplier and the Owner's Locksmith.

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FINISH HARDWARE

1.08 WARRANTY

- A. Provide guarantee from hardware supplier as follows:
1. Closers: Ten years; except electronic closers: Two years.
 2. Exit Devices & Locksets: Three years
 3. All other Hardware: Two years.

PART 2 – PRODUCT

2.01 MANUFACTURERS

- A. Approval of manufacturers other than those listed shall be in accordance with paragraph 1.02 A.

<u>Item:</u>	<u>Manufacturer:</u>	<u>Approved:</u>	<u>Approved</u>
Hinge	Hager	Stanley	
Cont. Hinges	Hager	Select	Pemko
Locks	Best	None	
Cylinders	Best	None	
Offline Electronic Lock	Schlage	None	
Closers	LCN	None	
ADA Closers	LCN	None	
Exit Devices	Von Duprin	None	
Lock-down	Trimco	None	
Interior Door Pulls	Hager	Rockwood	Ives
Exterior Door Pulls	Special-Lite	None	
Silencers	Hager	Rockwood	Ives
Kickplates	Hager	Rockwood	Ives
Mag Holder	Rixson	Dorma	LCN
Stops	Hager	Rockwood	Ives
Thresholds	National Guard	Zero	
Seals/Sweeps	National Guard	Zero	

- B. Furnish all items of hardware required to complete the work in accordance with specifications and plans.
- C. Carefully inspect Project for the extent of the finish hardware required to complete the Work. Where there is a conflict between these Specification and the existing hardware furnish finish hardware to specification.

2.02 MATERIALS

- A. Locksets: All locksets and latchsets shall be extra-heavy-duty cylindrical with Best 7-pin interchangeable core. Lockset and Cores to be of the same manufacturer to maintain complete lockset warranty. Locks to have solid shank with no opening for access to keyed lever keeper. Keyed lever to be protected by means of a break-away mechanism to prevent forced entry, when excessive torque is applied, a replaceable part will shear. Lock chassis must be through-bolted (outside of the lock chassis prep to prevent rotation of chassis after installation. Lock manufacturer shall provide a three-year warranty, in writing, to the Owner, along with three copies of the lock service manual. Strikes shall be 16 gauge curved brass,

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bronze or stainless steel with a 1" deep box construction, and have sufficient length to clear trim and protect clothing.

- B. Mortise type Locks and Latches shall be heavy-duty with hinged, anti-friction, 3/4 inch throw latchbolt with anti-friction piece made of self lubricating stainless steel. Functions and design as indicated on the hardware groups. Deadbolt functions shall be 1 inch projection made of hardened stainless steel. both deadbolt and latchbolt are to extend into the case a minimum of 3/8 inch when fully extended. Furnish locksets and latchsets with sufficient curved strike lip to protect door trim. Provide locksets with 7-pin interchangeable core cylinders. All mortise cylinders shall have a concealed internal set screw for securing the cylinder to the lockset. The internal set screw will be accessible only by removing the core from the cylinder body. Locksets and latchsets to have self-aligning, thru-bolted trim. Auxiliary deadlatch to be made of one piece stainless steel, permanently lubricated. Lever handles must be of forged or cast brass, bronze or stainless steel construction. Levers which contain a hollow cavity are not acceptable. Spindle to be such that if forced it will twist first, then break, thus preventing forced entry. Levers to be operated with a roller bearing spindle hub mechanism.
 - 1. Grade 1 Cylindrical Locks shall have minimum 9/16 throw. All deadbolts shall have 1-inch minimum throw.
 - 2. Comply with requirements of local security ordinances.
 - 3. Lock Series and Design: Best 93K7 AB 15D & 45H7 A 15J Trim.
 - 4. Cylinders: Best 7-Pin
- C. Offline Electronic Lock:
 - 1. Schlage AD200
 - 2. Provide outside trim VD
 - 3. Lock shall be compatible with Best keying system
- D. Hinges: All exterior doors shall have continuous geared concealed leaf hinges. Furnish hinges with five knuckles and flush bearing. All hinge open widths shall be minimum, but of sufficient size to permit door to swing 180.
 - 1. Furnish 3 hinges per leaf to 7 foot 6 inch height. Add one for each additional 30 inches in height or fraction thereof.
 - 2. Provide hinges as listed in schedule.
- E. Exit Devices:
 - 1. Furnish all sets at wood doors with sex bolts unless otherwise specified.
 - 2. Provide Trimco Lock-Down quick release devices on all acceptable dogging exit devices
- F. Surface Door Closers: Full rack and pinion type with removable non-ferrous cover. Provide sex bolts at all wood doors. Place closers inside building, stairs, and rooms. Closers shall be non-handed, non-sized and adjustable.
 - 1. Provide multi-size 1 through 6 at all doors rated or not.
 - 2. Flush transom offset brackets shall be used where parallel arm closers are listed for doors with fixed panels over.
 - 3. Drop brackets are required at narrow head rails.
 - 4. Set exterior doors closers to have 8.5 lbs maximum pressure to open, interior non-rated at 5 lbs , rated openings at 12 lbs.
- G. ADA Door Operators: LCN 4642 Series installed per manufacturer's recommendations and ADA Guidelines. Provide all necessary components needed for wireless operation unless otherwise noted on the Project Drawings.

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- H. Kickplates: Provide with four beveled edges, 10 inches high by width less 2 inches on single doors and 1 inch on pairs of doors. Furnish Type "A" screws to match finish.
- I. Seals: All seals shall be finished to match adjacent frame color. Seals shall be furnished as listed in schedule. Material shall be UL listed for labeled openings.
- J. Screws: All exposed screws shall be Phillips head.
- K. Silencers: Furnish silencers on all interior frames, 3 for single doors, 2 for pairs. Omit where any type of seals occur.

2.03 FINISH

- A. Generally to be BHMA 626 Satin Chrome.
- B. Protection Plates, Push, Pulls shall be BHMA 630.
- C. Spray door closers to match other hardware, unless otherwise noted.
- D. Aluminum items shall be finished to match predominant adjacent material. Seals to coordinate with frame color.

2.04 KEYING REQUIREMENTS

- A. Provide construction cores and keys during the construction period. Construction control and operating keys and core shall not be part of the Owner's permanent keying system or furnished on the same keyway (or key section) as the Owner's permanent keying system. Permanent cores and keys (prepared according to the accepted keying schedule) will be furnished to the Owner (by the local Best factory representative) prior to occupancy.
- B. All cylinders shall be Best 7-pin, interchangeable core.
- C. Permanent cores shall be sent uncombined.
- D. Furnish two (2) key blanks per core provided in the proper keyway configuration as directed by the University Locksmith
- E. The Owner, or the Owner's agent, will install permanent cores and return the construction cores to the Best Access Systems Factory Representative. All Construction cores and control keys remain the property of Best Access Systems.

PART 3 – EXECUTION

3.01 HARDWARE LOCATION

- A. Hinges:
 - 1. Bottom Hinge: 10 inches from door bottom to bottom of hinge.
 - 2. Top Hinge: 5 inches from door top to top of hinge.
 - 3. Center Hinge: Center between top and bottom hinge.
 - 4. Extra Hinge: 6 inches from bottom of top hinge to top of extra hinge.
- B. Lock: 38 inches from finished floor to center of lever or knob.
- C. Push Bar: 44 inches from bottom of door to center of bar.
- D. Push Plate: 44 inches from bottom of door to center of plate.
- E. Pull Plate: 42 inches from bottom of door to center of pull.
- F. Exit Device: 39-13/16 inches from finished floor to center of pad.
- G. Deadlock Strike: 44 inches from floor, centered.

3.02 INSTALLATION

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- A. Install each hardware item per manufacturer's instructions and recommendations. Do not install surface mounted items until finishes have been completed on the substrate. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- B. Installation shall conform to local governing agency security ordinance.

3.03 ADJUSTING

- A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly.
- B. Inspection: Hardware supplier shall inspect all hardware furnished within 10 days of contractor's request and include with his guarantee a statement that this has been accomplished. Inspector or Contractor shall sign off the hardware as being complete and correctly installed and adjusted. Further corrections of defective material shall be the responsibility of his representative.

3.04 ADJUSTMENTS AND CLEANING

- A. At final completion, and when HVAC is operational and balanced, installer shall make final adjustment to and verify proper operation of all door closers and other hardware. Lubricate moving parts with type lubrication recommended by the manufacturer.
- B. All hardware shall be left clean and in good condition. Hardware found to be disfigured, defective or inoperative shall be repaired or replaced.

3.05 SCHEDULE OF FINISH HARDWARE

- A. Legend of listed manufacturers:
 - 1. HA - Hager
 - 2. BE - Best
 - 3. VD - Von Duprin
 - 4. LC - LCN
 - 5. NG - National Guard
 - 6. TR - Trimco
- B. The items listed in the following "Schedule of Finish Hardware" shall conform throughout to the requirements of the foregoing specification. The last column of letters in the Hardware Schedule refers to the manufacturer abbreviation listed above.
- C. The Door Schedule on the Drawings indicates which Hardware Set is used with door.

END OF SECTION 087100

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Work Included: Provide all labor, materials and equipment necessary to install glazing necessary to satisfy the intent of the Contract Documents. This work shall include but shall not necessarily be limited to the following:
 - 1. Windows
 - 2. Doors
 - 3. Sidelites, transoms and interior window lites.
- B. Work Not Included:
 - 1. Unit Skylights
- C. Related Work Specified Elsewhere:
 - 1. Section 081313 Metal Doors
 - 2. Section 081416 Wood Doors
 - 3. Section 081429 Flush Veneer Wood Doors
 - 4. Section 085113 Aluminum Windows

1.02 INDUSTRY STANDARDS

- A. Publications of the following institutes, associations, societies and agencies are referred to in this section.
 - 1. Flat Glass Jobbers Association, FGJA.
 - 2. Underwriter's Laboratories, Inc., U.L.

1.03 SUBMITTALS

- A. Submit 4 x 8 inch samples of each type of glazing and one labeled unit of each glazing material to the Architect for approval.
- B. Furnish full size installation drawings in electronic format (PDF) of each type of glazing rabbet to the Architect for approval prior to fabrication or installation of any glass.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Insulating Glass (standard double glazed units):
 - 1. Exterior light: 1/4" tinted, solar bronze, float glass.(Tint shall match ISU Standard)
 - 2. Interior light:1/4" clear, float glass
 - 3. Unit Thickness: 1"
 - 4. Standards:
 - a. TWINDOW by PPG Industries, Inc.
 - b. THERMOPANE by Libbey-Owens-Ford Company
 - c. INSULATED GLAZING by Glasmont Corporation
- B. Insulating Glass (special double glazed units as noted on drawings):
 - 1. Exterior Light: 2 layers of 1/8" float glass with .060 vinyl laminate between (Exterior layer shall be tinted to match ISU Standard, interior layer shall be clear.)

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GLAZING

2. Interior Light: 2 layers of 1/8" clear float glass with .060 vinyl laminate between
 3. Unit thickness: 1"
 4. Standards:
 - a. TWINDOW by PPG Industries, Inc.
 - b. THERMOPANE by Libbey-Owens-Ford Company
 - c. INSULATED GLAZING by Glasmont Corporation
- C. Laminated Plate
1. Unit Thickness: 1/4" or as indicated on the Drawings
 2. Standards:
 - a. SAFLEX by Monsanto
 - b. Laminated by L.O.F.
- D. Tempered Plate (Clear or Tinted)
1. Unit Thickness: 1/4" or as indicated on the Drawings
 2. Standards:
 - a. TRU-TEMP FLOAT by ASG Industries
 - b. TUF-FLEX FLOAT by Libbey-Owens-Ford
 - c. HERCULITE FLOAT by PPG Industries
- E. Clear Float Glass
1. Unit thickness: 1/4" or as indicated on the Drawings
 2. Standards:
 - a. PPG Industries
 - b. Libbey-Owens-Ford Company
- F. Welded Wire Float Glass, U.L. Listed
1. Unit thickness: 1/4"
 2. Standards:
 - a. Polished Nu-Weld by ASG Industries
 - b. Baroque polished wire by Libbey-Owens-Ford
 - c. Polished baroque by Mississippi Wire Glass
 3. Wire shall be vertical and horizontal in the glass.
- G. Spandrel Insulated Glazing
1. Exterior Light: 1/4" tinted, solar bronze (Tint shall match ISU Standard), heat-strengthened spandrel coating to be on Surface #2.)
 2. Unit thickness: 1"
 3. Standards:
 - a. Virginia Glass
 - b. Hordis Glass Products
 4. Spandrel coating color to be selected by Architect from manufacturer's standard colors.
- H. Glazing Compound, Standards:
1. FLEXIGLAZE
 2. M-251 by Pecora
 3. CHANNEL GLAZING COMPOUND By Tremco

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PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's recommendations and as indicated in the drawings.
- B. All glazing scheduled for doors sidelights and transoms shall be of wire glass in label bearing doors/frames. Otherwise, provide laminated plate per U.B.C. requirements.

END OF SECTION 088100

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GLAZING

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GYPSUM WALLBOARD SYSTEMS

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Work Included: Gypsum Wallboard is required on all interior walls and ceiling surfaces in this work as indicated on the Drawings.

1.02 PRODUCT HANDLING

- A. Delivery and Handling:
 - 1. Deliver materials to the project site with manufacturer's labels intact and legible.
 - 2. Handle materials with care to prevent damage.
 - 3. Deliver fire-rated materials bearing testing agency label and required fire classification numbers.
- B. Storage:
 - 1. Store materials inside under cover, stack flat, off floor.
 - 2. Stack wallboard so that long lengths are not over short lengths.
 - 3. Avoid over-loading floor system.
 - 4. Store adhesives in dry area. Provide protection against freezing at all times.
- C. Protection: Use all means necessary to protect the materials of this section before, during and after installation, and to protect the installed work of other trades.
- D. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect, and at no additional cost to the Owner.

1.03 QUALITY ASSURANCE

- A. Use only qualified journeymen. In the acceptance or rejection of installed gypsum wallboard, no allowance will be made for lack of skill on the part of the drywall Subcontractor.
- B. Where fire-resistive gypsum wallboard assemblies are required, adhere to assemblies and guidelines as published by the Gypsum Association in the current edition of the Gypsum Association's Fire Resistance Design Manual.

1.04 REFERENCES/STANDARDS

- A. ASTM C36 -Gypsum Wallboard
- B. ASTM C79 -Gypsum Sheathing Board
- C. ASTM C442 -Gypsum Backing Board and Core Board
- D. ASTM C514 - Nails for the Application of Gypsum Wallboard
- E. ASTM C645 - Non-Load (Axial) Bearing Steel Studs, Runners (Track) and Rigid Furring Channels for Screw Application of Gypsum Board
- F. ASTM C754 - Installation of Framing Members to Receive Screw Attached Gypsum Wallboard, Backing Board or Water Resistant Backing Board
- G. ASTM C840 - Application and Finishing of Gypsum Board
- H. ASTM C1002 - Steel Drill Screws for the Application of Gypsum Board
- I. ASTM E119 - Fire Tests of Building Construction and Materials
- J. GA-201 - Gypsum Board for Walls and Ceilings
- K. GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board
- L. GA-600 - Fire Resistance Design Manual

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GYPSUM WALLBOARD SYSTEMS

1.05 JOB CONDITIONS

A. Environmental Conditions:

1. Temperature: During cold weather, in areas receiving wallboard installation, maintain temperature storage between 55 degrees F. to 70 degrees F. (13 degrees C. to 21 degrees C.) for 24 hours before, during, and after gypsum wallboard and joint treatment application.
2. Ventilation:
 - a. Provide ventilation during and following adhesives and joint treatment application.
 - b. Protect installed materials from drafts during hot, dry weather.

B. Protection: Protect adjacent surfaces against damage and stains.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Gypsum Wallboard

1. Water resistant board shall be in thicknesses and locations as indicated on the drawings.
2. Regular board shall be in thickness as indicated on the drawings.

B. Concrete GFR wallboard

1. All surfaces to receive ceramic tile finish shall be covered with 7/16" concrete glass-fiber-reinforced wallboard.

C. Fasteners:

1. Gypsum wallboard screws
2. Screw length for wood or metal stud application:
 - a. Single layer 5/8" wallboard application: 1 5/8", Bugle head screw.

D. Grillage:

1. Running Channels: 1 1/2" cold rolled galvanized steel.
2. Cross furring channels: 3/4" cold rolled galvanized steel.
3. Hangers: Minimum of No. 12 gauge galvanized annealed wire.
4. Note: Gypsum wallboard lath suspension system 650 by Chicago Metallic Corporation is an acceptable equal.

E. Accessories:

1. Drywall Reveal Molding: Style WOM-625-75 by Fry Reglet Corporation.
2. Surface-Mounted Corner Guard: Type CGS-3 by Balco, Inc.
3. Color to be selected by Architect.

PART 3 – EXECUTION

3.01 INSPECTION

- A. Check framing for accurate spacing and alignment.
- B. Verify that spacing of installed framing does not exceed maximum allowable of thickness of wallboard to be used.
- C. Verify that door frames are set for thickness of wallboard to be used.

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GYPSUM WALLBOARD SYSTEMS

- D. Do not proceed with installation of wallboard until deficiencies are corrected and surfaces to receive wallboard are acceptable.

3.02 APPLICATION

A. General:

1. Use wallboard of maximum lengths to minimize end joints.
2. Stagger end joints when they occur.
3. Locate end joints as far as possible from center of wall or ceiling.
4. Abut wallboards without forcing.
5. Neatly fit ends and edges of wallboard.
6. Support ends and edges of wallboard panels on framing or furring members.
7. Follow manufacturer's installation recommendations.
8. Stagger vertical joints on opposite side of partition to occur on different
9. Place all board so that all joints occur at center of studs or furring channels.
10. Make all joints tight and accurate, keeping adjacent boards in flush planes.
11. Cut and fit boards neatly and accurately around electrical boxes, light fixtures, grilles, registers, diffusers, and similar items so that evidence of cutting and fitting will be concealed by cover plates, flanges, or trim.
12. Seal cut edges where such cuts occur in water-resistant board according to the manufacturer's recommendations.
13. Where full height walls and walls containing acoustic or thermal insulation are indicated on the drawings, install sealant at the perimeter of such gypsum drywall surfaces and around all items protruding through such surfaces. Refer to Section 09260, Acoustical Treatment for Partitions/Ceilings, for specific information.
14. Provide control joints in continuous runs of wall exceeding 30'-0" (vertical or horizontal). Coordinate the location of all control joints with the Architect prior to installation.
15. Provide control joints at all locations where secured to structural steel to provide isolation from wallboard secured to partition framing.

B. Single Layer Application:

1. Vertical surfaces: Space screws a maximum 8" o.c. in field of panel and 8" o.c. along vertical abutting edges. Stagger screws on abutting edges or ends.
2. Horizontal surfaces: Space screws maximum 6" o.c. in field of panel and 6" o.c. along abutting end joints. Stagger screws on abutting edges or ends.

C. Joint System

1. Prefill:
 - a. Fill "V" grooves formed by abutting rounded edges of wallboard with prefill joint compound.
 - b. Fill "B" joint flush and remove excess compound beyond groove.
 - c. Leave clear depression to receive tape.
 - d. Permit prefill joint compound to harden prior to application of tape.

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2. Taping and finishing joints:
 - a. Taping or embedding joints:
 - 1) Apply compound in thin uniform layer to all joints and edges to be reinforced.
 - 2) Apply reinforcing tape immediately.
 - 3) Center tape over joint, and seat tape into compound.
 - 4) Leave approximately 1/64" (0.05mm) to 1/32" (.1mm) compound under tape to provide bond.
 - 5) Apply skim coat immediately following tape embedment, but not to function as fill or second coat.
 - 6) Fold tape and embed in angles to provide true angle.
 - 7) Dry embedding coat prior to application of fill coat.
 - b. Filling:
 - 1) Apply joint compound over embedding coat.
 - 2) Fill taper flush with surface.
 - 3) Apply fill coat to cover tape.
 - 4) Feather out fill coat beyond tape and previous joint compound line.
 - 5) Do not apply fill coat on interior angles.
 - 6) Allow fill coat to dry prior to application of finish coat.
 - c. Finishing:
 - 1) Spread joint compound evenly over and beyond fill coat on all joints.
 - 2) Feather to smooth uniform finish.
 - 3) Apply finish coat to taped angles to cover tape and taping compound.
 - 4) Sand final application of compound to provide surface ready for decoration.
 3. Filling and finishing depressions:
 - a. Apply joint compound as first coat to fastener depressions.
 - b. Apply at least two additional coats of compound after first coat is dry.
 - c. Leave filled and finished depressions level with plane of surface.
 4. Finished beads and trim:
 - a. First fill coat:
 - 1) Apply joint compound to bead and trim.
 - 2) Feather out from ground to plane of the surface.
 - 3) Dry compound prior to application of second fill coat.
 - b. Second fill coat:
 - 1) Apply joint compound in same manner as first fill coat.
 - 2) Extend beyond first coat onto face of wallboard.
 - 3) Dry compound prior to application of finish coat.
 - c. Finish coat:
 - 1) Apply joint compound to bead and trim.
 - 2) Extend beyond second fill coat.
- D. Metal Trim:
1. The drawings do not propose to show all metal trim required; verify with the Architect the precise locations and types of trim to be used.
 2. Provide metal trim at all junctures of gypsum wallboard and dissimilar materials.

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GYPSUM WALLBOARD SYSTEMS

3. Carefully inspect the drawings and verify location of all metal trim required.
 4. Install all trim in strict accordance with the manufacturer's recommendations, paying particular attention to make all trim installation plumb, level, and true-to-line with firm attachment to supporting members.
- E. Grillages: Spacing of furring channels and runner channels, and the spacing and spans of runners shall not exceed the limits given for each shape in the "Metal Lath Association Specifications".
1. Running channels shall be spaced not over 3 feet on center and spans shall not exceed 4 feet (2 feet at light fixtures).
 2. Suspend running channels directly from structure with 12 gauge hanger wire.
 3. Cross furring channels shall be spaced not over 13-1/2" on center.
 4. Hangers shall be spaced as specified above and within 6" of the ends of main runner runs and of boundary walls, girders, or similar interruptions of ceiling continuity. Main runner shall be properly positioned and leveled, and hangers shall be saddle tied along runner. Main runners shall not be let into nor come in contact with abutting masonry walls. Runner channels shall be located within 6" of the walls to channels shall be securely saddle tied with two strands of 16 gauge tie wire to main runners and shall not be let into or come in contact with abutting masonry walls. All openings shall be formed with carrying channels. All offsets and isolated areas shall be securely braced against sway.
- 3.03 ADJUST AND REPAIR
- A. "Nail Pop":
1. When face paper is punctured, drive new screw approximately 1-1/2" (38mm) from defective fastening and remove defective fastening.
 2. Fill damaged surface with compound.
- B. Ridging:
1. Do not repair ridging until condition has fully developed - approximately 6 months after installation or one heating season.
 2. Sand ridges to reinforcing tape without cutting through tape.
 3. Fill concave areas on both sides of ridge with topping compound.
 4. After fill is dry, blend in topping compound over repaired area.
- C. Cracks:
1. Fill cracks with compound and finish smooth and flush.

END OF SECTION 092116

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GYPSUM WALLBOARD SYSTEMS

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095113
SUSPENDED ACOUSTICAL CEILINGS

PART 1 -GENERAL

1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system and perimeter trim.
- B. Acoustical tile and panels.
- C. Non-fire rated assembly.
- D. Supplementary acoustical insulation over system units.

1.02 REFERENCES

- A. ASTM C635 - Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- B. ASTM C636 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
- C. ASTM E580 - Practice for Application of Ceiling Suspended Systems for Acoustical Tile and Lay-in panels in areas requiring seismic restraint.
- D. ASTM E1264 - Classification of Acoustical Ceiling Products.
- E. Ceilings and Interior Systems Contractors Association (CISCA) - Acoustical Ceilings: Use and Practice.

1.03 SUBMITTALS

- A. Submit under provisions of Section 013200.
- B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other work or ceiling finished, interrelation of mechanical and electrical items related to system and wall layouts.
- C. Product Data: Provide data on metal grid system components, acoustical units and accessories.
- D. Samples: Submit two samples full size illustrating material and finish of acoustical units.
- E. Samples: Submit two samples each, 12 inches (300 mm) long, of suspension system main runner, cross runner, edge trim, and hold down clips.
- F. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

1.04 QUALIFICATIONS

- A. Grid Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Acoustical Unit Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.05 REGULATORY REQUIREMENTS

- A. Conform to applicable code for combustibility requirements for materials.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C), and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.07 SEQUENCING

- A. 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.
- B. Install acoustical units after interior wet work is dry.

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SUSPENDED ACOUSTICAL CEILINGS

1.08 EXTRA MATERIALS

- A. Furnish under provisions of Section 017700.
- B. Provide 10 percent of total acoustical unit area of extra tile panels to Owner.

PART 2 – PRODUCTS

2.01 MANUFACTURERS - SUSPENSION SYSTEM

- A. Chicago Metallic Corp.
- B. Armstrong Contract Interiors.
- C. Donn by U.S.G. Interiors, Inc.

2.02 SUSPENSION SYSTEM MATERIALS

- A. Non-fire Rated Grid: ASTM C635, heavy duty; exposed T as indicated: components die cut and interlocking.
- B. Grid Materials: Commercial quality cold rolled steel with galvanized coating.
- C. Exposed Grid Surface Width: 15/16 inch (24 mm).
- D. Grid Finish: White and color as indicated.
- E. Accessories: Stabilizer bars clips splices edge moldings hold down clips and for suspended grid system.
- F. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, a ceiling system flatness requirement specified.

2.03 MANUFACTURERS - ACOUSTICAL UNITS

- A. U.S.G. Interiors, Inc. Product as schedule.
- B. Armstrong Contract Interiors Product as scheduled.
- C. Celotex Building Products Product as scheduled.

2.04 ACOUSTICAL UNIT MATERIALS

- A. Armstrong Type 737
 - 1. Recessed Angular Tegular
 - 2. Size: 24" x 24" x 5/8"
 - 3. Grid: 15/16" DX
 - 4. Color: White

2.05 ACCESSORIES

- A. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify site conditions.
- B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - LAY IN GRID SUSPENSION SYSTEM

- A. Install suspension system in accordance with manufacturer's instructions and as supplemented in this section.
- B. Install system in accordance with ASTM E580.

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SUSPENDED ACOUSTICAL CEILINGS

- C. Install system capable of supporting imposed loads to a deflection of 1/240 maximum.
- D. Lay out system as indicated on reflected ceiling plans.
- E. Supply hangers or inserts for installation with instructions for their correct placement.
- F. Install after major above ceiling work is complete. Coordinate the location of hangers with other work.
- G. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.
- H. 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.
- I. 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.
- J. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches (150 mm) of each corner; and support components independently.
- K. Do not eccentrically load system, or produce rotation of runners.
- L. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions.
- M. Form expansion joints as required. Maintain visual closure.

3.03 INSTALLATION - CONCEALED GRID SUSPENSION SYSTEM

- A. Install suspension system in accordance with manufacturer's instructions and as supplemented in this section.
- B. Install system in accordance with ASTM E580.
- C. Install system capable of supporting imposed loads to a deflection of 1/240 maximum.
- D. Lay out system to a balanced grid design as indicated on reflected ceiling plans and/or electrical lighting plans.
- E. Install after major above ceiling work is complete. Coordinate the location of hangers with other work.
- F. Supply hangers or inserts for installation with instructions for their correct placement.
- G. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.
- H. 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.
- I. 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.
- J. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located with 6 inches (150 mm) of each corner; and support components independently.
- K. Do not eccentrically load system, or produce rotation of runners.
- L. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions.
- M. Form expansion joints as required. Maintain visual closure.

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SUSPENDED ACOUSTICAL CEILINGS

3.04 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance 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 one way with pattern parallel to shortest room axis. Fit border trim neatly against abutting surfaces.
- D. Install units after above ceiling work is complete.
- E. Install acoustical units level, in uniform plane, and free from twist, warp and dents.
- F. Cut tile panels to fit irregular grid and perimeter edge trim. Field rabbett tile panel edge. Double cut and field paint exposed edges of tegular units.
- G. Where bullnose concrete block corners round obstructions occur, provide preformed closers to match edge molding.
- H. Lay acoustical insulation for a distance of 48 inches (1 200 mm) either side of acoustical partitions.
- I. Install hold-down clips to retain panels tight to grid system within 20 ft (6 m) of an exterior door.

3.05 ERECTION TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).
- B. Maximum Variation from Plumb Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION 095113

096813
CARPET - CARPET SQUARES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Carpet squares with adhesive back.
- B. Accessories

1.02 REFERENCES

- A. ASTM D2859 - Test method for flammability of finished textile floor covering materials.
- B. ASTM E84 - Surface burning characteristics of building materials.
- C. ASTM E648 - Critical Radiant flux of floor covering systems using a radiant heat energy source.
- D. NFPA 253 - Test for critical radiant flux of floor covering systems.

1.03 SUBMITTALS

- A. Submit under provisions of Section 013200.
- B. Shop Drawings: Indicate seaming plan, method of joining seams, direction of carpet.
- C. Product Data; Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation, and layout of flat wire system.
- D. Samples: Submit two samples 18 x 18 inch (450 x 450 mm) in size illustrating color and pattern for each carpet material specified.
- E. Submit two, 12 inch (300 mm) long samples of edge strip, material for each color specified.
- F. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

1.04 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing specified carpet with minimum three years documented experience.
- B. Installer: Company specializing in installing carpet with minimum three years documented experience.

1.05 REGULATORY REQUIREMENTS

- A. Conform to applicable code for flame/smoke rating requirements in accordance with ASTM E84.
- B. Conform to NFPA 253, ASTM E648, Class I for flooring radiant panel test.
- C. Conform to ASTM D2859 for surface flammability ignition test.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Store materials for 3 days prior to installation in area of installation to achieve temperature stability.
- B. Maintain minimum 70 degrees F (21 degrees C) ambient temperature 3 days prior to, during and 24 hours after installation.

1.07 MAINTENANCE DATA

- A. Submit under provisions of Section 017700.
- B. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

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CARPET - CARPET SQUARES

1.08 EXTRA MATERIAL

- A. Furnish under provisions of Section 017700.
- B. Provide 10% extra of carpet squares, but not less than 8, of each type, color, and pattern specified.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS – CARPET SQUARES

- A. Mohawk
- B. Shaw
- C. Milliken
- D. All others must submit for approval

2.02 MATERIALS - CARPET

- A. Refer to the Room Finish Schedule for Carpet Material for this Project

2.03 ACCESSORIES

- A. Sub-Floor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. "Pressure Sensitive Adhesive" designed for use with carpet squares

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are smooth and flat with maximum variation of ¼ inch in 10 ft. (6 mm in 3 m), and are ready to receive work.
- B. Verify concrete floors are dry to a maximum moisture content of 7 percent; and exhibit negative alkalinity, carbonization, or dusting.

3.02 PREPARATION

- A. Vacuum clean substrate.
- B. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.
- C. Prime any patched areas, dirty, dusty or porous floors with a latex milk additive such as Parachem 615 or 620.

3.03 ADHESIVE APPLICATION

- A. Adhesive must be used in a full spread application
- B. Apply with a 1/16 x 1/16 x 1/16 square notched trowel. Do not apply with a paint roller.
- C. Allow adhesive to dry to a clear and tacky state before laying carpet squares.

3.04 INSTALLATION

- A. Install carpet squares per Manufacturer's instructions.
- B. Install tiles immediately after adhesive has dried
- C. Lay carpet squares tight and flat on subfloor.
- D. Fit carpet squares tight to intersection with vertical surfaces without gaps.
- E. Where wall bases are scheduled, cut carpet squares tight to walls.
- F. Fit carpet squares tight to vertical surfaces to form base.
- G. Carpet squares shall be installed in a quarter turn configuration.

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CARPET - CARPET SQUARES

3.05 CLEANING

- A. Clean work under provisions of 017700.
- B. Remove excess adhesives without damage, from floor, base, and wall surfaces.
- C. Clean and vacuum carpet surfaces.

END OF SECTION 096813

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CARPET - CARPET SQUARES

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099010
GENERAL PAINTING REQUIREMENTS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Includes But Not Limited To-

1. Finishing elements of the building shown on attached Finish Schedule or specified below.
2. Back prime work to be installed against concrete or masonry or subjected to moisture.
3. Paint mechanical and electrical items located in classrooms as determined by Owner.

B. Related Documents-

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Section in Division 01, General Requirements, of these Specifications.

1.02 DESCRIPTION OF SYSTEMS:

- A. It is the intent of this Specification to require all existing painted wall surfaces, except those explicitly exempted herein, to be painted under this contract.

1.03 SUBMITTALS

A. Product Data-

1. Written list of specific products proposed along with Manufacturer's certification that products meet specified requirements.
 - a. Data shall be specific as to Manufacturer's brand name and identifying numbers.
 - b. Indicate square footage to be covered by each product, Manufacturer's recommended coverage rates, and amount of product required based on average coverage.
 - c. Indicate items to be finished as work of each painting Section.
 - d. Outline, preparation and application procedures to be followed including application methods, time between coats, and environment
 - e. Provide Manufacturer's cut sheets which indicate paint components. As a minimum, specification requirements for paint composition shall be given on cut sheets submitted.
2. Color selection data.
3. Maintenance instructions.

B. Samples-

1. Provide paint card for each color and for each paint system. Card to show each component of system as well as total system.

1.04 QUALITY ASSURANCE

A. Pre-installation Meeting-

1. Schedule meeting after delivery of paint but prior to application of field samples or paint.

B. Field Samples-

1. Prior to application of any paint system meet on Project site with Owner's representative. Owner may select one surface for application of each paint system specified.
2. Apply paint systems to surfaces indicated following procedures outlined in Contract Documents and Product Data submission specified above.
3. After approval of samples, proceed with application of paint system throughout Project.

GENERAL PAINTING REQUIREMENTS

- C. Applicator shall have experience in application of specified products for five years minimum and be acceptable to Owner and Manufacturer.

1.05 DELIVERY, STORAGE, & HANDLING

- A. Deliver specified products in original containers with labels intact on each container. Deliver amount of material indicated on submittal for Project in single shipment. Notify Owner two working days prior to delivery.
- B. Store materials in single place.
- C. Keep storage area clean and rectify any damage to area at completion of work of this Section.

1.06 PROJECT/SITE CONDITIONS

- A. Environmental Conditions-
 - 1. Maintain temperature of paint storage area at 55 deg. F minimum.
 - 2. Perform painting operations at temperature conditions recommended by Manufacturer for each operation.

1.07 SCHEDULING

- A. Coordinate by room painting schedules with Owner.
- B. Examine Contract Documents for painting requirements of other trades. Become familiar with their painting provisions and the painting of finish surfaces left unfinished by the requirements of other Sections.
- C. Contractor may work in facilities during normal hours of 6 a.m. to 6 p.m., or with approval of Owner after 6 p.m.

1.08 MAINTENANCE

- A. Extra Materials-
 - 1. Provide one gallon of each finish coat material in Manufacturer's original container in each color used. Provide one gallon of each primer and of each undercoat in each color used.

PART TWO – PRODUCTS

2.01 MATERIALS

- A. Linseed oil, shellac, turpentine, and other painting materials shall be pure, of highest quality, and bear identifying labels on containers.
- B. Tinting color shall be best grade of type recommended by Manufacturer of paint or stain used on Project.
- C. Paint compositions shall not only meet specified requirements but also contain sufficient miscellaneous components to promote proper drying and performance during and after application.

PART THREE – EXECUTION

3.01 INSPECTION

- A. Prior to installation of work of this Section, inspect classrooms to verify that space is ready for commencing painting.
- B. If inspection reveals deficiencies in work areas such that painting cannot be successfully completed, for not proceed with work of this Section in area of deficiency until resolved.
- C. Starting painting work will be construed as acceptance of surfaces and conditions within any particular area.

099010
GENERAL PAINTING REQUIREMENTS

3.02 PREPERATION

A. Protection-

1. Remove all oily rags and waste from building each night. Take every precaution to avoid danger of fire.
2. Protect finish work and adjacent materials during painting.
3. Good painting practice excludes splattering, dripping or painting any surfaces not intended to be painted. These items will not be spelled out in detail but pay special attention to the following-
 - a. Do not paint finish copper, bronze, chromium plate, nickel, stainless steel, anodized aluminum, or monel metal except as explicitly specified.
 - b. Keep cones of ceiling speakers completely free of paint. If it is required that metal speaker grilles are to be painted, paint prior to mounting grilles to speakers. Mask of metal grilles installed on ceiling speakers if ceiling is being spray painted.

B. General Surface Preparation-

1. Surfaces to be painted shall be clean and free of loose dirt. Clean and dust surfaces before painting or finishing.
2. Do no exterior painting while surface is damp, unless recommended by Manufacturer, nor during rainy or frosty weather. Interior surfaces shall be dry before painting.
3. Apply barrier coats over incompatible primers.
4. Remove hardware, electrical device covers, lighting fixtures, and similar in place work or provide surface applied protection prior to surface preparation and painting. After completion of painting, reinstall any removed work.
5. Fill holes and cracks in surfaces to receive paint or stain.

C. Metal Surfaces-

1. Wash metal surfaces with mineral spirits to remove dirt and grease before applying materials.
2. Where rust or scale is present, use wire brush or sandpaper to clean before painting.
3. Clean shop coats of paint that have become marred and touch up with proper type primer.
4. Treat galvanized metal and zinc surfaces as specified and in accordance with Manufacturer's directions before applying first paint coat.

D. Wood Surfaces-

1. Sand woodwork smooth with 220 sandpaper and clean surfaces before proceeding with stain or first coat application.
2. Use fine sandpaper between coats to produce smooth, even surfaces.

E. Cementitious & Masonry Surfaces-

1. Clean to remove efflorescence, chalk, dust, dirt, grease, oils, and the like.
2. Roughen where required to remove glaze.
3. Clean concrete floors with etching cleaner and flush with clean water.
4. Pay particular attention to the paint manufacturer's preparation instructions.
5. Except for steam cured products, allow surfaces to cure from 30 to 90 days according to manufacturer's recommendations before painting.

099010
GENERAL PAINTING REQUIREMENTS

3.03 APPLICATION

- A. Carefully follow Specifications and color schedule, painting complete all surfaces to be painted.
- B. Spread materials smoothly and evenly.
- C. Putty nail holes in wood after application of first finish coat using natural colored type to match wood finish. Bring putty flush with adjoining surfaces.
- D. Finished work shall be uniform, of approved color, smooth, and free from runs, sags, defective brushing, rolling, clogging, and excessive flooding.
- E. Read color schedule for rooms before priming walls. Tint priming coat and undercoat to approximate shade of final coat, but with enough difference so it is possible to check application of specified number of coats.
- F. Touch up suction spots after application of first coat.
- G. Use fine sandpaper between coats as necessary to produce even, smooth surfaces.
- H. Paint shall be thoroughly dry and surfaces clean before applying succeeding coats.
- I. Make edges of paint adjoining other materials or colors clean, sharp, and without overlapping.

3.04 ADJUSTMENT

- A. At completion of Project, touch up work to match specified finish. Repaint are damaged during construction with specified finish at no additional cost to Owner.

3.05 CLEANING

- A. Do not discard paint containers without Owner's written approval to allow count to determine if paint delivered was applied.
- B. Upon completion of work of this Section, remove paint spots from floors, walls, glass, or other surfaces and leave work clean, orderly, and in acceptable condition. Remove debris caused by work of this Section from premises.

END OF SECTION 099010

101100
GLASS MARKERBOARDS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. Section Includes:
 - 1. Fixed dry-erase magnetic glass markerboards
 - 2. Fixed dry-erase non-magnetic glass markerboards

1.02 REFERENCED STANDARDS

- A. American National Standard's Institute
 - 1. ANSI Z97.1 Safety Glazing Materials Used in Buildings -Safety Performance Specifications and Methods of Test
- B. American Society for Testing Materials
 - 1. ASTM 8221 Standard Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wires, Profiles and Tubes
- C. GREENGUARD Environmental Institute
 - 1. GREENGUARD Certified. UL2818-2013 Standard for Chemical Emissions for Building Materials, Finishes and Furnishings.
 - 2. GREENGUARD Gold Certified. UL2818-2013 Standard for Chemical Emissions for Building Materials, Finishes and Furnishings.

1.03 SUBMITTALS

- A. Shop Drawings: Provide shop drawings for each type of visual display board required.
- B. Product Data: Provide technical data for materials specified. Include Material Safety Data Sheets, when applicable.
- C. Samples: Provide sample to illustrate finish and texture, where required.
- D. Manufacturer's Instructions: Provide Manufacturer's installation and cleaning instructions.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Manufacturer shall be a firm engaged in the manufacture of visual display boards in the United States.
 - 2. Manufacturer shall have a minimum of 5 years experience in the manufacture of visual display boards.
- B. Operation and Maintenance: Include data on regular cleaning, stain removal, and precautions.
- C. Product Certifications: Provide GREEN GUARD/ GREENGUARD Gold certificates for markerboard surfaces, as applicable.

1.05 PROJECT CONDITIONS

- A. Field measure prior to preparation of shop drawings and fabrication to ensure proper fit.
- B. Comply with manufacturer's recommendations for acclimating area for interior moisture and temperature to approximate normal occupied conditions.

101100
GLASS MARKERBOARDS

1.06 DELIVERY, STORAGE AND HANDLING

- A. Schedule delivery of visual display boards with spaces sufficiently complete so that visual display boards can be installed upon delivery.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Store materials protected from exposure to harmful weather conditions and at temperatures and humidity conditions recommended by manufacturer.

1.07 WARRANTY

- A. Submit a warranty, stating that under normal usage and maintenance, and when installed in accordance with manufacturer's instructions and recommendations, Claridge glass markerboard writing surfaces are guaranteed for ten (10) years. Guarantee covers replacement of defective boards but does not include cost of removal or re installation.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Claridge Products and Equipment, Inc.
- B. All others must submit for approval

2.02 MATERIALS

- A. Magnetic Glass Markerboards
 - 1. Glass: ¼ -inch thick, tempered, low-iron, extra clear, safety writing glass with polished edges
 - 2. Glass Markerboard writing surface: Smooth finish intended for use with dry-erase markers
 - 3. Glass Sizes: Sizes available - 2'0" x 3'0" through 4'0" x 8'0". (Specify size.)
 - 4. Back-Painted Color: 10 standard colors. Calm White furnished if color not specified (optional colors available). Specially formulated back paint creates a durable paint/glass bond that is fade resistant, water resistant, heat resistant, and environmentally friendly and free of unsafe chemicals.
 - 5. Backing: Magnetic glass markerboards have steel backing permanently adhered to the back of the glass.
- B. Mounting Methods (specify)
 - 1. MGM - Brushed stainless edge grips for stand-off mounting (4 stand-offs with sizes up to 4' x 6'; 6 with 4' x 6' and 4' x 8')
 - 2. MGMI-Z-bar hanger clips- no visible mounting hardware; concealed hanger mounted to back of board. Full-length, minus 3", concealed z-bar hanger for the wall. Furnished with 3M Dual Lock™ fasteners to hold bottom of board firmly in place. Z-bar mounting method to pass 500 lb. load test without failure.
- C. Accessories
 - 1. Rare Earth Magnets furnished with MGM and MGMI
 - 2. Optional Aluminum Accessory tray equipped with double-sided tape
 - 3. Optional Aluminum Accessory tray equipped with rare earth magnets
 - 4. Optional Marker Caddy and Magnetic Eraser (Magnetic Glass Markerboards only)

101100
GLASS MARKERBOARDS

PART 3 – EXECUTION

3.01 PROJECT CONDITIONS

- A. Interior moisture and temperature should approximate normal occupied conditions.
- B. Verify that wall surfaces are true and plumb and are prepared and ready to receive boards.

3.02 INSTALLATION

- A. Deliver factory built units completely assembled and of dimensions shown in details and in accordance with manufacturer's shop drawings as approved by the architect.
- B. Follow manufacturer's instructions for storage and handling of units before installation.
- C. Do not install on damp walls or in damp and humid weather without heat in the building.
- D. Install level and plumb, keeping perimeter trim straight in accordance with manufacturer's recommendations.**

3.03 ADJUST AND CLEAN

- A. Verify that all accessories are installed as required for each unit.
- B. At completion of work, clean surfaces and trim in accordance with manufacturer's recommendations, leaving all materials ready for use.

PLASTIC LAMINATE CASEWORK AND COUNTERTOPS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Cabinets and counter tops.
- B. Casework hardware.

1.02 REFERENCES

- A. Countertop Standard: ANSI A161.2
- B. Catalog Standards: Manufacturer's catalog numbers may be shown on drawings or in equipment schedule for convenience in identifying certain cabinet work. Unless modified by notation on drawings or otherwise specified, catalog description for indicated number constitutes requirements for each such cabinet.

1.03 SUBMITTALS

- A. Submit under provisions of Section 013200.
- B. Shop Drawings: Indicate casework locations, large scale plans, elevations, rough-in and anchor placement dimensions and tolerances, clearances required.
- C. Product Data: Provide component dimensions, configurations, construction details and joint details.
- D. Samples: Submit two samples, minimum size 3 x 6 inches (75 x 150 mm) of each color of finish.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with ANSI 161.1.

1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.06 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Stevens Cabinet Company, Inc. Product Architectural Designer Series.
- B. L.S.I. Corp. of America, Inc.
- C. Trimline Product.
- D. Custom fabricated per enclosed specifications.
- E. Or approved equal

2.02 BASIC MATERIALS

- A. Particleboard: ANSI A208.1 mat. formed particleboard, Grade 1-M- with minimum density of 40 lbs. per cu. ft., internal bond of 60 psi; and minimum screw holding capacity of 225 lbs. on faces and 200 lbs. on edges.
- B. Plastic Laminate: NEMA LD-3, of thickness, type and grade designation indicated; in colors or patterns and finishes indicated or, if not indicated, as selected by Architect from manufacturer's standard range.
- C. Exposed Surfacing Material of Doors, Drawer Fronts, Fixed Panels, Toeboards and Ends: High pressure decorative laminate, 0.028" thick, General Purpose Type (GP-28).

PLASTIC LAMINATE CASEWORK AND COUNTERTOPS

- D. Semi-Exposed Surfacing Material and Doors: High pressure plastic laminate, 0.020" thick, Cabinet Liner Type (CL-20), in color or pattern and finish matching interior of cabinets, unless otherwise indicated.
- E. Remaining Semi-Exposed Materials: Decorative boards, General Purpose type, conforming to NEMA LQ-1 with decorative faces in patterns or colors and finish indicated or, if not indicated, as selected by Architect from manufacturer's standard range.
- F. Concealed Materials: Any sound dry solid lumber, plywood or particleboard or combination thereof; without defects affecting strength, utility or stability. On concealed surfaces of portions constructed of decorative boards, provide decorative or cabinet liner laminate backing (Light-Duty Type).
- G. Core Material for Plastic Laminates: Industrial Grade Particleboard conforming to ANSI A20B.1, Grade 1-M-2.
- H. Treatment of Exposed and Semi-Exposed Edges: Edges of doors and drawer fronts shall have GP-28 plastic laminate to match fronts.
- I. Cabinet Construction
 - 1. Sides, dividers, tops, bottoms, shelves and stretchers: Not less than 1/2" thick. Provide stretchers at top of base cabinet.
 - 2. Backs: Not less than 3/8" thick for unexposed backs. Exposed backs are to be 3/4" thick panels of balanced construction tenoned into cabinet ends.
 - 3. Drawers
 - a. Sides, subfronts and backs: not less than 1/2" thick.
 - b. bottoms: not less than 1/4" thick particleboard or provide solid wood sides and back.
 - c. Provide box type construction with front, bottom and back rabbeted in sides.
 - d. All joints secured with glue and mechanical fasteners.
 - e. All drawers must be suspended on extension drawer slides.
 - 4. Joinery
 - a. Rabbet backs flush into end panels and secure with concealed mechanical fasteners.
 - b. Connect wall cabinet tops and bottoms and base cabinet bottoms and stretchers to ends and dividers by means of mechanical fasteners.
 - c. Rabbet tops, bottom and backs into end panels or cabinetry corner joints to incorporate fluted dowel pin construction.
 - 5. Subbase: Not less than 3/4" thick, of height and relationship to cabinet fronts and exposed ends as indicated. Rubber base furnished and applied continuously per Section 09650.
 - 6. Toe Board: Not less than 3/4" thick, attached to subbase with concealed fasteners.

2.03 COUNTERTOPS

- A. Exposed Surfacing Material: High pressure plastic laminate, 0.050" thick, General Purpose Type (GP-50); except 0.042" thick, Postforming Type (PF-42), where postformed countertop configuration is indicated.
- B. Substrate (Core) for Exposed Surfacing Material: Particleboard.
- C. Countertop Configuration: Provide self-edge countertops with continuous 4" backsplash.
- D. Countertop Thickness: As indicated or, if not indicated, not less than 1-1/4" thick, and unless otherwise indicated, with substrate (core) not less than 3/4" thick.

PLASTIC LAMINATE CASEWORK AND COUNTERTOPS**2.04 CABINET AND CASEWORK HARDWARE AND ACCESSORIES**

- A. General: Provide manufacturer's standard hardware and accessory units of type, size and finish indicated, complying with ANSI A156.9 or, if not indicated, as selected by Architect from manufacturer's standard range.
- B. Hinge: Institutional type, 5 knuckle with 270 degree swing. Provide one pair for doors less than 4 ft. high and 1-1/2 pair for doors over 4 ft.
- C. Pulls: Selected from manufacturer's standard. Provide 2 pulls for drawers over 24" wide.
- D. Door Catches: Nylon roller spring catch or dual self-aligning permanent magnet type. Provide 2 catches on doors over 4 ft. high.
- E. Drawer Slides: Steel slides with ballbearing nylon rollers. 100# rating. File drawers shall have full extension drawer slides for full access to drawer.
- F. Drawer and Cupboard Locks: Half-mortise type, 5-disc tumbler and dead bolt, round cylinder only exposed, die cast with plated finish.
 - 1. Key each cabinet in room alike.
 - 2. Key each room differently.
 - 3. Provide one master key.
 - 4. Provide two keys each.
- G. Sliding Door Hardware Sets: Manufacturer's standard to suit type and size of sliding door units.
- H. Shelf Support Clips: One-piece molded nylon.
- I. Sinks and Faucets: As specified in Division 22.
- J. Finish: Unless otherwise indicated, provide hardware units with manufacturer's standard, satin finish.

2.05 FABRICATION

- A. Shop assemble casework for delivery to site in unit easily handled and to permit passage through building openings.
- B. Fabricate corners and joints without gaps or inaccessible spaces or areas where dirt or moisture could accumulate.
- C. Fabricate each unit rigid, not dependent on building structure adjacent units for rigidity.
- D. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
- E. Form edges smooth. Form material for counter tops, facing, shelves, and linings from continuous sheets.
- F. Provide cutouts for plumbing fixtures, appliances, fixtures and fittings. Prime paint contact surfaces of cut edges.
- G. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.06 FINISHES

- A. Exposed To View Surfaces: Plastic Laminate of color and pattern as selected.
- B. Interior Surfaces: Plastic Laminate of color and pattern as selected.

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PLASTIC LAMINATE CASEWORK AND COUNTERTOPS

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions.
- B. Verify adequacy of support framing.

3.02 INSTALLATION

- A. Install casework, components and accessories in accordance with manufacturer's instruction.
- B. Use anchoring devices to suit conditions and substrate materials encountered.
- C. Set casework items plumb and square, securely anchored to building structure.
- D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch (1 mm). Use filler strips not additional overlay trim for this purpose.
- E. Close ends of units, back splashes, shelves and bases.
- F. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

3.03 ADJUSTING

- A. Adjust work under provisions of Section 017700.
- B. Adjust doors, drawers, hardware, fixtures, and other moving or operating parts to function smoothly.

3.04 CLEANING

- A. Clean work under provisions of 017700.
- B. Clean casework, counters, shelves and hardware.

3.05 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Section 017700.
- B. Do not permit finished casework to be exposed to continued construction activity.

3.06 SCHEDULES

- A. See Plans and Details.

END OF SECTION 123216

WET-PIPE FIRE PROTECTION SPRINKLERS (FOR RENOVATION PROJECTS)

PART 1 – GENERAL

1.01 SCOPE OF WORK:

- A. Provide piping, fittings, valves and specialties for revision to existing automatic wet sprinkler system.

1.02 DRAWINGS:

- A. Deviations from the submitted drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the system, shall not be made without the written approval of the Architect/Engineer,
- B. Revised drawings shall be re-submitted to FM and the authority having jurisdiction for approval unless waiver is granted by the Owner.

1.03 QUALITY ASSURANCE:

- A. Materials, installation and testing shall comply with the following:
 - 1. NFPA 13 - Installation of Sprinkler Systems.
 - 2. FM - Factory Mutual Approval Guide.
 - 3. NFPA 14 - Installation of Standpipe and Hose Systems.
 - 4. UL - Fire protection Equipment Directory.
 - 5. FM - Data Sheets.
 - 6. Indiana State University Standards
 - 7. City of Terre Haute requirements.
 - 8. State of Indiana requirements
- B. Equipment and Components shall bear UL and FM label or marking and shall be FM approved for fire service.
- C. All fire protection sprinkler work shall be performed by a licensed Sprinkler Contractor

1.04 SUBMITTALS:

- A. Submit data, drawings, and hydraulic calculations, as specified in Section 15011, in conjunction with Division 1 requirements.
- B. Submit shop drawings to Factory Mutual for approval **first**. After FM approval submit shop drawings to State of Indiana Office of Fire Safety for approval. Submit shop drawings stamped by the State of Indiana Office Of Fire Safety to the Architect/ Engineer and Owner for approval.

1.05 HYDRAULIC DESIGN CRITERIA:

- A. Calculations shall be based on connection to existing fire main in the area.
- B. Hydraulic calculations shall be per NFPA and FM requirements.
- C. Density shall be as indicated (gallons/minute /square foot, gpm/sf). Size all piping to suit densities indicated below:
 - 1. Offices: Density of 0.15 gpm/sf over the most remote 2000 sq. ft. area, 168 sq. ft. per head maximum.
 - 2. Storage Rooms: Generally the same as Mechanical rooms (Verify with FM for special conditions).
 - 3. Other rooms: Same as offices.
- D. Existing inspector's test connections shall be maintained.

WET-PIPE FIRE PROTECTION SPRINKLERS (FOR RENOVATION PROJECTS)

- E. Provide fire protection for soffit areas, void spaces, obstructions, top and bottom of ductwork above 4' wide, closets, and other spaces required by authority having jurisdiction, and at no additional cost to owner.

1.06 IMPAIRING FIRE PROTECTION SYSTEM:

- A. Indiana State University personnel shall impair existing fire protection systems. Notify Bill Fairbanks at (812)-237-4020 or bill.fairbanks@indstate.edu a minimum of 48 hours prior to required shutdown.
- B. Indiana State University complies with 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 the University.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All hose threads shall be National Standard.
- B. All piping materials of a given type shall be manufactured by a single source, and supplied by a single supplier.

2.02 ABOVE GROUND PIPING MATERIAL

- A. Fire protection piping shall be schedule 40, ASTM 53, black steel pipe with screwed cast iron or malleable iron fittings (or match existing fittings in building) for sizes through 2", and schedule 10, ASTM A135, black steel pipe with grooved couplings for sizes 2- 1/2" and larger. All piping, fittings and accessories shall be rated for a minimum working pressure of 175 psig. B. Manufacturers: Victaulic Style 005 Rigid Firelock couplings with type "E" EPDM gasket, Anvil
- B. Pipe Hangers: Pipe hangers shall comply with requirements of 220600, be FM approved, and be spaced in accordance with NFPA 13 and FM.

2.03 SPRINKLER HEADS

- A. General: Provide brass sprinkler heads with wide angle spray, thermosensitive glass bulb with temperature rating of 155F to 165F, rated for 175 psig, standard response and orifice, except as otherwise specified, FM and UL approved. Install sprinkler head type as indicated on drawings.
- B. Sprinkler head guards: Provide red, wire mesh guards where damage to sprinkler heads may occur, such as stairways, loading docks or aisles. Manufacturers: same as sprinkler manufacturer.
- C. Semi-recessed pendant type: chrome plated brass, with chrome plated brass semi-recessed escutcheon. Manufacturers: Reliable model G, Anvil, Viking model M.
- D. Concealed pendant type: brass finish with cover to match ceiling. Manufacturers: Reliable model G4FR, Anvil, Viking
- E. Upright type: brass finish. Manufacturers: Reliable model G, Anvil, Viking
- F. Sidewall type: chrome plated brass, with deflector and chrome plated brass escutcheon. Manufacturers: Reliable HSW1, Anvil, Viking
- G. Dry type (freezeproof): recessed with center strut, lever and solder capsule, unobstructed waterway. Manufacturers: Anvil Corp., Reliable Model G3, Viking

WET-PIPE FIRE PROTECTION SPRINKLERS (FOR RENOVATION PROJECTS)

PART 3 - EXECUTION

3.01 STATE SUBMISSION

- A. If less than twenty (20) FP sprinkler heads are in the scope of work submission to the State of Indiana is not required.

3.02 COORDINATION WITH OWNER

- A. All Sprinkler work shall be coordinated with Bill Fairbanks, ISU Fire Safety Specialist, at 812-237-4020.
- B. Provide a minimum of two (2) working days prior notification before beginning work.

3.03 GENERAL PIPING INSTALLATION REQUIREMENTS:

- B. Install piping in compliance with Industry Standards, with hanger spacing as dictated by NFPA and FM.
- C. Flush per NFPA 13 and FM requirements.
- D. Sleeve all piping passing through walls, floors and partitions.

3.04 SPRINKLER HEAD INSTALLATION REQUIRMENTS:

- A. Locate heads per drawings, FM and NFPA 13, coordinated with lighting, building equipment layout, and other interferences. Aesthetically locate heads with respect to ceiling patterns, tile patterns, masonry bonds and similar constructions lines. Center heads in two directions in ceiling tile, with piping offsets as required.
- B. Protect heads, covers and escutcheons prior to painting. Remove protection after painting.

3.05 FIELD QUALITY CONTROL AND TESTING:

- A. Test equipment per the manufacturer's instructions, NFPA, and FM.
- B. Test piping systems per NFPA 13 and the requirements of Factory Mutual.
- C. The Owner's Fire Safety Specialist or designee and Factory Mutual shall witness all certification tests.

END OF SECTION 211314

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220500
COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes, but is not limited to, following basic provisions, materials, and methods common to various plumbing work, to complement other Division 22 Sections and govern respective Division 22 work, where applicable, the same as if repeated in respective Sections:
 - 1. Quality Assurance requirements.
 - 2. Equipment Selection requirements.
 - 3. Delivery, Storage, and Handling requirements.
 - 4. Sequencing and Scheduling requirements.
 - 5. Method of listing and referencing Acceptable Manufacturers.
 - 6. No shrink grout for equipment installations.
 - 7. Rough-In and Installation requirements common to equipment and systems.
 - 8. Field-fabrication of metal and wood equipment supports.
 - 9. Cutting and patching requirements.
 - 10. Fire stopping coordination requirements (Complement to Division 7) and/or NFPA.
- B. Other basic mechanical materials and methods which complement this Section and govern respective Division 22 work are specified in respective complementary Sections immediately following this Section and in Sections designated "General". Refer to Project Manual "Table of Contents" for respective Section numbers and titles.
- C. Particular products and systems are specified in respective Sections. Refer to Project Manual "Table of Contents" for respective Section numbers and titles.

1.02 DEFINITIONS

- A. Concealed Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- B. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- C. Exposed Exterior Installations: Exposed to view outdoors and subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations, outdoors on grade, attached to exterior building walls etc.
- D. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- E. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below the roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- F. Installer: Respective tradesperson or subcontractor responsible for respective work.
- G. Supplier: Respective manufacturer or his authorized distributor or representative.

1.03 SUBMITTALS, GENERAL

- A. Submit prescribed submittal items for materials and products to be installed on this Project, when requested and as called for in respective Section or on Drawings and when space or sequencing coordination is required.

220500
COMMON WORK RESULTS FOR PLUMBING

1.04 QUALITY ASSURANCE, GENERAL

- A. Quality assurance requirements for mechanical work are included in "Quality Assurance, Basic Provisions" and complimented for particular work in respective product and system Sections.
- B. Prior to ordering and rough-in, coordinate mounting, fit, trim, etc., of respective furnished items with design and construction of adjoining equipment and construction. Take special care to coordinate design of trim, flanges, attachments, etc., with related construction.

1.05 EQUIPMENT SELECTION AND SUITABILITY

- A. Following provisions complement requirements of respective Sections in Division 1 which govern material and equipment selection.
- B. Product Substitutions: Governed by "Substitutions" in "Instructions to Bidders". Burden of proof of equality of products is on the Contractor.
- C. Drawings indicate capacities, sizes, and dimensional requirements of system components. Equipment, specialties, and accessories are based on specific types, manufacturers, and models indicated. Components having equal performance characteristics that deviate from indicated size and dimensions may be considered provided deviations do not change the design concept or intended performance as judged by A/E/D.
- D. Mention of a specific product, by name or model number, in Contract Documents does not negate requirements for that particular product to meet physical and performance criteria set forth in the Contract Documents.
 - 1. References to specific products are to establish general design and a level of quality.
 - 2. Furnished products shall possess all required features and be coordinated with conditions affecting the work.
 - 3. Actual rough-in and connection requirements and locations for referenced items may not be the same as the typical arrangements represented on Drawings. Equipment rough-in and connections are subject to manufacturer's standards for items furnished. Piping, conduit, wiring, etc., shall be coordinated with furnished products and installed accordingly, without added cost to Owner.
- D. Equipment of greater or larger power, dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical facilities (services, circuit breakers, conduit, motors, bases, equipment spaces, etc.) are increased. No additional costs will be approved for these increases, if larger equipment is approved. If equipment minimum energy ratings or efficiencies are specified, furnished equipment must meet specified design requirements and commissioning requirements.

1.06 DELIVERY, STORAGE, AND HANDLING, GENERAL

- A. Deliver products to site and properly store and protect under applicable provisions of Division One, requirements herein, and requirements in respective product and system Sections.
 - 1. Properly identify products on outside of container with names, model numbers, types, grades, compliance labels, and other information needed for identification. Include project name, drawing reference designation, room number, etc. to aid distribution at job site.
- B. Schedule deliveries, coordinated with construction progress, so that materials will be available when needed. When possible, schedule deliveries of large equipment items for a time when respective items can be moved directly into installation location from delivery vehicle, thereby avoiding storage on site.
- C. Handle products, components, and accessories carefully to prevent damage. Comply with respective manufacturer's rigging and installation instructions for unloading and moving products. Do not install damaged items; replace with new.

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- D. Store products in original container, protective wrap, etc. and protect from weather and construction work traffic. Where possible, store indoors; when necessary to store outdoors, store above grade and enclose with weatherproof wrapping.

1.07 SEQUENCING AND SCHEDULING, GENERAL

- A. Coordinate installation of mechanical equipment, materials, and systems with other building components and construction progress.
- B. Arrange for chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.
- C. Coordinate respective installation provisions, as applicable:
 - 1. Sleeves and inserts in poured-in-place concrete, etc.
 - 2. Layout of supports and roof penetrations for roof mounted work.
 - 3. Size and location of concrete equipment bases.
 - 4. Rough-in of piping and electrical provisions for equipment.
- E. Sequence, coordinate, and integrate installation of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to closing in the building.
- F. Coordinate connection of mechanical systems with exterior utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

PART 2 – PRODUCTS

2.01 MANUFACTURERS, GENERAL

- A. Subject to compliance and requirements, manufacturers offering products that may be incorporated in the work including but not limited to manufacturers included in respective Contract Documents in one of the following forms:
 - 1. Named (Referenced) Products: Where proprietary names, names of particular manufacturers or vendors and catalog/model numbers, etc. are referenced in Specifications, on Drawings, etc.; specific item referenced shall be understood as establishing general type, function, approximate dimensions, appearance, and quality desired. Products furnished shall be configured and equipped, with alterations when and as required, to provide all features and functions specified or shown and to conform to all conditions effecting incorporation of the product into the work.
 - a. Actual manufacturer's ordering numbers denoting configuration, features, capacities, etc. specified or required shall be determined by Contractor and supplier, through comparison of respective manufacturer's specifications and options with Project Specifications and Drawings (schedules, notes, details, etc.), job conditions, and applicable codes and regulations.
 - 2. Listed (Acceptable) Manufacturers: Manufacturers listed as "acceptable" in specifications are believed to have the ability to manufacture products which are equivalent to the product described and referenced (named) in respective Specifications or on Drawings. Contractor has the option to furnish products that are manufactured by one of the listed acceptable manufactures provided that products furnished comply with respective product specifications and are suitable for the application and intent of design.
- B. Subject to compliance with requirements, manufacturers not referenced or listed in Specifications or on Drawings who offer products equivalent to referenced products may be acceptable if proposed substitution is requested ten (10) working days prior to bidding and approved in compliance with provisions of "Substitutions" in "Instructions to Bidders".

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2.02 GROUT

- A. Non-shrink, Non-metallic Grout: ASTM C 1107, Grade B.
- B. Characteristics: Post-hardening, volume adjusting, dry, hydraulic -cement grout, non-staining, non-corrosive, non-gaseous, and recommended for interior and exterior applications, design mix to be 5000 PSI, 28-day compressive strength with premixed factory packaged.

2.03 PLUMBING VENT FLASHING

- A. Vent flashing shall be fabricated from four (4) lb. lead sheet.
- B. Pre-formed rubber boot flashing

2.04 THERMOSTATIC MIXING VALVES (TMV)

- A. Provide in location shown or required on each water system.
 - 1. TMV must have integral check valves, stop valves, strainer and adjustable temperature settings, 2" diameter thermometer in discharge line and same size as service line valved by pass all mounted inside a surface mounted cabinet as manufactured by Lawler series 800.

2.05 REDUCED PRESSURE BACKFLOW PREVENTER (BFP)

- A. Provide as required by the serving utility and or code on the main building service and at any point of water connection to mechanical or other equipment.
 - 1. BFP is to be bronze construction with stainless steel internal parts, bronze strainer, shut-off isolation valves, test cocks, and pressure differential relief valve located between two positive seating check valves as manufactured by Watts series 909 with USC approval for cross connection control.
 - 2. Install BFP with unions for easy removal all over a stainless steel drain pan with a ¾" line to a floor drain.

2.06 WALL HYDRANTS

- A. Provide where shown on the drawings
 - 1. Recessed box with locking bronze chrome plated cover
 - 2. Hose connection, vacuum breaker and "T" handle operator
 - 3. Acceptable Manufacturers: Smith 5509 or equal by Wade or Woodford.
 - a. Cast iron body with flashing clamp
 - b. Cast iron strainer hinged with sediment bucket
 - c. Acceptable Manufacturers: JR Smith 2415 with 4595 P-trap and 4103 cleanout or approved equal by Wade, Watts or Zurn or as specified on drawings.

PART 3 – EXECUTION

3.01 CORRELATION OF WORK WITH DRAWING AND SPECIFICATION DISPARITY

- A. If specifications for a particular product, process, material, or installation differ from representations on Drawings, respective product, material, or process utilized shall comply with the more comprehensive quality and quantity requirements and the more restrictive limits, unless directed otherwise by A/E/D.
 - 1. Verify governing requirements for respective installation with A/E/D prior to ordering respective product or performing respective work.
- B. Work which meets the less comprehensive requirements or the less restrictive limits may be provided for an installation if both of the following two (2) conditions are met:

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1. A/E/D shall have determined that the more comprehensive requirements or the more restrictive limits are not required for the particular installation and confirmed the determination in writing.
2. Contractor shall give Owner a credit for the cost difference, if any, between the subject variant material or method requirements; credited by change order or other acceptable means.

3.02 EXAMINATION, GENERAL

- A. Examine areas and conditions under which work is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.03 ROUGH-IN, GENERAL

- A. Verify required rough-in nature, size, and locations for actual equipment to be connected and coordinate field measurements. Respective rough-in provisions are specified in respective equipment and system Sections and indicated necessary on Drawings.

3.04 PLUMBING INSTALLATIONS, GENERAL

- A. All work must be adequately supported and secured in place and performed in a craftsman like manner adjudged by the A/E/D and by using acceptable approved hardware, hangers, carriers etc. designed and appropriate for the respective installation.
- B. Adjust all operating parts and packing nuts of valves, faucets, etc. to operate freely without any leakage and adjust all manual and automatic flush valves and faucets for correct operation.
- C. Adjust all pop up waste stops to close effectively and retain water in bowl and adjust all flow and temperature regulators to required flow rates and operating ranges.
- D. Sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment.
 1. Coordinate mechanical systems, equipment, and materials installation with other building components. Verify all dimensions by field measurements.
 2. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for mechanical installations. Coordinate penetrations with fire stopping work.
 3. 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.
 4. Sequence, coordinate, and integrate delivery and installation 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.
- E. Work shall be performed by fully qualified respective trade craft-persons skilled in execution of the respective tasks; following industry standard practices, in compliance with applicable codes, regulations, specified methods and procedures, and respective manufacturer's instructions.
- F. All systems and equipment shall be installed complete and fully operable, unless specifically instructed otherwise for a particular system or item.
 1. Provide appropriate automatic control devices compatible with existing controls and systems, installed and arranged as required to operate and sequence respective equipment and systems to maintain intended conditions.
 2. Provide proper type and capacity safety and relief devices, installed where required, in compliance with applicable codes and regulations.

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3. Provide appropriate interface devices (valves, unions, stops, arresters, vacuum breakers, traps, expansion and contraction devices etc., strainers) and fittings, installed at each piping termination (plumbing fixture, item of equipment, outlet, etc.).
 - G. Where mounting heights are not dimensioned or detailed, install systems, materials, and equipment to provide maximum possible headroom.
 - H. Install systems, materials, and equipment generally to conform to arrangements indicated by Contract Documents and approved submittal data, including coordination drawings, to greatest extent possible. Where coordination requirements conflict with individual system requirements, refer conflict to A/E/D.
 1. Install work level and plumb, parallel and perpendicular to other building systems and components where exposed in finished spaces, except where indicated otherwise. Give right-of-way priority to systems required to be installed at a specified slope.
 - I. In addition to conforming to these general provisions, install respective products and systems in compliance with provisions in respective Sections and on respective Drawings. Refer to Project Manual "Table of Contents" for respective Section numbers and titles.
 - J. Electrical Work provided as a Part of Mechanical Work: Comply with applicable requirements of Division 26.
 - K. Provide access panels or doors where concealed equipment, devices, etc., are not accessible through accessible ceiling or are not accessible by other appropriate acceptable access means.
 - L. Provide identification specified in Section "Mechanical Identification" Section 220750.
- 3.05 EQUIPMENT POSITIONING AND CONNECTIONS, GENERAL
- A. Provide complete wiring and piping diagrams of each piece of equipment. Furnish diagrams to other trades involved, with all of manufacturer's requirements and recommendations included.
 - B. Where equipment piping details are not shown on Drawings, manufacturers' recommendations plus code requirements shall be considered to be minimum requirements.
 - C. Position and connect all equipment for convenient servicing. Extend grease fittings to an accessible location. Prior to final hook-up and demonstrate that there is room to remove and service all respective components (coils, burners, tube bundles, filters, pumps, motors, controls, etc.).
- 3.06 ERECTION OF METAL AND WOOD SUPPORTS AND ANCHORAGE
- A. Cut, fit, and place supports and anchorage accurately in location, alignment, and elevation; sized and arranged to adequately support and anchor respective mechanical materials and equipment. Attach to substrates as required to support applied loads. Make tight connections between members.
 - B. Metal Supports and Anchorage: Appropriate miscellaneous metal. Field welding shall comply with AWS D1.1.
 - C. Wood Supports and Anchorage: Grounds, nailers, blocking, anchorage, etc.
- 3.07 Select fastener size that will not penetrate through members where opposite side will be exposed to view or will receive finish materials. Install fasteners without splitting wood members.
- 3.08 CUTTING AND PATCHING, GENERAL
- A. Division 1 Section "Cutting and Patching" governs respective work.
 - B. Coordinate timing of mechanical work installation with related construction to eliminate the need for cutting and patching as much as possible.

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- C. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Skilled mechanics of the trades involved shall perform cutting. Repair cut surfaces to match material and finish of adjacent surfaces.

3.09 GROUTING

- A. Install non-metallic, no shrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's printed instructions.
- B. Clean surfaces that will come into contact with grout and provide forms for placement of grout, as required.
- C. Avoid air entrapment when placing grout and place grout completely filling equipment bases.
- D. Place grout on concrete bases to provide a smooth bearing surface for equipment.
- E. Place grout around anchors and cure placed grout according to manufacturer's printed instructions.

3.10 FIRESTOPPING

- A. Fire stopping will be performed by Mechanical Contractor or Installer responsible for Division 7 Section "Fire Stopping". Refer to "Fire Stopping" Section, if used in this manual, for requirements for fire stopping through-penetrations in fire-resistance-rated construction, smoke barriers, etc.
- B. Cooperate with Fire Stopping Installer and coordinate mechanical installation work with fire stopping materials and work. Keep Fire Stopping Installer informed of mechanical installation progress so fire stopping preparation and work may be performed in a timely manner.
- C. Arrange mechanical installations so that respective fire stopping can be installed in compliance with governing requirements. Coordinate hole sizes, locations, arrangements, sleeves, etc. with respective mechanical items and fire stopping materials and methods.

3.11 PLUMBING PIPE MATERIAL SCHEDULE

Service	Material	Joint
Gravity waste inside above ground	Cast Iron (SV or NH)	Compression gasket
	PVC Schedule 40	Primed and solvent weld
Gravity sewer outside below ground	Cast Iron (SV or NH)	Compression gasket
	PVC Schedule 40	Primed and solvent weld
Domestic Water Supply above and below ground	Type "L" copper	Brazed
Roof drains and vents	PVC Schedule 40	Primed and solvent weld
Low pressure steam supply	Steel schedule 40	screwed or welded
Low pressure steam condensate	Steel schedule 80	Screwed or welded
Heating supply and return	Type "L" copper	soldered

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3.12 VALVE SCHEDULE

Service	Size	Type	Joint	Reference Product
Heating/Cooling and Domestic Water	0-2"	Ball Valve	Screwed or Soldered Flanged	Crane Series 9400 Notes 1,2 & 3
Heating/Cooling and Domestic Water	2½" – Up	Butterfly Valve	Flanged	Crane Series 2200 Notes 1,2 & 3
Low Pressure Steam and Condensate	0 – 2"	Gate Valve	Screwed or Flanged	Crane 430
Low Pressure Steam and Condensate	2½" - Up	Gate Valve	Flanged	Crane 461
High Pressure Steam and Condensate	0 – 2"	Globe Valve	Screwed or Flanged	Crane 1 Nibco 211
High Pressure Steam and Condensate	2 ½" – Up	Globe Valve	Flanged	Crane 351 Nibco 718

- Notes:1. Provide memory stop when used for balance purposes.
2. Gate valve may be used on domestic cold water incoming service.
3. No-lead silver solder is to be used on domestic water lines.

END OF SECTION 220500

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GENERAL PLUMBING REQUIREMENTS

PART 1 – GENERAL

1.01 SCOPE

- A. This section is coordinated with and complementary to the 220500 Common Work Results for plumbing wherever applicable to plumbing work. Where items of the General Conditions or Supplementary General Conditions are repeated in this section of the Specifications, it is intended to call particular attention to or qualify them; it is not intended that any other parts of the General Conditions or Supplementary General Conditions shall be assumed to be omitted if not repeated herein.
- B. This section applies equally and specifically to all Trades supplying labor and/or equipment, and/or materials as required under the plumbing section of the specifications.
- C. It is the intention of these plans and specifications to call for finished work, completely tested and ready for the Owner's operation. The Contractor shall submit before bidding the project a detailed description of any problems to the Bid Documents for any reason whatsoever: i.e., materials or apparatus believed unsuitable or inadequate, violation of codes, ordinances, rules or regulations, items of work omitted, incorrect service locations or condition etc. The absence of such written notice shall indicate agreement that all cost of any such required changes have been anticipated and included in the Bid.

1.02 INTERFACE

- A. Refer to drawings and specifications for other Divisions of work to determine materials and conditions of other work where Division 22 work meets or connects to such other work. Coordinate respective Division 22 work with work of other Divisions.

1.03 DEFINITIONS

- A. The following list of words is defined to amplify their meaning whenever used on the mechanical drawings, or in Division 22 of these specifications. Those definitions supersede any other definitions, given or inferred by the General Provisions, Supplementary Conditions or any (Webster) standard definitions for usage in Division 22 only:
 - 1. Furnish - to supply (only) to another party for their use or installation, with all cost of delivery to job site.
 - 2. Install - to unload, distribute, uncrate, assemble and fix into the intended final position, the installer to provide all miscellaneous hardware required to anchor and/or support securely, clean up and dispose of rubbish.
 - 3. Connect - to bring service(s) to point of installation and make all final connections of the service(s) to the installed equipment, and provide all miscellaneous auxiliary appurtenances necessary to make operable for its intended final use.
 - 4. Provide - to furnish, install and connect operating and complete.
 - 5. The "Contractor" means specifically the Contractor and/or Subcontractor working under his respective section of the specifications.
 - 6. "Piping" includes, in addition to pipe, all fittings, valves, hangers, insulation and other accessories relating to such piping.
 - 7. "Concealed" means hidden from sight in trenches, chases, furred spaces, shafts, hung ceiling, embedded in construction, or in crawl spaces.
 - 8. "Equal" means any equipment or material which, in the opinion of the Architect/ Engineer/ Designer, is equal in quality, durability, appearance, strength, design and performance to the equipment or material specified and will function adequately in accordance with the general design.
 - 9. The General, Mechanical, Electrical and Temperature Control Contractor's are referred to herein and on the drawings as G.C., M.C., E.C. and T.C.C. respectively.

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10. The Architect/Engineer/Designer shall be referred to as A/E/D.

1.04 CONTRACT DOCUMENTS

- A. The accompanying drawings and these specifications are complementary each to the other and what is called for on one shall be as binding as if called for by both. The drawings being more specific with quantity, the specifications more specific with quality.
- B. This Contractor is requested and shall be held to having examined all drawings and specifications for all trades, such as Architectural, Structural, Plumbing, Electrical, Heating, Site, etc., in order to familiarize himself with the requirements of all of the trades as applied to this Contractor's work. No allowances will be made for deviations from work shown to coordinate this Contractor's work with work of other Contractors.
- C. Any doubt as to the intent of the drawings and/or specifications shall be submitted to the A/E/D in writing, requesting an interpretation. Interpretation will be by Addendum only, issued by the A/E/D. The person submitting the request will be responsible for its delivery.
- D. Under no circumstances shall any sizes be decreased or radical changes in any part of the installation be made without the written consent of the A/E/D.
- E. Elevations and grades shown on drawings are approximate only. This Contractor shall verify same on premises and shall take all measurements and determine all final elevations and be responsible for same applying to his work.

1.05 EQUIPMENT LIST AND SUBSTITUTIONS

- A. Each Bidder shall prepare a list covering typical important items of equipment involved in his portion of the Contract. A sub-contractor and material list is to be provided with the Bid. This may or may not also be in the front portion of this Specification.
- B. Certain manufactured articles specified herein are mentioned under one or more trade or manufacturer's names. These manufactured articles, as specified and detailed on drawings, shall form the basis of the Contractor's Bid. Additional products or product manufacturers will be permitted by addendum only.
- C. Articles of other manufacturers, of equivalent design, quality and capacity, as adjudged by the A/E/D will be considered no later than ten (10) working days prior to bid date. Establishing proof of the equality of the product to that specified shall be the responsibility of the bidder. Determination of equality of all products is vested in the A/E/D whose decision shall be final and binding upon all concerned. No substitutions will be allowed after the Contract is awarded.
- D. Where a Contractor proposes to use an item of equipment other than that as designed and detailed on the drawings (even though listed as an acceptable manufacturer) which requires purchase of additional and/or specific equipment, more space, or any re-design of any other part of the mechanical, electrical or architectural layout, all such re-design and all new drawings required shall be prepared by the Contractor, at his own expense. And, should this re-design require additional cost to other Contractors, this expense shall be borne by the Contractor making such changes. All changes must be approved by A/E/D. The Contractor and manufacturer and/or representative shall be responsible to coordinate physical limitations of equipment prior to bidding. No requests for extras will be allowed due to changes required by equipment substitutions.

1.06 CODES, LAWS, ORDINANCES, PERMITS AND FEES

- A. Plumbing installation shall comply with all requirements of the State Board of Health, and the Indiana Plumbing Code with all their respective amendments.
- B. Mechanical installation shall comply with the Indiana Mechanical Code with all amendments.
- C. Underground water mains and associated installations shall conform to the AWWA Standards and the National Fire Protection Association "NFPA" Pamphlet No. 24.

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- D. Pipe welding shall conform to "Welding Code for Steel and Wrought Iron Pipe" of the "Heating, Piping, and Air Conditioning Contractors' National Associations."
 - E. All installations shall comply with the latest editions, issues or supplements of all applicable codes, ordinances, regulations and requirements without increase in contract price. Such provision, rules, regulations and ordinances are to be considered as much a part of these specifications as if repeated herein or attached hereto. All changes or modifications required to conform to such codes, regulations, or requirements must be reviewed, the same as Shop Drawings, by the A/E/D.
 - F. The Contractor shall give all necessary notices, obtain and pay all utility company bills or governmental taxes, fees for connections, water taps and other costs in connection with his work; and he shall also maintain and pay special charges, overtime, or provide any special protection, barricades, lights, personnel as may be required by the State, County, Owner or City in the performance of the contract requirements, as well as providing the necessary equipment to dig or drive and provide de-watering or shoring by any means designated so as to comply with the governing bodies' procedures.
 - G. All materials furnished and all work installed shall comply with the rules and recommendations of the National Fire Protection Association, with all requirements of the local utility companies, with the recommendations of the Owner's fire insurance rating organization having jurisdiction, and with the requirements of all governmental departments having jurisdiction.
 - H. This Contractor shall assume all responsibility of proper installation of services to meet all rules and regulations of the utility or governmental agent involved and pay all fees or charges required.
 - E. All details shall be verified before bidding with each utility or agency and no allowances will be made in the Contract to properly or differently than detailed install any service.
- 1.07 SITE VERIFICATION
- A. This Contractor is directed to visit the premises and make him self thoroughly familiar with the general layout of the building site and the location of present lines to which connections shall be made. He shall also check present grades, ditches, pavements, sewers, and/or all other conditions affecting the service installations contemplated under this Contract. Such offsets as may be required to leave new work clear, etc. must be included in the Contractor's proposal, and the Contractor must assume the full responsibility for having made a proper and thorough investigation of these requirements. The contractor is to review the construction documents and visit the premises prior to bidding. Visits to the facility by the prospective contractors must be coordinated with the A/E/D.
 - B. No extras will be allowed subsequently to the successful Contractor to cover any such error, omission and/or oversight on the part of the contractor for not having made a thorough inspection of the grounds, facilities, building conditions, proposed drawings etc.
 - C. Contractor shall further inspect the site and see for himself the available storage space, trucking facilities for bringing materials into the building/area and must assume responsibility for receiving, unloading, storing freight, demurrage, theft and any and all other factors influencing the work under this specification.
- 1.08 COORDINATION OF WORK
- A. Locations of various parts of the equipment, ductwork, services and piping shown by Mechanical Plans are diagrammatic and approximately correct. Exact location shall be determined on job and governed by structural conditions of the building and work of other Contractors, subject to decision of A/E/D, who reserves the right to make any reasonable change in locations indicated without extra charge to Owner.

GENERAL PLUMBING REQUIREMENTS

- B. Contractor shall study and become familiar with contract drawings of other trades and A/E/D's drawings in order to obtain all necessary information in order that all interferences with work of other trades may be avoided. Cooperate with all other workmen and install work in such a way that all interferences are avoided. All work shall be installed so that all parts required are readily accessible for inspection, operation, removal, maintenance and repair.
- C. All pipe, apparatus, appliances or other items interfering with proper placement of other work, as indicated on the drawings, specified, or required, shall be removed and shall be re-located and re-connected without extra cost. All damage to other work caused by this Contractor, his Subcontractors or his workmen, by reason of neglect, accident or any cause whatsoever, shall be repaired and made good in the same manner as specified for new work of the same character.
- D. Openings and chases shall be left in new walls for this Contractor's work when so requested before general work so affected is completed. Where this Contractor has failed to make such request at proper time, he shall pay for all cutting, patching, etc., of the building required for this work.

1.09 LAYING OUT

- A. This Contractor shall take all measurements necessary for his work and shall assume responsibility for their accuracy. This Contractor shall not scale Mechanical Drawings but shall obtain all dimensions from building and the Construction Drawings unless specified herein or shown on drawings.

1.12 PROTECTION

- A. The Contractor shall be responsible for the maintenance and protection of all equipment, materials, and tools supplied by him and stored or installed on the job site from loss, theft, vandalism or damage until final acceptance by the Owner.
- B. The Contractor shall be responsible for the protection of Owner's materials and equipment, and any finished work of other trades from damage or defacement by his operations and must remedy any such injury at his own expense.
- C. Openings in exterior walls, and roofs, particularly at or below grade, shall be kept properly plugged at all times. After completion of work, openings for which the Contractor is responsible shall be permanently sealed and caulked in the manner approved by the A/E/D.

1.13 SHOP DRAWINGS

- A. Contractor shall submit a electronic copy in PDF Format of each shop drawing to A/E/D and Owner for review before commencing any work or providing materials. Review of shop drawing does not relieve contractor of correct ordering and installations. Electronic shop drawing systems may be employed and will be detailed at the on set if allowed.
- B. Drawings submitted shall bear the stamp of approval of the Contractor as evidence that the drawings have been checked by the Contractor and comply with the requirements of the contract drawings and specifications. Any drawings submitted without this stamp of approval will not be considered and will be returned to the Contractor for resubmission. If the drawings submitted show variations from the requirements of the Contract, the Contractor shall make specific mention of such variations in his letter of transmittal in order that, if acceptable, suitable action may be taken for proper adjustment, otherwise, the Contractor will not be relieved of the responsibility of executing the work in accordance with the Contract even though such drawings have been reviewed.
- C. The A/E/D and Owner's reviewing of the Contractor's and Subcontractor's Drawings or Equipment Details does not relieve the Contractor from responsibility for errors, omissions, or equipment capacities which may exist or develop even though work is done and equipment furnished in accordance with such checked or reviewed drawings.

GENERAL PLUMBING REQUIREMENTS

- D. The reviewing of Contractor's and Subcontractor's drawings or equipment details by the A/E/D is a gratuitous assistance and the A/E/D does not thereby assume responsibility for errors or omissions. Where such errors or omissions are discovered later, they shall be made good by the Contractor irrespective of any review by the A/E/D.
- E. Review by A/E/D and Owner applies only to capacity, quality, general arrangement, design and type. Approval does not apply to quantities, dimensions, connection locations and similar. In all cases, Contractors shall be responsible for furnishing the proper quantities of equipment and/or materials required, that all equipment fits the available space in satisfactory manner and that all piping, electrical and other connections are suitably located.
- F. Review by A/E/D and Owner will not modify or nullify any provisions of Contract Documents which include Drawings and Specifications, nor will approval relieve Contractor from responsibility for error, omissions and deviations from Contract Documents.

1.14 RECORD DRAWINGS

- A. The Contractor shall keep an accurate, current and progressive record of all installed work, including all changes and deviations from the design drawings. Recordings shall be made on prints kept in good condition at the job site as the work progresses and before any work is covered. Detail drawings shall be made if necessary for clarity.
- B. Recordings shall be made on prints kept in good condition at the job site as the work progresses and before any work is covered. The field drawings are to be brought to the construction progress meetings for periodic checks.
- C. Upon completion of the contract work, the Contractor shall deliver the marked-up prints to the A/E/D with a signed certification by a principal of the contracting firm, that all work was installed as shown.
- D. All labor and material costs incurred in the accomplishment of the foregoing requirements shall be borne by the Contractor. Final approval of the work and final payment shall be withheld until after receipt of the marked as built prints.

1.15 FIELD INSTRUCTIONS

- A. During construction, the A/E/D shall observe the work and give written field instructions as required without invalidating the Contract. Such field instruction shall not be construed as authority to change the terms of the Contract
- B. In cases where extra cost or reductions in cost of the Contract are involved, the Contractor shall notify the A/E/D in writing at the time of such instructions and shall establish cost difference and shall receive written approval before proceeding. The Contractor shall not be reimbursed for extra work unless this procedure has been followed.

1.16 CLEAN-UP

- A. Contractor shall remove from site, and legally dispose of, rubbish resulting from the work under his Contract. Rubbish shall be removed daily and not be allowed to accumulate. Owner has first right of salvage. Owner salvaged items shall be delivered to Owner by the Contractor at specified locations.

PART 2 – PRODUCTS**2.01 PRODUCT WARRANTY**

- A. All work shall be guaranteed (parts and labor) for a period of one (1) year.
- B. Warranty shall run from written date of substantial completion of the work, not from date of installation of a device or piece of equipment, nor from any date set by the equipment supplier relative to his equipment.

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GENERAL PLUMBING REQUIREMENTS

2.02 PLUMBING REFERENCE SYMBOLS, DETAILS AND DRAWINGS

- A. Symbols used are diagrammatic are generally generic in nature.
- B. Details and Drawings are typical in nature and are subject to variations to suit specific products and project conditions and available space

PART 3 – EXECUTION

3.01 WORKMANSHIP

- A. All work is to be performed in a craftsman like manner as judged by the A/E/D and conform to the Trade Association Standard of Installation.

3.02 INSTALLATION

- A. Whenever necessary, the Contractor shall provide all bases and supports not part of the building structure, of required size, type and strength, as approved by the A/E/D for all equipment and materials furnished by him. When earthquake loads are applicable in accordance with the Building Code, mechanical system supports shall be designed and installed for the seismic forces in accordance with the Building Code. Generally all Mechanical systems are to be supported in accordance with the Mechanical Code.
- B. Escutcheons shall be installed on pipes wherever they pass through floors, ceiling, walls or partitions.
 - 1. Escutcheons for pipes passing through floors shall be split-hinged, cast-brass type, designed to fit pipe on one end and cover sleeve projecting through floor on the other end.
 - 2. Escutcheons for pipes passing through interior walls, partitions and ceilings shall be split-hinged, cast-brass, chromium-plated type.

3.03 CLEANING

- A. Piping and equipment shall be thoroughly cleaned of all foreign substance inside and out before being placed in operation.
 - 1. All piping to be flushed with water and run to drain until water leaving the pipe systems is free of all oil, dirt, and scale; and all new potable water piping shall be cleaned as installed, and in addition, domestic piping shall be sterilized, using pressure sterilization in accordance with the recommendation of the State Department of Health. See Section 221410 Disinfection of Domestic Water Piping.
 - 2. Hydronic systems are to be flushed free of dirt, oil, scale and waste etc. with water. Run water to waste until it runs clear.
 - 3. Domestic water systems are to be sterilized as specified in Section 221420 Disinfection of Domestic Water Piping.
- B. All pipe strainers are to be cleaned prior to testing and balancing and cleaned again just prior to turning project over to Owner. Remove screens, clean screens and interior of strainer bodies and reinstall screens
- C. All equipment and premises are to be thoroughly cleaned.

3.04 RESPONSIBILITIES

- A. The Prime Contractor shall be responsible to coordinate with his subcontractors and to pursue all job problems concerning repair, replacement or proper operation of all systems.
- B. It shall be the Contractor's responsibility to determine, in conjunction with the A/E/D if required, the source of any problems and obtain solution and correction of same with all expediency.

GENERAL PLUMBING REQUIREMENTS**3.05 EQUIPMENT ACCESSIBILITY AND SPACE COORDINATION AND PER-BID VERIFICATION REQUIREMENTS**

- A. Physical size and arrangement of proposed equipment and apparatus must be suitable for the space available. Maintain required clearances and allow space for proper maintenance and placing in the facility and removing from the facility.
 - 1. Prior to bidding project each Contractor and equipment representative must review the installation, arrangement, space available and verify that the proposed installation will retain required clearance and maintain accessibility. Maintenance space must be demonstrated by Contractor.
 - 2. Any deviations required to accommodate equipment etc. must be coordinated by Contractor with A/E/D before bids are accepted on the project. After bids are accepted such work will be part of the Contractor's work and will add no additional expense to the project.
- B. Contractor is responsible for furnishing equipment which is suitable for the space available and must bear the costs for all modifications to his work and the work of others required to accommodate his equipment both the installing and moving into place.

3.06 EQUIPMENT SERVICE AND CONNECTION REQUIREMENTS COORDINATION AND PRE-BID VERIFICATION REQUIREMENTS

- A. Service and connection requirements of proposed equipment and apparatus must be compatible with the respective services available as required to accommodate the intent of the design.
- B. Mechanical and electrical service connection requirements of a manufacturer's equipment, even if listed as acceptable, may not be the same as the requirements as the product specified or shown on the construction drawings. Contractor is to make adjustments as required. All connections are to be made complete to accommodate the intent of the design.
 - 1. Prior to bidding the project, each bidding Contractor and respective equipment manufacturer's representative must review the installation arrangement and mechanical and electrical service connections indicated on the Construction Drawings and verify that installation of the proposed equipment will be compatible with the Construction Drawing's, available space and actual conditions.
- C. The Contractor is responsible for furnishing equipment etc. which is suitable for the existing or proposed space and services. The Contractor must bear the costs for all modifications to his work and the work of others required to accommodate equipment furnished by the Contractor.

3.07 MARKING UNDERGROUND UTILITIES

- A. Install an appropriate 6" wide plastic marker tape a minimum of 12" above any direct buried utility line.
- B. Concrete encased utility lines shall have the concrete dyed or painted the appropriate color for the particular utility.

3.08 TESTING AND ADJUSTING

- A. Thoroughly test for leaks and operate each system device and item of equipment installed as part of this project and cooperate with the Testing and Balancing Agency performing the final testing and adjusting of the respective systems.
- B. Notify A/E/D 48 hours previous to all testing, adjusting or balancing. Tests must be conducted in the presence of a representative of the A/E/D and a written report is to be provided.
- C. System testing and balancing is to be performed after the respective systems have been deemed by the Contractor to be complete and operating in full working order.

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END OF SECTION 220501

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BASIC HVAC MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes, but is not limited to, following basic provisions, materials, and methods common to various mechanical work, to complement other Division 23 Sections and govern respective Division 23 work, where applicable, the same as if repeated in respective Sections:
 - 1. Quality Assurance requirements.
 - 2. Equipment Selection requirements.
 - 3. Delivery, Storage, and Handling requirements.
 - 4. Sequencing and Scheduling requirements.
 - 5. Method of listing and referencing Acceptable Manufacturers.
 - 6. No shrink grout for equipment installations.
 - 7. Rough-In and Installation requirements common to equipment and systems.
 - 8. Field-fabrication of metal and wood equipment supports.
 - 9. Cutting and patching requirements.
 - 10. Fire stopping coordination requirements (Complement to Division 7) and/or NFPA.
- B. Other basic mechanical materials and methods which complement this Section and govern respective Division 15 work are specified in respective complementary Sections immediately following this Section and in Sections designated "General". Refer to Project Manual "Table of Contents" for respective Section numbers and titles.
- C. Particular products and systems are specified in respective Sections. Refer to Project Manual "Table of Contents" for respective Section numbers and titles.

1.02 DEFINITIONS

- A. Concealed Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- B. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- C. Exposed Exterior Installations: Exposed to view outdoors and subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations, outdoors on grade, attached to exterior building walls etc.
- D. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- E. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below the roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- F. Installer: Respective tradesperson or subcontractor responsible for respective work.
- G. Supplier: Respective manufacturer or his authorized distributor or representative.

1.03 SUBMITTALS, GENERAL

- A. Submit prescribed submittal items for materials and products to be installed on this Project, when requested and as called for in respective Section or on Drawings and when space or sequencing coordination is required.

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1.04 QUALITY ASSURANCE, GENERAL

- A. Quality assurance requirements for mechanical work are included in "Quality Assurance, Basic Provisions" and complimented for particular work in respective product and system Sections.
- B. Prior to ordering and rough-in, coordinate mounting, fit, trim, etc., of respective furnished items with design and construction of adjoining equipment and construction. Take special care to coordinate design of trim, flanges, attachments, etc., with related construction.

1.05 EQUIPMENT SELECTION AND SUITABILITY

- A. Following provisions complement requirements of respective Sections in Division 1 which govern material and equipment selection.
- B. Product Substitutions: Governed by "Substitutions" in "Instructions to Bidders". Burden of proof of equality of products is on the Contractor.
- C. Drawings indicate capacities, sizes, and dimensional requirements of system components. Equipment, specialties, and accessories are based on specific types, manufacturers, and models indicated. Components having equal performance characteristics that deviate from indicated size and dimensions may be considered provided deviations do not change the design concept or intended performance as judged by A/E/D.
- D. Mention of a specific product, by name or model number, in Contract Documents does not negate requirements for that particular product to meet physical and performance criteria set forth in the Contract Documents.
 - 1. References to specific products are to establish general design and a level of quality.
 - 2. Furnished products shall possess all required features and be coordinated with conditions affecting the work.
 - 3. Actual rough-in and connection requirements and locations for referenced items may not be the same as the typical arrangements represented on Drawings. Equipment rough-in and connections are subject to manufacturer's standards for items furnished. Piping, conduit, wiring, etc., shall be coordinated with furnished products and installed accordingly, without added cost to Owner.
- D. Equipment of greater or larger power, dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical facilities (services, circuit breakers, conduit, motors, bases, equipment spaces, etc.) are increased. No additional costs will be approved for these increases, if larger equipment is approved. If equipment minimum energy ratings or efficiencies are specified, furnished equipment must meet specified design requirements and commissioning requirements.

1.06 DELIVERY, STORAGE, AND HANDLING, GENERAL

- A. Deliver products to site and properly store and protect under applicable provisions of Division One, requirements herein, and requirements in respective product and system Sections.
 - 1. Properly identify products on outside of container with names, model numbers, types, grades, compliance labels, and other information needed for identification. Include project name, drawing reference designation, room number, etc. to aid distribution at job site.
- B. Schedule deliveries, coordinated with construction progress, so that materials will be available when needed. When possible, schedule deliveries of large equipment items for a time when respective items can be moved directly into installation location from delivery vehicle, thereby avoiding storage on site.
- C. Handle products, components, and accessories carefully to prevent damage. Comply with respective manufacturer's rigging and installation instructions for unloading and moving products. Do not install damaged items; replace with new.

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- D. Store products in original container, protective wrap, etc. and protect from weather and construction work traffic. Where possible, store indoors; when necessary to store outdoors, store above grade and enclose with weatherproof wrapping.

1.07 SEQUENCING AND SCHEDULING, GENERAL

- A. Coordinate installation of mechanical equipment, materials, and systems with other building components and construction progress.
- B. Arrange for chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.
- C. Coordinate respective installation provisions, as applicable:
 - 1. Sleeves and inserts in poured-in-place concrete, etc.
 - 2. Layout of supports and roof penetrations for roof mounted work.
 - 3. Size and location of concrete equipment bases.
 - 4. Rough-in of piping and electrical provisions for equipment.
- E. Sequence, coordinate, and integrate installation of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to closing in the building.
- F. Coordinate connection of mechanical systems with exterior utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

PART 2 – PRODUCTS

2.01 MANUFACTURERS, GENERAL

- A. Subject to compliance and requirements, manufacturers offering products that may be incorporated in the work including but not limited to manufacturers included in respective Contract Documents in one of the following forms:
 - 1. Named (Referenced) Products: Where proprietary names, names of particular manufacturers or vendors and catalog/model numbers, etc. are referenced in Specifications, on Drawings, etc.; specific item referenced shall be understood as establishing general type, function, approximate dimensions, appearance, and quality desired. Products furnished shall be configured and equipped, with alterations when and as required, to provide all features and functions specified or shown and to conform to all conditions effecting incorporation of the product into the work.
 - a. Actual manufacturer's ordering numbers denoting configuration, features, capacities, etc. specified or required shall be determined by Contractor and supplier, through comparison of respective manufacturer's specifications and options with Project Specifications and Drawings (schedules, notes, details, etc.), job conditions, and applicable codes and regulations.
 - 2. Listed (Acceptable) Manufacturers: Manufacturers listed as "acceptable" in specifications are believed to have the ability to manufacture products which are equivalent to the product described and referenced (named) in respective Specifications or on Drawings. Contractor has the option to furnish products that are manufactured by one of the listed acceptable manufactures provided that products furnished comply with respective product specifications and are suitable for the application and intent of design.
- B. Subject to compliance with requirements, manufacturers not referenced or listed in Specifications or on Drawings who offer products equivalent to referenced products may be acceptable if proposed substitution is requested ten (10) working days prior to bidding and approved in compliance with provisions of "Substitutions" in "Instructions to Bidders".

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2.02 GROUT

- A. Non-shrink, Non-metallic Grout: ASTM C 1107, Grade B.
- B. Characteristics: Post-hardening, volume adjusting, dry, hydraulic -cement grout, non-staining, non-corrosive, non-gaseous, and recommended for interior and exterior applications, design mix to be 5000 PSI, 28-day compressive strength with premixed factory packaged.

PART 3 – EXECUTION

3.01 CORRELATION OF WORK WITH DRAWING AND SPECIFICATION DISPARITY

- A. If specifications for a particular product, process, material, or installation differ from representations on Drawings, respective product, material, or process utilized shall comply with the more comprehensive quality and quantity requirements and the more restrictive limits, unless directed otherwise by A/E/D.
 - 1. Verify governing requirements for respective installation with A/E/D prior to ordering respective product or performing respective work.
- B. Work which meets the less comprehensive requirements or the less restrictive limits may be provided for an installation if both of the following two (2) conditions are met:
 - 1. A/E/D shall have determined that the more comprehensive requirements or the more restrictive limits are not required for the particular installation and confirmed the determination in writing.
 - 2. Contractor shall give Owner a credit for the cost difference, if any, between the subject variant material or method requirements; credited by change order or other acceptable means.

3.02 EXAMINATION, GENERAL

- A. Examine areas and conditions under which work is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.03 ROUGH-IN, GENERAL

- A. Verify required rough-in nature, size, and locations for actual equipment to be connected and coordinate field measurements. Respective rough-in provisions are specified in respective equipment and system Sections and indicated necessary on Drawings.

3.04 HVAC INSTALLATIONS, GENERAL

- A. Sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment.
 - 1. Coordinate mechanical systems, equipment, and materials installation with other building components. Verify all dimensions by field measurements.
 - 2. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for mechanical installations. Coordinate penetrations with fire stopping work.
 - 3. 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.
 - 4. Sequence, coordinate, and integrate delivery and installation 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.
- B. Work shall be performed by fully qualified respective trade craft-persons skilled in execution of the respective tasks; following industry standard practices, in compliance with applicable codes, regulations, specified methods and procedures, and respective manufacturer's instructions.

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- C. All systems and equipment shall be installed complete and fully operable, unless specifically instructed otherwise for a particular system or item.
 - 1. Provide appropriate automatic control devices compatible with existing controls and systems, installed and arranged as required to operate and sequence respective equipment and systems to maintain intended conditions.
 - 2. Provide an appropriate air device (diffuser, grille, register, etc.), installed at every duct termination, unless specifically noted otherwise for a particular location.
 - D. Where mounting heights are not dimensioned or detailed, install systems, materials, and equipment to provide maximum possible headroom.
 - E. Install systems, materials, and equipment generally to conform to arrangements indicated by Contract Documents and approved submittal data, including coordination drawings, to greatest extent possible. Where coordination requirements conflict with individual system requirements, refer conflict to A/E/D.
 - 1. Install work level and plumb, parallel and perpendicular to other building systems and components where exposed in finished spaces, except where indicated otherwise. Give right-of-way priority to systems required to be installed at a specified slope.
 - F. In addition to conforming to these general provisions, install respective products and systems in compliance with provisions in respective Sections and on respective Drawings. Refer to Project Manual "Table of Contents" for respective Section numbers and titles.
 - G. Electrical Work provided as a Part of Mechanical Work: Comply with applicable requirements of Division 26.
 - H. Provide access panels or doors where concealed equipment, devices, etc., are not accessible through accessible ceiling or are not accessible by other appropriate acceptable access means.
 - I. Provide identification specified in Section "Mechanical Identification" Section 220750.
- 3.05 EQUIPMENT POSITIONING AND CONNECTIONS, GENERAL
- A. Provide complete wiring and piping diagrams of each piece of equipment. Furnish diagrams to other trades involved, with all of manufacturer's requirements and recommendations included.
 - B. Where equipment piping details are not shown on Drawings, manufacturers' recommendations plus code requirements shall be considered to be minimum requirements.
 - C. Position and connect all equipment for convenient servicing. Extend grease fittings to an accessible location. Prior to final hook-up and demonstrate that there is room to remove and service all respective components (coils, burners, tube bundles, filters, pumps, motors, controls, etc.).
- 3.06 ERECTION OF METAL AND WOOD SUPPORTS AND ANCHORAGE
- A. Cut, fit, and place supports and anchorage accurately in location, alignment, and elevation; sized and arranged to adequately support and anchor respective mechanical materials and equipment. Attach to substrates as required to support applied loads. Make tight connections between members.
 - B. Metal Supports and Anchorage: Appropriate miscellaneous metal. Field welding shall comply with AWS D1.1.
 - C. Wood Supports and Anchorage: Grounds, nailers, blocking, anchorage, etc.
 - 1. Select fastener size that will not penetrate through members where opposite side will be exposed to view or will receive finish materials. Install fasteners without splitting wood members.

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3.07 CUTTING AND PATCHING, GENERAL

- A. Division 1 Section "Cutting and Patching" governs respective work.
- B. Coordinate timing of mechanical work installation with related construction to eliminate the need for cutting and patching as much as possible.
- C. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Skilled mechanics of the trades involved shall perform cutting. Repair cut surfaces to match material and finish of adjacent surfaces.

3.08 GROUTING

- A. Install non-metallic, no shrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's printed instructions.
- B. Clean surfaces that will come into contact with grout and provide forms for placement of grout, as required.
- C. Avoid air entrapment when placing grout and place grout completely filling equipment bases.
- D. Place grout on concrete bases to provide a smooth bearing surface for equipment.
- E. Place grout around anchors and cure placed grout according to manufacturer's printed instructions.

3.09 FIRESTOPPING

- A. Fire stopping will be performed by Mechanical Contractor or Installer responsible for Division 7 Section "Fire Stopping". Refer to "Fire Stopping" Section, if used in this manual, for requirements for fire stopping through-penetrations in fire-resistance-rated construction, smoke barriers, etc.
- B. Cooperate with Fire Stopping Installer and coordinate mechanical installation work with fire stopping materials and work. Keep Fire Stopping Installer informed of mechanical installation progress so fire stopping preparation and work may be performed in a timely manner.
- C. Arrange mechanical installations so that respective fire stopping can be installed in compliance with governing requirements. Coordinate hole sizes, locations, arrangements, sleeves, etc. with respective mechanical items and fire stopping materials and methods.

END OF SECTION 230500

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PART 1 – GENERAL

1.01 SCOPE

- A. This section is coordinated with and complementary to the 230110 Mechanical General Provisions, 230500 Basic Mechanical Materials and Methods and Supplementary General Conditions wherever applicable to mechanical work. Where items of the General Conditions or Supplementary General Conditions are repeated in this section of the Specifications, it is intended to call particular attention to or qualify them; it is not intended that any other parts of the General Conditions or Supplementary General Conditions shall be assumed to be omitted if not repeated herein.
- B. This section applies equally and specifically to all Trades supplying labor and/or equipment, and/or materials as required under the mechanical section of the specifications.
- C. It is the intention of these plans and specifications to call for finished work, completely tested and ready for the Owner's operation. The Contractor shall submit before bidding the project a detailed description of any problems to the Bid Documents for any reason whatsoever: i.e., materials or apparatus believed unsuitable or inadequate, violation of codes, ordinances, rules or regulations, items of work omitted, incorrect service locations or condition etc. The absence of such written notice shall indicate agreement that all cost of any such required changes have been anticipated and included in the Bid.
- D. Work described and referenced in Division 23 of the project manual and on the drawings noted "Mechanical" shall be the responsibility of the contractor for respective Division 23 work unless the work is specifically assigned to another contractor or party

1.02 DEFINITIONS

- A. The following list of words is defined to amplify their meaning whenever used on the mechanical drawings, or in Division 23 of these specifications. Those definitions supersede any other definitions, given or inferred by the General Provisions, Supplementary Conditions or any (Webster) standard definitions for usage in Division 23 only:
 - 1. Furnish - to supply (only) to another party for their use or installation, with all cost of delivery to job site.
 - 2. Install - to unload, distribute, uncrate, assemble and fix into the intended final position, the installer to provide all miscellaneous hardware required to anchor and/or support securely, clean up and dispose of rubbish.
 - 3. Connect - to bring service(s) to point of installation and make all final connections of the service(s) to the installed equipment, and provide all miscellaneous auxiliary appurtenances necessary to make operable for its intended final use.
 - 4. Provide - to furnish, install and connect operating and complete.
 - 5. The "Contractor" means specifically the Contractor and/or Subcontractor working under his respective section of the specifications.
 - 6. "Piping" includes, in addition to pipe, all fittings, valves, hangers, insulation and other accessories relating to such piping.
 - 7. "Concealed" means hidden from sight in trenches, chases, furred spaces, shafts, hung ceiling, embedded in construction, or in crawl spaces.
 - 8. "Equal" means any equipment or material which, in the opinion of the Architect/ Engineer/ Designer, is equal in quality, durability, appearance, strength, design and performance to the equipment or material specified and will function adequately in accordance with the general design.

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9. The General, Mechanical, Electrical and Temperature Control Contractor's are referred to herein and on the drawings as G.C., M.C., E.C. and T.C.C. respectively.
10. The Architect/Engineer/Designer shall be referred to as A/E/D.

1.03 CONTRACT DOCUMENTS

- A. The accompanying drawings and these specifications are complementary each to the other and what is called for on one shall be as binding as if called for by both. The drawings being more specific with quantity, the specifications more specific with quality.
- B. This Contractor is requested and shall be held to having examined all drawings and specifications for all trades, such as Architectural, Structural, Plumbing, Electrical, Heating, Site, etc., in order to familiarize himself with the requirements of all of the trades as applied to this Contractor's work. No allowances will be made for deviations from work shown to coordinate this Contractor's work with work of other Contractors.
- C. Any doubt as to the intent of the drawings and/or specifications shall be submitted to the A/E/D in writing, requesting an interpretation. Interpretation will be by Addendum only, issued by the A/E/D. The person submitting the request will be responsible for its delivery.
- D. Under no circumstances shall any sizes be decreased or radical changes in any part of the installation be made without the written consent of the A/E/D.
- E. Elevations and grades shown on drawings are approximate only. This Contractor shall verify same on premises and shall take all measurements and determine all final elevations and be responsible for same applying to his work.

1.04 EQUIPMENT LIST AND SUBSTITUTIONS

- A. Each bidder shall prepare a list covering typical important items of equipment involved in his portion of the Contract. A sub-contractor and material list is to be provided with the Bid. This may or may not also be in the front portion of this Specification.
- B. Certain manufactured articles specified herein are mentioned under one or more trade or manufacturer's names. These manufactured articles, as specified and detailed on drawings, shall form the basis of the contractor's bid. Additional products or product manufacturers will be permitted by addendum only.
- C. Articles of other manufacturers, of equivalent design, quality and capacity, as adjudged by the A/E/D will be considered no later than ten (10) working days prior to bid date. Establishing proof of the equality of the product to that specified shall be the responsibility of the bidder. Determination of equality of all products is vested in the A/E/D whose decision shall be final and binding upon all concerned. No substitutions will be allowed after the Contract is awarded.
- D. Where a Contractor proposes to use an item of equipment other than that as designed and detailed on the drawings (even though listed as an acceptable manufacturer) which requires purchase of additional and/or specific equipment, more space, or any re-design of any other part of the mechanical, electrical or architectural layout, all such re-design and all new drawings required shall be prepared by the Contractor, at his own expense. And, should this re-design require additional cost to other Contractors, this expense shall be borne by the Contractor making such changes. All changes must be approved by A/E/D. The Contractor and manufacturer and/or representative shall be responsible to coordinate physical limitations of equipment prior to bidding. No requests for extras will be allowed due to changes required by equipment substitutions.

1.05 CODES, LAWS, ORDINANCES, PERMITS AND FEES

- A. Plumbing installation shall comply with all requirements of the State Board of Health, and the Indiana Plumbing Code with all their respective amendments.
- B. Mechanical installation shall comply with the Indiana Mechanical Code with all amendments.

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- C. Pipe welding shall conform to "Welding Code for Steel and Wrought Iron Pipe" of the "Heating, Piping, and Air Conditioning Contractors' National Associations."
- D. All installations shall comply with the latest editions, issues or supplements of all applicable codes, ordinances, regulations and requirements without increase in contract price. Such provision, rules, regulations and ordinances are to be considered as much a part of these specifications as if repeated herein or attached hereto. All changes or modifications required to conform to such codes, regulations, or requirements must be reviewed, the same as Shop Drawings, by the A/E/D.
- E. The Contractor shall give all necessary notices, obtain and pay all utility company bills or governmental taxes, fees for connections, water taps and other costs in connection with his work; and he shall also maintain and pay special charges, overtime, or provide any special protection, barricades, lights, personnel as may be required by the State, County, Owner or City in the performance of the contract requirements, as well as providing the necessary equipment to dig or drive and provide de-watering or shoring by any means designated so as to comply with the governing bodies' procedures.
- F. All materials furnished and all work installed shall comply with the rules and recommendations of the National Fire Protection Association, with all requirements of the local utility companies, with the recommendations of the Owner's fire insurance rating organization having jurisdiction, and with the requirements of all governmental departments having jurisdiction.
- G. This Contractor shall assume all responsibility of proper installation of services to meet all rules and regulations of the utility or governmental agent involved and pay all fees or charges required.
- H. All details shall be verified before bidding with each utility or agency and no allowances will be made in the Contract to properly or differently than detailed install any service.

1.06 SITE VERIFICATION

- A. This Contractor is directed to visit the premises and make him self thoroughly familiar with the general layout of the building site and the location of present lines to which connections shall be made. He shall also check present grades, ditches, pavements, sewers, and/or all other conditions affecting the service installations contemplated under this Contract. Such offsets as may be required to leave new work clear, etc. must be included in the Contractor's proposal, and the Contractor must assume the full responsibility for having made a proper and thorough investigation of these requirements. The contractor is to review the construction documents and visit the premises prior to bidding. Visits to the facility by the prospective contractors must be coordinated with the A/E/D.
- B. No extras will be allowed subsequently to the successful Contractor to cover any such error, omission and/or oversight on the part of the contractor for not having made a thorough inspection of the grounds, facilities, building conditions, proposed drawings etc.
- C. Contractor shall further inspect the site and see for himself the available storage space, trucking facilities for bringing materials into the building/area and must assume responsibility for receiving, unloading, storing freight, demurrage, theft and any and all other factors influencing the work under this specification.

1.07 INTERFACE

- A. Refer to drawings and specifications for other Divisions of work to determine materials and conditions of other work where Division 23 work meets or connects to such other work. Coordinate respective Division 23 work with work of other Divisions.

1.08 COORDINATION OF WORK

- A. Locations of various parts of the equipment, ductwork, services and piping shown by Mechanical Plans are diagrammatic and approximately correct. Exact location shall be

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determined on job and governed by structural conditions of the building and work of other Contractors, subject to decision of A/E/D, who reserves the right to make any reasonable change in locations indicated without extra charge to Owner.

- B. Contractor shall study and become familiar with contract drawings of other trades and A/E/D's drawings in order to obtain all necessary information in order that all interferences with work of other trades may be avoided. Cooperate with all other workmen and install work in such a way that all interferences are avoided. All work shall be installed so that all parts required are readily accessible for inspection, operation, removal, maintenance and repair.
- C. All pipe, apparatus, appliances or other items interfering with proper placement of other work, as indicated on the drawings, specified, or required, shall be removed and shall be re-located and re-connected without extra cost. All damage to other work caused by this Contractor, his Subcontractors or his workmen, by reason of neglect, accident or any cause whatsoever, shall be repaired and made good in the same manner as specified for new work of the same character.
- D. Openings and chases shall be left in new walls for this Contractor's work when so requested before general work so affected is completed. Where this Contractor has failed to make such request at proper time, he shall pay for all cutting, patching, etc., of the building required for this work.

1.09 LAYING OUT

- A. This Contractor shall take all measurements necessary for his work and shall assume responsibility for their accuracy. This Contractor shall not scale Mechanical Drawings but shall obtain all dimensions from building and the Construction Drawings unless specified herein or shown on drawings.

1.12 PROTECTION

- A. The Contractor shall be responsible for the maintenance and protection of all equipment, materials, and tools supplied by him and stored or installed on the job site from loss, theft, vandalism or damage until final acceptance by the Owner.
- B. The Contractor shall be responsible for the protection of Owner's materials and equipment, and any finished work of other trades from damage or defacement by his operations and must remedy any such injury at his own expense.
- C. Openings in exterior walls, and roofs, particularly at or below grade, shall be kept properly plugged at all times. After completion of work, openings for which the Contractor is responsible shall be permanently sealed and caulked in the manner approved by the A/E/D.

1.13 SHOP DRAWINGS

- A. Contractor shall submit electronically in PDF Format shop drawing to A/E/D for review before commencing any work or providing materials. Review of shop drawing does not relieve contractor of correct ordering and installations. Electronic shop drawing systems may be employed and will be detailed at the on set if allowed.
- B. Drawings submitted shall bear the stamp of approval of the Contractor as evidence that the drawings have been checked by the Contractor and comply with the requirements of the contract drawings and specifications. Any drawings submitted without this stamp of approval will not be considered and will be returned to the Contractor for resubmission. If the drawings submitted show variations from the requirements of the Contract, the Contractor shall make specific mention of such variations in his letter of transmittal in order that, if acceptable, suitable action may be taken for proper adjustment, otherwise, the Contractor will not be relieved of the responsibility of executing the work in accordance with the Contract even though such drawings have been reviewed.
- C. The A/E/D's reviewing of the Contractor's and Subcontractor's Drawings or Equipment Details does not relieve the Contractor from responsibility for errors, omissions, or equipment

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capacities which may exist or develop even though work is done and equipment furnished in accordance with such checked or reviewed drawings.

- D. The reviewing of Contractor's and Subcontractor's drawings or equipment details by the A/E/D is a gratuitous assistance and the A/E/D does not thereby assume responsibility for errors or omissions. Where such errors or omissions are discovered later, they shall be made good by the Contractor irrespective of any review by the A/E/D.
- E. Review by A/E/D applies only to capacity, quality, general arrangement, design and type. Approval does not apply to quantities, dimensions, connection locations and similar. In all cases, Contractors shall be responsible for furnishing the proper quantities of equipment and/or materials required, that all equipment fits the available space in satisfactory manner and that all piping, electrical and other connections are suitably located.
- F. Review by A/E/D will not modify or nullify any provisions of Contract Documents which include Drawings and Specifications, nor will approval relieve Contractor from responsibility for error, omissions and deviations from Contract Documents.

1.14 RECORD DRAWINGS

- A. The Contractor shall keep an accurate, current and progressive record of all installed work, including all changes and deviations from the design drawings. Recordings shall be made on prints kept in good condition at the job site as the work progresses and before any work is covered. Detail drawings shall be made if necessary for clarity.
- B. Recordings shall be made on prints kept in good condition at the job site as the work progresses and before any work is covered. The field drawings are to be brought to the construction progress meetings for periodic checks.
- C. Upon completion of the contract work, the Contractor shall deliver the marked-up prints to the A/E/D with a signed certification by a principal of the contracting firm, that all work was installed as shown.
- D. All labor and material costs incurred in the accomplishment of the foregoing requirements shall be borne by the Contractor. Final approval of the work and final payment shall be withheld until after receipt of the marked as built prints.

1.15 FIELD INSTRUCTIONS

- A. During construction, the A/E/D shall observe the work and give written field instructions as required without invalidating the Contract. Such field instruction shall not be construed as authority to change the terms of the Contract
- B. In cases where extra cost or reductions in cost of the Contract are involved, the Contractor shall notify the A/E/D in writing at the time of such instructions and shall establish cost difference and shall receive written approval before proceeding. The Contractor shall not be reimbursed for extra work unless this procedure has been followed.

1.16 CLEAN-UP

- A. Contractor shall remove from site, and legally dispose of, rubbish resulting from the work under his Contract. Rubbish shall be removed daily and not be allowed to accumulate. Owner has first right of salvage. Owner salvaged items shall be delivered to Owner by the Contractor at specified locations.

PART 2 – PRODUCTS

2.01 PRODUCT WARRANTY

- A. All work shall be guaranteed (parts and labor) for a period of one (1) year.
- B. Warranty shall run from written date of substantial completion of the work, not from date of installation of a device or piece of equipment, nor from any date set by the equipment supplier relative to his equipment.

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2.02 MECHANICAL REFERENCE SYMBOLS, DETAILS AND DRAWINGS

- A. Symbols used are diagrammatic are generally generic in nature.
- B. Details and Drawings are typical in nature and are subject to variations to suit specific products and project conditions and available space.

PART 3 – EXECUTION

3.01 WORKMANSHIP

- A. All work is to be performed in a craftsman like manner as judged by the A/E/D and conform to the Trade Association Standard of Installation.

3.02 INSTALLATION

- A. Whenever necessary, the Contractor shall provide all bases and supports not part of the building structure, of required size, type and strength, as approved by the A/E/D for all equipment and materials furnished by him. When earthquake loads are applicable in accordance with the Building Code, mechanical system supports shall be designed and installed for the seismic forces in accordance with the Building Code. Generally all Mechanical systems are to be supported in accordance with the Mechanical Code.

3.03 RESPONSIBILITIES

- A. The Contractor shall be responsible to coordinate with his subcontractors and to pursue all job problems concerning repair, replacement or proper operation of all systems.
- B. It shall be the Contractor's responsibility to determine, in conjunction with the A/E/D if required, the source of any problems and obtain solution and correction of same with all expediency.

3.04 EQUIPMENT ACCESSIBILITY AND SPACE COORDINATION AND PER-BID VERIFICATION REQUIREMENTS

- A. Physical size and arrangement of proposed equipment and apparatus must be suitable for the space available. Maintain required clearances and allow space for proper maintenance and placing in the facility and removing from the facility.
 - 3 Prior to bidding project each Contractor and equipment representative must review the installation, arrangement, space available and verify that the proposed installation will retain required clearance and maintain accessibility. Maintenance space must be demonstrated by Contractor.
 - 4 Any deviations required to accommodate equipment etc. must be coordinated by Contractor with A/E/D before bids are accepted on the project. After bids are accepted such work will be part of the Contractor's work and will add no additional expense to the project.
- B. Contractor is responsible for furnishing equipment which is suitable for the space available and must bear the costs for all modifications to his work and the work of others required to accommodate his equipment both the installing and moving into place.

3.05 EQUIPMENT SERVICE AND CONNECTION REQUIREMENTS COORDINATION AND PRE-BID VERIFICATION REQUIREMENTS

- A. Service and connection requirements of proposed equipment and apparatus must be compatible with the respective services available as required to accommodate the intent of the design.
- B. Mechanical and electrical service connection requirements of a manufacturer's equipment, even if listed as acceptable, may not be the same as the requirements as the product

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GENERAL HVAC REQUIREMENTS

specified or shown on the construction drawings. Contractor is to make adjustments as required. All connections are to be made complete to accommodate the intent of the design.

1. Prior to bidding the project, each bidding Contractor and respective equipment manufacturer's representative must review the installation arrangement and mechanical and electrical service connections indicated on the Construction Drawings and verify that installation of the proposed equipment will be compatible with the Construction Drawing's, available space and actual conditions.

3.06 TESTING AND ADJUSTING

- A. Thoroughly test for leaks and operate each system device and item of equipment installed as part of this project and cooperate with the Testing and Balancing Agency (Section 15950) performing the final testing and adjusting of the respective systems.
- B. Notify A/E/D 48 hours previous to all testing, adjusting or balancing. Tests must be conducted in the presence of a representative of the A/E/D and a written report is to be provided.
- C. System testing and balancing is to be performed after the respective systems have been deemed by the Contractor to be complete and operating in full working order.

3.07 CLEANING

- A. All equipment and premises are to be thoroughly cleaned.
- B. Air filters for air handling units are to have one set of filters installed at start up. The second set is to be installed just before Air Balance and the third set is to be awarded to Owner for future installation.

3.08 MECHANICAL EQUIPMENT CONTROL WIRING

- A. Furnish and install complete all controls and connect control wiring for all equipment provided as part of this project and respective work. Verify operation and correctness of connections and terminations of equipment. Operation of all equipment must be demonstrated to A/E/D and Owner by the Contractor.
- B. See Section 230913 Temperature Control.

END OF SECTION 230501

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GENERAL HVAC REQUIREMENTS

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TESTING, ADJUSTING AND BALANCING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and 230100 HVAC General Requirements, 230110 HVAC General Provisions, 231500 Basic HVAC Materials and Methods, including all general and supplementary conditions and Division 1 Sections shall apply to this Section.

1.02 SUMMARY

- A. This Section includes testing, adjusting and balancing HVAC and Plumbing and Hydronic Systems to produce the design objectives, including the following:
 - 1. Adjusting the total HVAC systems to provide indicated requirements and desired results as judged by the A/E/D.
 - 2. Providing a written report of the results of the activities and procedures specified in this Section.

1.03 DEFINITIONS

- A. Adjust: To regulate fluid rate and air patterns at the terminal equipment, such as to reduce fan speed or regulate a damper.
- B. Balance: To proportion flows within the distribution system including sub-mains, branches and terminals according to the design quantities.
- C. Draft: A current of air, when referring to localized effect, caused by one or more factors of high air velocity, low ambient temperature, or direction of air flow, whereby more heat is withdrawn from a person's skin than is normally dissipated. Generally air velocity over persons shall not exceed 50 FPM.
- D. Procedure: An approach to and execution of a sequence of work operations.
- E. Report form: Test data sheets for recording test data in logical order.
- F. Static head: The pressure due to the weight of the fluid above the point of measurement expressed in PSI or feet of water column.
- G. Suction head: The height of fluid surface above the centerline of the pump on the suction side usually expressed in feet of water column.
- H. System effect: A phenomenon that can create undesired or unpredicted conditions that result in reduced capacities in a part or all of the system.
- I. System effect factors: Allowances used to calculate a reduction of performance of a fan or pump etc. installed under different conditions than those used for the design or the manufacturer's performance testing.
- J. Terminal: A point where the control medium, such as fluid or energy enters or leaves the distribution system.
- K. Test: A procedure to positively determine quantitative performance of a system or system component.
- L. Testing and adjusting and balancing agent: The entity responsible for performing and reporting all testing, adjusting and balancing.
- M. Accepted associations: AABC – Associated Air Balance Council, AMCA – Air movement and Control Council, NEBB – National Environmental Balancing Bureau and SMACNA – Sheet Metal and Air Conditioning Contractor's National Association.

1.04 QUALITY ASSURANCE

- A. Agent qualifications: Contractor must be a qualified testing adjusting and balancing

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TESTING, ADJUSTING AND BALANCING

contractor presently certified by AABC or NEBB.

- B. Testing and balancing agencies:
 - Gibson Services
 - Fluid Engineering Services (Johnson Controls Inc.)
 - Mechanical Systems Balancing
 - Bledsoe
- C. Balancing Contractor (B.C.) to use standard forms from AABC or NEBB.
- D. B.C. to comply with all standards and procedures described in NEBB's "Procedural Standards for Testing, Adjusting and Balancing of environmental Systems."
- E. M.C., E.C. and T.C.C. to provide support and coordinated effort to the B.C. in order to achieve the most accurate testing, adjusting and balancing possible. M.C. to provide volume dampers, deflectors, splitters, valves, test ports, cocks, gauges, thermometers etc. as directed by the B.C.
- F. B.C. to provide minimum of 48 hours notice to A/E/D and Owner before testing is performed. All testing is to be performed after air and water tests have been completed by M.C.
- G. Negative or positive air pressure relationships between rooms and areas, as indicated on the Drawings, must be adhered to above exact air quantities.
- H. Generally, all listed quantities must be balanced within 10% of the listed flow. B.C. to halt balance and notify A/E/D should irresolvable discrepancies arise. A/E/D is to provide direction to B.C. and M.C. as to how to proceed with balance.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – GENERAL TESTING AND BALANCING PROCEDURES

3.01 PERFORMANCE

- A. Perform testing, adjusting and balancing procedures on all and each system in accordance with the procedures detailed in AABC national standards, or NEBB's performance procedures.
- B. Cut duct's, pipe's and equipment cabinet's insulation etc. as required for test ports and probes etc. After testing and balancing close holes and patch insulation with new materials like those removed. Restore all vapor barriers complete.
- C. Mark equipment settings with paint or permanent marker to provide a resilient identification for damper positions, valve indicators, fan speed controls, levers and such control devices to show final settings. Set and lock all memory stops.
- D. Verify that all variable flow systems track true and in proper proportion to system requirements and in correct response to the respective control.

3.02 INSTALLATION TOLERANCES

- A. Air handling systems are to be adjusted within plus or minus 10% of design flow for supply, relief and return air. Supply air would preferably be set high before low with other air flows proportional.

3.03 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required design supply, return, outside air and exhaust air quantities and static pressures.
- B. Measure air quantities at air inlets and outlets.

TESTING, ADJUSTING AND BALANCING

- C. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise while maintaining air pressure relationships specified or displayed on drawings.
- D. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

3.04 SCHEDULES

A. Report:

- 1. Summary Comments:
 - a. Design versus final performance
 - b. Summary of outdoor and exhaust flows to indicate amount of building pressurization.
 - c. Test conditions.
- 2. Return Air
 - a. Flows and respective relationships
- 3. System diagrams to include layouts of air and hydronic distribution presented with single line drawings which include the following data:
 - a. Quantities of outside, supply, relief (exhaust) airflows
 - b. Duct outlet/inlet sizes and flows
 - c. Terminal units with size and flows listed

END OF SECTION 230593

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TESTING, ADJUSTING AND BALANCING

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230700
HVAC INSULATION-GENERAL.

PART I - GENERAL

1.01 SUMMARY

- A. Section includes general provisions common to mechanical insulation work.
- B. Applicable general provisions in this Section govern insulation work the same as if repeated in respective complementary Sections.
- C. Provide materials, transportation, labor, and services and insulate respective mechanical work in compliance with provisions herein and in respective system and equipment Insulation Sections and in compliance with notes on Drawings.
- D. Fire stopping provisions in Section 230500 General HVAC Requirements govern fire stopping at mechanical work penetrations of fire resistive and fire rated construction.

1.02 REFERENCES

- A. Following standards form a part of mechanical insulation specifications to the extent indicated by references made thereto:
 - 1. American Society of Testing Materials (ASTM).
 - 2. Underwriters' Laboratories (UL).

1.03 SUBMITTALS

- A. Submit product data for insulation, jackets, coverings, adhesives, sealants, cements and other materials to be installed on this Project. List materials and thickness for each service application.
- B. Provide shop and installation drawings of field fabricated covers. Samples of products may be required at A/E/D's request.

1.04 QUALITY ASSURANCE

- A. Applicator: A company specializing in, and experienced in mechanical equipment and systems insulation application. (Insulation Contractor)
- B. Fire Performance Characteristics: Insulation, facings, cements, and adhesives shall have 25/50 maximum flame spread/smoke developed rating in accordance with ASTM E84, except insulation outside may be rated 75/150 maximum. Insulation shall be tested by and bear label of U.L. or other testing organization acceptable to authority having jurisdiction.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store products in unopened factory packaging.
- B. Protect adhesives, mastics, cements, etc., from freezing.
- C. Protect insulating materials from moisture.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Ambient temperatures and conditions during installation operations, and curing period when applicable, shall comply with manufacturer's requirements for respective product (adhesives, mastics, insulation cements, etc.).

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Referenced or listed in respective complementary Insulation Section.

2.02 MATERIAL

- A. Specified in respective complementary Insulation Section.

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HVAC INSULATION-GENERAL.

2.03 INSULATION SCHEDULE

A. Ductwork

SERVICE	MATERIAL	JACKET
Supply & Return Air Duct	1½" thick foil faced 3/4lb density fiberglass wrap	Seal joints with foil faced tape
Outside Air Intake Duct	2" thick foil faced 3/4lb density fiberglass wrap	Seal joints with foil faced tape
Plenums and Ducts above un-heated space	2" thick foil faced 3/4lb density fiberglass wrap	Seal joints with foil faced tape

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

- A. Before installing insulation, verify that respective work to be insulated is complete, has been tested and cleaned, and is ready to be insulated. Use tarpaulins or other coverings to protect equipment, uncovered piping, ductwork, etc. from dirt and rubbish which may be caused by insulation installation operations.
- B. Prior to starting insulation installation operations and while performing work, verify that environmental conditions are within manufacturer's recommendations for sealants, tapes, and other adhesives to be used.

3.02 INSTALLATION OF INSULATION, GENERAL

- A. Insulation Work: Performed by qualified tradesmen, following manufacturer's written instructions for respective products, in compliance with applicable building codes and industry standards. (Insulation Contractor).
- B. Install insulation over clean, dry surfaces only.

END OF SECTION 230700

230713
DUCT INSULATION

PART 1 – GENERAL

1.01 SCOPE

- A. Furnish and install duct insulation as shown on the Contract Documents.

1.02 SUBMITTALS

- A. Submit descriptive literature for approval.
- B. Submit samples if requested.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Schuller,
 - 2. Owens Corning,
 - 3. Armstrong,
 - 4. Certain-Teed
 - 5. Knauf.

2.02 INSULATION

- A. Blanket glass fiber insulation thickness shall be minimum 1-1/2" thickness for supply and return and 2" thick for outside air intake with a thermal conductivity of 0.30 at 75° F differential; vapor barrier shall be combination aluminum foil reinforced with glass fiber yarn mesh and laminated to 40 lb. flame resistant Kraft paper having 2" tab.
- B. All insulation inside building shall be UL listed and have composite UL flame spread and smoke developed ratings not exceeding 25 and 50. Accessories such as adhesives, mastics, cements, tapes, glass, fabric, etc., shall have same component ratings as insulation.

2.03 ACCESSORIES

- A. Sealants, mastics and adhesives shall be as recommended by insulation manufacturer and shall be vermin proof.

PART 3 – EXECUTION

3.01 PREPERATION

- A. Prior to beginning work, verify that duct surfaces are clean, sealed, and dry. Carefully inspect the work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

3.02 REQUIREMENTS

- A. Exposed fabricated unlined sheet metal plenums, unlined housings, unlined outside air ductwork and rectangular air conditioning supply in equipment rooms shall be externally insulated with rigid board glass fiber insulation.
- B. Ductwork shall be externally insulated with blanket glass fiber insulation as indicated above and on drawings.

3.03 INSTALLATIONS

- A. Cover all joints on external insulation with 3" wide foil reinforced kraft tape specifically manufactured for this application.
- B. All insulation shall be installed with edges tightly butted. Any insulation which is not so installed or shows evidence of leaking, sagging, buckling or sweating shall be replaced in its

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DUCT INSULATION

entirety at no additional cost. All defective insulation shall be remade in its entirety with new materials.

- C. All insulation shall be continuous through wall and ceiling openings and sleeves, except at fire or smoke walls or ceilings.
- D. Vapor barrier jackets shall be applied with a continuous, unbroken vapor seal. Hangers, supports, anchors, etc., that are secured directly to cold surfaces shall be insulated and vapor sealed to prevent condensation.
- E. Secure insulation tightly to ductwork with all joints tightly butted. Secure insulation to ductwork by using mechanical fasteners which do not pierce duct. Fasteners shall be adhered to ductwork with adhesive and shall be installed on 12" centers in both directions. All joints and penetration of the vapor barrier shall be sealed with 3" pressure seal aluminum foil tape. All cuts or tears shall be sealed with strips of the aluminum foil tape.

END OF SECTION 230713

233000
AIR DISTRIBUTION

PART 1 – GENERAL

1.01 SYSTEMS

- A. Air distribution systems include but are not necessarily limited to the following:
 - 1. Heating, Air Conditioning
- B. Air distribution equipment and apparatus, direct fired heating equipment, DX cooling equipment, air moving equipment without coils, ductwork, terminals, etc. are included in this section and respective subsections.

1.02 QUALITY ASSURANCE

- A. Requirements in Sections 230500 and 230501 govern equipment in this section and equipment supplier responsibilities.
- B. All products of a similar type shall be from the same manufacturer.
- C. Manufacturer's identifying numbers referred to herein and on drawings are to establish general design. Actual identification numbers denoting features specified or required shall be determined by contractor and supplier through comparison of the respective manufacturer's specifications with the project specifications, drawings and job conditions.
- D. See specific item for listing of manufacturers.

.PART 2 – PRODUCTS

2.01 PRODUCTS ARE NOT INCLUDED IN THIS SECTION BUT ARE INCLUDED IN OTHER DIVISION 23 SECTIONS

PART 3 - EXECUTION

3.01 INSTALLATION OF AIR HANDLING EQUIPMENT AND SYSTEMS

- A. Air Handling Equipment and Systems: installed as shown on drawings, in compliance with requirements included in respective specifications and related sections. All installations shall be coordinated with other work, complete with all hardware and accessories even though some parts may be omitted on drawings.

3.02 AIR LEAK TESTING

- A. Test all duct systems for leaks and seal all leaks.

3.03 PERFORMANCE TESTING, ADJUSTING AND BALANCING

- A. Testing, Adjusting and Balancing: performed in compliance, with all leak testing and duct sealing completed before balancing is started by installing Contractor.
- B. Verify that adjustable sheaves as specified have been furnished and that furnished sheaves allow necessary adjustments to obtain the required air volume determined by the balancing technician. Replace with proper sheaves where required to allow balancing.
 - 1. After Air Handling unit sheaves have been adjusted for proper air volume, replace adjustable sheaves with fixed sheaves of proper size to produce required air volume on units of 5000 CFM or more..
- C. Initially start, lubricate and balance all fans to eliminate noise and vibration.
- D. Install clean filters, media, etc. immediately before balancing is started.
- E. Supply all balancing and adjusting dampers shown and as required to obtain final system balance.

END OF SECTION 233000

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AIR DISTRIBUTION

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PART 1 – GENERAL

1.01 DESCRIPTION

- A. Ductwork and accessories for HVAC including the following:
 - 1. Supply air and return air systems.
- B. Definitions:
 - 1. SMACNA Standards as used in this specification means the HVAC Duct Construction Standards, Metal and Flexible.
 - 2. Seal or Sealing: Use liquid or mastic as an additional sealant, with or without compatible tape overlay or gasketing of flanged joints, to keep air leakage at duct joints, seams and connections to an acceptable minimum.
 - 3. Duct Pressure Classification: SMACNA HVAC Duct Construction Standards, Metal and Flexible.

1.02 QUALITY ASSURANCE

- A. Fire Safety Code: Comply with NFPA 90A.
- B. Duct System Construction and Installation: Referenced SMACNA Standards are the minimum acceptable quality.
- C. Duct accessories exposed to the air stream, such as dampers of all types (except smoke dampers) and access openings, shall be of the same material as the duct or provide at least the same level of corrosion resistance.

1.03 SUBMITTALS

- A. Coordinate with administrative requirements for submittal procedures.

1.04 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. Air Diffusion Council Test Code:
 - 1. 1062R4 Certification, Rating, and Test Manual (1977)
- C. Air Moving and Conditioning Association (AMCA):
 - 1. 500-75 Test Method and Louvers, Dampers and Shutters
- D. American Society for Testing and Materials (ASTM):
 - 1. A527-90 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality
 - 2. A569-91 Standard Specification for Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality
- E. National Fire Protection Association (NFPA):
 - 1. 90A-96 Standard for the Installation of Air Conditioning and Ventilating Systems
- F. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
 - 1. HVAC Duct Construction Standards, Metal and Flexible, 2nd Edition-1995
 - 2. HVAC Air Duct Leakage Test Manual, 1st Edition, 1985
- G. Underwriters Laboratories, Inc. (UL):

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DUCTWORK

1. 181-90 UL Standard for Safety Factory-Made Air Ducts and Connectors.

PART 2 – PRODUCTS

2.01 DUCT MATERIALS AND SEALANT

- A. General: Except for systems specified otherwise, construct ducts, casings, and accessories of galvanized sheet steel, ASTM A527, coating G90; or, aluminum sheet, ASTM B209, alloy 1100, 3003 or 5052.
- B. Joint Sealing: Refer to SMACNA Standards, paragraph S1.8 and S1.9.
 1. Sealant: Elastomeric compound, gun or brush grade, maximum 25 flame spread and 50 smoke developed (dry state) compounded specifically for sealing ductwork as recommended by the manufacturer. Generally provide liquid sealant, with or without compatible tape, for low clearance slip joints and heavy, permanently elastic, mastic type where clearances are larger. Oil base caulking and glazing compounds are not acceptable because they do not retain elasticity and bond.
 2. Tape: Use only tape specifically designated by the sealant manufacturer and apply only over wet sealant. Pressure sensitive tape shall not be used on bare metal or on dry sealant.
- C. Approved factory made joints by Pittsburg Lock may be used Snap or Button Lock is not acceptable.

2.02 DUCT CONSTRUCTION AND INSTALLATION

- A. Follow SMACNA HVAC Duct Construction Standards. Acceptable connection to be Pittsburg Lock Joints. (Snap Lock is not acceptable)
- B. Duct Pressure Classes:
 1. Supply and return ductwork: 2" Pressure Class
- C. Seal Classes: In accordance with SMACNA HVAC Air Duct Leakage Test Manual.
- D. Volume Dampers: Single blade or opposed blade, multi-louver type as detailed in SMACNA Standards.
- E. Duct Hangers and Supports: Refer to SMACNA Standards Section IV. Avoid use of trapeze hangers for round duct.

2.03 FLEXIBLE AIR DUCT CONNECTORS

- A. General: Factory fabricated, complying with NFPA 90A for connectors not passing through floors of buildings. Flexible ducts shall not penetrate any fire or smoke barrier which is required to have a fire resistance rating of one hour or more. Flexible duct length shall not exceed 4 feet. Provide insulated acoustical air duct connectors in supply air duct systems and elsewhere as shown.
- B. Flexible ducts shall be listed by Underwriters Laboratories, Inc., complying with UL 181. Ducts larger than 8 inches in diameter shall be Class 1. Ducts 8 inches in diameter and smaller may be Class 1 or Class 2.
- C. Insulated Flexible Air Duct: Factory made including mineral fiber insulation with maximum C factor of 0.25 at 24°C (75°F) mean temperature, encased with a low permeability moisture barrier outer jacket, having a puncture resistance of not less than 50 Beach Units. Acoustic insertion loss shall not be less than 3 dB per foot of straight duct, at 500 Hz, based on 6 inch duct, of 2500 fpm.
- D. Application Criteria:
 1. Temperature range: 0 to 200°F internal.
 2. Maximum working velocity: 2500 feet per minute.

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DUCTWORK

3. Maximum working pressure, inches of water gage: 2 inches positive, 1 inches negative.
- E. Duct Clamps: 100 percent nylon strap, 175 pounds minimum loop tensile strength manufactured for this purpose or stainless steel strap with cadmium plated worm gear tightening device. Apply clamps with sealant and as approved for UL 181, Class 1 installation.

PART 3 – EXECUTION

2.01 INSTALLATION

- A. Comply with provisions of Section 230500, Basic HVAC Materials and Methods, particularly regarding coordination with other trades and work in existing building.
- B. Fabricate and install ductwork and accessories in accordance with referenced SMACNA Standards:
 1. Drawings show the general layout of ductwork and accessories but do not show all required fittings and offsets that may be necessary to connect ducts to equipment, boxes, diffusers, grilles, etc., and to coordinate with other trades. Fabricate ductwork based on field measurements. Provide all necessary fittings and offsets at no additional cost to the Owner. Coordinate with other trades for space available and relative location of HVAC equipment and accessories in and above ceiling grid. Duct sizes on the drawings are inside dimensions which may be altered by Contractor to other dimensions with the same square inch of opening and same air handling characteristics where necessary to avoid interference and clearance difficulties. All duct size changes are to be approved by the Engineer.
 2. Provide duct transitions, offsets and connections to dampers, coils, and other equipment in accordance with SMACNA Standards, Section II. Provide streamliner, when an obstruction cannot be avoided and must be taken in by a duct. Repair galvanized areas with galvanizing repair compound.
- B. Install duct hangers and supports in accordance with SMACNA Standards, Section IV.
- C. Flexible duct installation: Refer to SMACNA Standards, Section III. Ducts shall be continuous, single pieces not over 4 feet long (NFPA 90A), as straight and short as feasible adequately supported. Centerline radius of bends shall be not less than two duct diameters. Make connections with clamps as recommended by SMACNA. Clamp per SMACNA S3.33 and S3.34 with one or any chase or partition designated as fire or smoke barrier, including corridor partitions fire rated one hour or two hour. Support ducts SMACNA Standards.
- D. Where diffusers, registers and grilles cannot be installed to avoid seeing inside the duct, paint the inside of the duct with flat black paint to reduce visibility.
- E. Protection and Cleaning: Adequately protect equipment and materials against physical damage. Place equipment in first class operating condition, or return to source of supply for repair replacement, as determined by A/E/D. Protect equipment and ducts during construction against entry of foreign matter to the inside and clean both inside and outside before operation and painting. When new ducts are connected to existing ductwork, clean both new and existing ductwork by mopping and vacuum cleaning inside and outside before operation.

END OF SECTION 233113

233113
DUCTWORK

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233313
DUCT ACCESSORIES

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Duct test holes.
- B. Volume control dampers.

1.02 RELATED SECTIONS

- A. Section 238150 Ductwork

1.03 REFERENCES

- A. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 1995, Second Edition with Addendum # 1.

1.04 SUBMITTALS

- A. See Section 013200 - for Submittal Procedures.

PART 2 – PRODUCTS

2.01 DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

2.02 VOLUME CONTROL DAMPERS.

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- B. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch. Maximum 6" dimension.
- C. Multi-Blade Damper: Above 6" fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware; Model CD504 Manufactured by Ruskin. Single blade is allowable on 6" deep and smaller ducts. Provide locking, indicating quadrant regulators on single and multi-blade dampers.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 15815 for duct construction and pressure class.
- B. Provide weighted adjustable backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct test holes where indicated and required for testing and balancing purposes.
- D. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment
- E. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION 233313

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DUCT ACCESSORIES

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DIFFUSERS, GRILLES AND REGISTERS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, Section 238150 DUCT WORK and Section 238200 DUCT WORK ACCESSORIES apply to this Section.

1.02 SUMMARY

- A. This section includes variable air volume terminals for connection to single duct.

1.03 SUBMITTALS

- A. Product Data: For each product indicated, include the following:
 - 1. Shop drawings are to indicate materials of construction, interior and exterior finish, and mounting details, plus performance data including heating/cooling capacity and air flows.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable manufacturers:
 - 1. Krueger
 - 2. Titus
 - 3. Price Industries
 - 4. Tuttle and Bailey
- B. Capacity, size and CFM set points are indicated on the drawings.

2.02 CEILING DIFFUSERS

- A. Square or rectangle with louvered face constructed of steel or aluminum.
 - 1. Air pattern: To be adjustable from vertical, horizontal and off.
 - 2. Inner assembly: To be removable for access and cleaning.
 - 3. Suspended ceiling: To have panel sizes to fit into ceiling grid.
 - 4. Plaster ceiling etc.: To have overlapping flange.
 - 5. Finish: To be factory applied enameled color as selected by Owner.
 - 6. Reference product: Tuttle and Bailey DFF.

2.03 CEILING RETURN AIR GRILLES

- A. Square or rectangle aluminum egg crate $\frac{1}{2}$ " x $\frac{1}{2}$ " x 1" deep with no deflection.
 - 1. Finish: To be factory applied enamel color to match ceiling.
 - 2. Ceiling mounting: To have panel sized to fit ceiling grid or flanged for tile mounting.
 - 3. Reference product: Tuttle and Bailey CRE 510

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DIFFUSERS, GRILLES AND REGISTERS

PART 3 – EXECUTION

3.01 EXAMINATION AND INSTALLATION

- A. Examine areas where outlets and inlets are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment, such as proximity to walls and other air flow obstructions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Contractor to field verify exact frame requirements for each inlet and outlet.
 - 2. Support units from building structure.
 - 3. Connect to ductwork with draw bands or mechanical devices.
 - 4. Assure access to each outlet and inlet.

END OF SECTION 223713

260500
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.

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COMMON WORK RESULTS FOR ELECTRICAL

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 CD or DVD. The following is a list, but not limited to, of required documentation to be included on the CD or DVD:
 - 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. Additionally submit one hard copy of the O&M's in a 3-ring binder and unfolded Record Drawings.
- C. 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.

COMMON WORK RESULTS FOR ELECTRICAL

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.

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- 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.

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- 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.

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2. Multiple raceway runs may be 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 Manufacturers:
 1. B-Line
 2. Chalfant
 3. Cope
 4. Globetrax
 5. Husky
 6. Mono-Systems

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- 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.

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COMMON WORK RESULTS FOR ELECTRICAL

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.

COMMON WORK RESULTS FOR ELECTRICAL

- 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

COMMON WORK RESULTS FOR ELECTRICAL

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 which ever 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.

260500
COMMON WORK RESULTS FOR ELECTRICAL

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 260519 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

260500
COMMON WORK RESULTS FOR ELECTRICAL

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260502
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.

260502
SELECTIVE ELECTRICAL DEMOLITION

- 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 260502

260519
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, manufactures 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

260519
LOW VOLTAGE WIRE AND CABLE

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.

LOW VOLTAGE WIRE AND CABLE

- 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 260519

260519
LOW VOLTAGE WIRE AND CABLE

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260526
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 260513
- 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.

GROUNDING AND BONDING

- 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 260526

260533
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 1 - 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.

260533
RACEWAY AND BOXES

- 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 260533

260923
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 260500 Common Work Results for Electrical
- B. Section 260519 Low Voltage Wire and Cable
- C. Section 260533 Raceway and Boxes
- D. Section 265100 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) CD 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

260923
LIGHTING CONTROLS

B. Ratings

1. Like Paragon Model EC71St-N3/120V 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.

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LIGHTING CONTROLS

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.

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.**

END OF SECTION 260923

260923
LIGHTING CONTROLS

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262726
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 duplex 2 pole 3 wire grounding type unless loads require 20 amp.
- B. All switches shall be specification grade quiet switches, 120-277 volt 15 amp.
- C. Device colors shall be as 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, Bryant, Arrow Hart, 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- # HBL5361 or approved equal
 - 4. 20 amp GFCI - # GF5362 or approved equal

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WIRING DEVICES

- C. The following is the approved list of switches by type (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
- D. All interior device cover plates are to be nylon (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 install 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 262726

265100
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 260500 Common Work Results Electrical
- C. Section 260533 Raceway and Boxes
- D. Section 260529 Low Voltage Wiring
- E. Section 260923 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 lamp type to be provided
- C. The Electrical 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

- A. Acceptable Manufacturers
 - 1. FineLite
- B. All others must submit for approval.

2.02 FIXTURE SCHEDULE

- A. See drawings.

265100
INTERIOR LIGHTING

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

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 265100



Revised 10/29/2018

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 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.
 - 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.

END OF SECTION 27 00 10



Revised 10/29/2018

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 00.00



Revised 10/29/2018

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 wire ties shall be used wherever wire ties are permitted and wherever plenum rated cable is used.
- e) Wire ties 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) Velcro type wire ties shall be used in non-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 01.00



Revised 10/29/2018

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) 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.
 - 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, wyces, 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 ¼” 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 innerduct:

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 ¼", 3/8", ½", and 5/8" sizes.
 - i) Utilize ½" 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 ½" 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 – ½” 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



Revised 10/30/2018

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 manufacturers 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



Revised 10/30/2018

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. BISCIT 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 # - Patch Panel #/Port # - Outlet Room Number .
 - 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



Revised 10/30/2018

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.

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) $\text{Link_Attenuation (dB)} = \text{Cable_Attn (dB)} + \text{Connector_Attn (dB)} + \text{Splice_Attn (dB)}$
 - (2) $\text{Cable_Attn (dB)} = \text{Attenuation_Coefficient (dB/km)} * \text{Length (Km)}$
 - (3) $\text{Connector_Attn (dB)} = \text{number_of_connector_pairs} * \text{connector_loss (dB)}$
 - (4) Maximum allowable connector_loss = 0.75 dB
 - (5) $\text{Splice_Attn (dB)} = \text{number_of_splices} * \text{splice_loss (dB)}$
 - (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 CD-ROM. This CD-ROM 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 CD-ROM. This CD-ROM 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) $\text{Link_Attenuation (dB)} = \text{Cable_Attn (dB)} + \text{Connector_Attn (dB)} + \text{Splice_Attn (dB)}$
 - i) $\text{Cable_Attn (dB)} = \text{Attenuation_Coefficient (dB/km)} * \text{Length (Km)}$
 - ii) $\text{Connector_Attn (dB)} = \text{number_of_connector_pairs} * \text{connector_loss (dB)}$
 - iii) Maximum allowable connector_loss = 0.75 dB
 - iv) $\text{Splice_Attn (dB)} = \text{number_of_splices (S)} * \text{splice_loss (dB)}$
 - 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

END OF SECTION



Revised 10/31/2018

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 Premisers.
- 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 then 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 CablePUP6AM04BU-UG .
 - (A) Additional approved manufacturer(s):
 - (B) General Cable 7141819
 - (C) CommScope 2091 004ABL 4/23 R1000
 - (D) Belden 10GX13 D151000
 - (E) Mohawk M58646



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. 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.
5. 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 CFP4xxY
 - 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 each cable from a station outlet in numerical order on adjacent ports on the specified termination hardware within the appropriate Communications Room.
3. 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 13.00



Revised 10/31/2018

COMMUNICATIONS COAXIAL 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. Complete Horizontal Cabling Systems For
 - a) Video (RF Broadband Video Distribution)
 - 2. System includes but is not limited to:
 - a) Horizontal cabling.
 - b) Station outlets including frames, connector modules, and cover plates.
 - c) Connectors
- 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 Wall Linings”
 - b) Division 27 – “Communications Cable Management and Ladder Rack”
 - c) Division 27 – “Communications Copper Horizontal Cabling”
 - d) Division 27 – “RF Broadband Video Distribution System”
- C. Related Drawings
 - 1. Technology (T-Series) Drawings



1.3 REFERENCES

- A. ANSI/TIA/EIA-568-C.0 – Generic Telecommunications Cabling for Customer Premisers.
- B. ANSI/TIA/EIA-568-C.1 – Commercial Building Telecommunications Cabling Standard
- C. ANSI/TIA/EIA-568-C.4 – Standard on Coaxial Cabling Components
- D. ANSI/TIA/EIA-606-A – The Administrative Standard for the Telecommunications Infrastructure of Commercial Building.
- E. “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 Coaxial (RF) 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 compliant Coaxial horizontal cabling system.
 - 3. The system shall consist of total connectivity for a complete and permanent installed communications link.
 - 4. 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.
 - 5. The cable distance between the termination point with a Communications Room(s) and the station outlet(s) shall be no greater then 90 meters (295 ft).
 - 6. 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
 - 7. All system cables shall be continuous between points of termination, without splices.
 - 8. 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. The Contractor shall provide and install the appropriate cable for the appropriate conditions



B. Special Coordination (RF)

1. Leave a 10-foot service loop on each cable neatly coiled above the ceiling at the outlet location.
2. Terminate all RG-6 coaxial cables with an F style connector on each end and coil on designated backboard (with adequate length to reach extents of the backboard) in the ER/TRs and on feed-through bulkheads at the outlet.
3. Utilize a TDR to determine each cable's length; mark each cable with its measured length.
4. Separately record each cable and its measured length.
5. Provide a report in MS Excel format to the RF contractor documenting the following:
 - a) Each backbone RF cable installed
 - b) The rooms that they serve
 - c) The function they serve (Monitor or Local Input)
 - d) The cable designator (Marked on each cable approximately 3" from the connector)
 - e) The length of each cable.

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. Backbone diagram indicating all backbone cables and the connectivity provided; i.e. show cable types and the to-and-from locations for each.
2. Equipment rack/cabinet layouts (to scale) showing rack space used by each installed component.
3. A diagram of the labeling scheme used on the Project.
4. Cable manufacturer's certification of quality and performance.

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 listed in Part 2, 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 and CMR 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) Requirements for Outside Plant Rated cables.
 - 2) Proper cable classification is ultimately determined by building construction; reductions in classification for cables, not clarified or altered by addendum to the specifications, will require a deduct in price through a change order.
3. All references below for pathways, conduits, etc. are as defined by Section 27 05 28 "Pathways for Communications Systems".



B. Coaxial Cables

1. Electrical Requirements:

- a) All Coaxial cable is required to have the appropriate Radio Guide /Universal (RG/U) classification as defined by military standards adopted commercially. The compliance to these electrical characteristics must be third party verified by the manufacturer. Part 1 of this specification Section will define the appropriate classification for each cable.
 - i) Cable shall be 75 ohm impedance with 100 percent shielding. No discontinuity shall exist between 0 and 1000 MHz bands
 - ii) Cable shall be of the quad-shielded variety to minimize ingress and egress RF leakage.

2. Construction

- a) All coaxial cable will be properly constructed for the environmental conditions and to meet all applicable codes.
- b) The following basic construction types are available and recognized.
 - 1) Horizontal Video Coax Cables – RG-6U
 - i) Fully RG-6U compliant
 - ii) Cable shall be of the quad-shielded variety to minimize ingress and egress RF leakage.
 - iii) Cable shall be used in accordance with proper broadband design criteria. Cable shall be coaxial bare copper 18 AWG center conductor, foam/polyethylene dielectric, aluminum-mylar-aluminum foil tape, and 100 percent aluminum braid shield.
 - 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 Commscope 2227V

2.3 TERMINATION HARDWARE

A. General

- 1. Suggested layout of termination hardware is indicated on the Drawings. Coordinate layout of termination hardware with the Owner's Representative or Consultant/Architect/Engineer before installation.
- 2. Termination devices on this Project shall be color-coded. *** See Detail Drawings for details.
- 3. All devices shall be UL listed as required by the NEC published by the National Fire Protection Association.



B. Station Outlet

1. NOTE: Faceplates shall be provided with Horizontal Cabling
2. The following basic termination devices are available and recognized for this Project.
 - a) F style bulkhead Insert
 - 1) Female to Female 75 ohm bulkhead connector.
 - 2) Color to match outlet faceplate as described above; Electrical Ivory color unless otherwise specified
 - 3) Standard of quality shall be Panduit CMFSRxx

C. Equipment/Telecommunications Room Cabinet/Rack

1. The following basic termination devices are available and recognized for this Project.
2. Discreet Cable Connectors
 - a) The following basic termination devices are available and recognized on this Project:
 - 1) F style Coaxial connectors RG-6
 - i) Each connector will be sized for the proper cable construction to allow proper installation (Plenum vs. non-plenum)
 - ii) Connector shall utilize compression shield termination design
 - iii) Connector shall be terminated with manufacturer recommended crimping tool
 - iv) Standard of quality shall be as manufactured by Belden ProSNS FSNS6PLQ Quad Shield Plenum F-Connector

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

A. General

1. Miscellaneous

- a) Route all cabling and pathways parallel or at 90 degree angles to the rafters.
- b) All systems' cable runs are to be continuous without splices. All wiring is to be free from grounds, shorts, opens, and reversals.
- c) Provide proper strain relief at all connection points.
- d) Test and document the performance of all cables installed.



2. Protection

- a) 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.
- b) Do not terminate cables designated for different services onto the same patch panel unless otherwise clearly indicated on the drawings.
- c) No not exceed minimum bend radius or pulling tension specifications set forth by the product manufacturer.

3. 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, latter 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.

4. Labeling

- a) Label every cable at each end.
- b) Label all cabling and terminations as specified and indicated on related drawings.

5. Use of Raceways

- a) Install cabling within conduit and in surface raceway where specified in this or related sections and as indicated on the drawings.
- b) Cabling shall be installed in a concealed manner. Cables may be visible only in the following areas;
 - 1) Equipment Rooms
 - 2) Telecommunications Rooms
 - 3) Building spaces equipped with cable trays, but without finished ceilings to conceal the cables.
- c) Install cabling in Cable Tray / and Ladder rack where specified and/or indicated on the drawings.
- d) 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.

6. Cabling on backboards and Equipment racks

- a) Neatly dress, support, and securely attach all cabling.

7. Termination

- a) Terminate each end of every cable provided
- b) Terminate cables using the tools and connectors specified and as recommended by the cable/connector manufacturer.



8. Separation from Sources of Interference

- a) 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.

9. Cable Supports

- a) 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).

B. Horizontal Video (RF) Cables

1. Horizontal cabling

- a) Provide total connectivity to complete the permanent link.
- b) 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.
- c) 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.
- d) Install telecommunications outlets securely at work area locations.
- e) Any necessary electrical components (e.g., impedance-matching devices) at outlets shall be located outside the faceplate via a standard plug connection.
- f) 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.
- g) 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.
- h) Install all audio cable complete from connector to connector with no splices.

3.3 TESTING

A. Testing:

- 1. See: "Commissioning of Structured Cabling" for Coaxial Horizontal performance test parameters:

- 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



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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 T568A 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 00.00